



Incidence of Maxillofacial Trauma at Royal Prima Hospital

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Abstract

A study investigated the prevalence rates together with the sociodemographic features and the types of maxillofacial fractures and their causes for patients seeking treatment at Royal Prima Hospital in Medan during 2021–2023. This research employed a cross-sectional descriptive observational design using data retrieved from past records which documented 26 maxillofacial trauma patients. Selection of proper cases followed a purposive sampling method. The researchers used descriptive statistics in combination with cross-tabulations to evaluate associations among variables including gender distribution and patient age as well as fracture type and trauma etiology. The population of male patients exceeded females (69.2%) at a rate of 42.3% within the 11–20-year age category. Traffic accidents represented the primary reason behind traumatic injuries (61.5%) which mostly happened during motorcycle accidents. Lesions of the Le Fort I region of the maxilla occurred in 38.5 percent of cases and became the most prevalent fracture type. Hospital admission occurred for 65.4% of patients while surgical treatment became necessary for almost half of the total patients. The management of trauma patients became more complicated because 38.5% of patients presented systemic injuries with their facial trauma. Traffic accidents caused most of the maxillofacial trauma cases which mainly affected young male individuals at Royal Prima Hospital. The most common confrontational facial fracture presented as Le Fort I types among patients. The results demonstrate an immediate demand to create specific public health programs together with intensified traffic regulations and improved trauma medical systems in order to decrease facial injuries and achieve better patient recovery.

Introduction

Maxillofacial trauma is defined as a forceful injury related to the face and its surrounding tissues. The causes of traffic accidents are also a significant factor in maxillofacial trauma, along with other causes such as falls, assaults, industrial accidents, sports injuries, and firearm injuries (Chrcanovic et al., 2012; Khan et al., 2022; Dasukil et al., 2024). An example of maxillofacial trauma is a fracture of facial bones. In recent decades, the causes of maxillofacial fractures have continued to evolve and vary in each country. These fractures can result in functional failure, non-aesthetic appearance, and a decrease in the quality of life for an individual (Fauziah et al., 2025).

In anatomy, the oral and maxillofacial region has a complex anatomy with various essential organs situated adjacent to each other, including the brain, eyes, vital teeth, and surrounding nerve and blood vessel tissues (Susilawati et al., 2014; Balaji & Balaji, 2023; Joshi & Kochuveetil, 2021). There are three parts in the maxillofacial region: the first is the upper face, which includes the frontal bone; the second is the midface, which includes the maxilla categorized into three types—Le Fort I (transverse), Le Fort II (pyramidal), and Le Fort III

(craniofacial dysfunction)—as well as the zygomatic bone, nasal bone, and naso-ethmoidal complex. The third part is the lower face, which includes the mandible. Mandibular fractures can be categorized based on their anatomical location, including the angle, alveolar process, body, parasymphyseal region, coronoid process, symphysis, and condyle, ramus (Sjamsuhidajat, 2017; Panesar & Susarla, 2021; Iqbal et al., 2023; Derebaşınlioğlu & Cankorkmaz, 2022).

There are several variations and classifications of maxillofacial fractures, including fractures in the upper face such as the frontal and sinus bones, fractures in the mid-face such as the orbit, zygomatic bone, nasal bone, naso-ethmoid, and maxilla. The maxilla is divided into three types: Le Fort I (transverse), Le Fort II (pyramidal), and Le Fort III (craniofacial dysfunction). The last type is fractures in the lower face, such as the mandible, which has seven parts: angle, coronoid, symphysis, parasymphysis, ramus, alveolar, and condyle (Sjamsuhidajat, 2017; Singh et al., 2021; Kochkine et al., 2023). In the classification of maxillofacial fractures, the main focus is on soft tissue injuries. Disruptions in soft tissues, such as the lacrimal duct, parotid duct, major vascular architecture, and nerves, can damage the basic anatomical structures of the face (Ramirez et al., 2021; Langdon et al., 2017). It is essential to assess the potential damage, especially to all facial nerves. The face has a highly effective blood supply that supports optimal wound healing. Timely primary repair provides optimal outcomes, but in cases of challenging bleeding or extensive wounds, well-positioned combined sutures may be an initial referral measure for wound repair (Adrian & Wibowo, 2023).

Maxillary fractures can be classified into three forms: Le Fort I, Le Fort II, and Le Fort III. Each has distinct fracture characteristics, with the potential for damage to upper facial skull structures. Nasal fractures are the most commonly occurring facial bone fractures, often accompanied by symptoms such as swelling, epistaxis, nasal deviation, and tenderness (Sjamsuhidajat, 2017; Davis & Chu, 2015). Despite its strength and stability, the zygoma remains vulnerable to fractures resulting from direct blows to the malar eminence or cheek. Zygomatic fractures can be caused by assaults, especially punches, frequently targeting the cheek (Sjamsuhidajat, 2017). Naso-orbital-ethmoid (NOE) fractures involve an anatomical complex encompassing various bones in the nasal and orbital regions. The classification of NOE fractures is based on fragment damage levels and involvement of the medial canthal tendon (MCT) (Ajike et al., 2005; Baril & Yoon, 2013; Menville et al., 2024; Na et al., 2022; Chen et al., 2023).

Mandibular fractures can occur in various locations, including the condyle, ramus, angle, symphysis, parasymphyseal alveolar, and sometimes the coronoid process. Classification of mandibular fractures based on type includes greenstick, simple, comminuted, and compound fractures. Mandibular fractures often involve bone fragment dislocation, affecting the muscle tone inserted at the relevant site (Sjamsuhidajat, 2017; Scott et al., 2022; Dhupar, 2021; Lombardero et al., 2021). Orbital fractures, often referred to as "blowout fractures," result from blunt facial trauma and can be isolated or combined. These fractures can lead to significant functional and cosmetic complications, including expanded hypoesthesia, enophthalmos, diplopia, restricted eye mobility, and eye fractures (Sjamsuhidajat, 2017; Shetty, 2016; Moe et al., 2018). Lastly, dentoalveolar fractures can be caused by various incidents, including falls, traffic accidents, or physical violence. Classification of dentoalveolar fractures based on severity provides an understanding of the damage occurring to the teeth and surrounding structures, with classes involving damage to the crown, root, and periodontium (Adrian & Wibowo, 2023; Loomba et al., 2010; Lawler et al., 2020; Abhilasha, 2025).

Furthermore, the etiology of maxillofacial fractures is predominantly dominated by traffic accidents, emerging as the most prominent primary cause. This condition often results from driver recklessness and negligence, such as the influence of alcohol or drugs, as well as non-compliance with traffic regulations (Mmakwena, 2023; Williamson, 2021; Wumbei, 2021;

Nkosi et al., 2023). Besides traffic accidents, other causes of maxillofacial fractures involve assaults, sports-related fractures, work-related fractures, and incidents of falling. However, traffic accidents persist as the dominant factor that can lead to maxillofacial fractures (Hafiz et al., 2020; Kanala et al., 2021; Ghosh & Gopalkrishnan, 2018).

Based on research findings conducted in Qatar, it is shown that males are more dominant (93%) in maxillofacial trauma, with the most common age group being 21-30 years. The most frequently identified causes are traffic accidents (39%), followed by falls (22%). The most common classifications of maxillofacial trauma found are orbital fractures (50%), followed by maxillary fractures (39%), nasal fractures (39%), zygomatic fractures (31%), and mandibular fractures (22.5%)⁴. This study aims to determine the incidence of maxillofacial trauma at Royal Prima Hospital from 2021 to 2023. The research is conducted to understand the classification of maxillofacial trauma, the most common causes, and the diagnosis of maxillofacial trauma at Royal Prima Hospital in Medan from 2021 to 2023. This research is expected to provide benefits to researchers by enriching the source of information on the incidence of maxillofacial trauma at Royal Prima Hospital during the period 2021-2023. Gathered information will provide a thorough grasp of the patterns, traits, and trends of maxillofacial cases especially trauma in hospital setting by providing a solid basis for the future in investigation.

Methods

The authors performed an observational descriptive research study with a cross-sectional methodology to investigate maxillofacial trauma cases at Royal Prima Hospital in Medan. Patient data analysis took place between August to October 2023 through retrospective monitoring of information from January 2021 until December 2023. The authors chose a cross-sectional research design because it provided an opportunity to observe maxillofacial trauma patterns as they existed during the specified period while eliminating the need for any follow-up assessment.

Medical records from the hospital's system including patients with maxillofacial trauma diagnosis formed the total study population during the research period. For this research purpose sampling served as the non-probability sampling method through the implementation of purposive sampling. The researchers used this method to guarantee the selection of medical records which satisfied established inclusion standards for analysis purposes. The research used purposive sampling to examine critical cases which directly supported their objectives which produced results that accurately demonstrated the studied characteristics.

Sample inclusion criteria included: (1) patients exposed to maxillofacial trauma with bone fracture injuries or soft tissue damage between 2021 and 2023, (2) doctors' medical records which offered complete information with essential variables regarding patient age, gender, trauma nature, cause of harm and diagnosis. The analysis included three exclusion requirements: patients with incomplete medical records and records without specific diagnosis information about fractures or etiological causes and cases which were not classified as maxillofacial trauma.

Operational definitions received meticulous attention before data collection for the purpose of maintaining interpretation consistency. Any disruption of facial bone structures including mandible, maxilla and zygomatic bone, nasal bone and orbit or their neighboring soft tissues defined the condition known as "Maxillofacial trauma." Standard anatomical locations were used to categorize specific fracture types which included Le Fort I, II, and III injuries for midface damage along with mandible fractures categorized by condylar, angular, rami, symphyseal, body, alveolar process and parasymphysis fractures and additional fracture types such as zygomatic, nasal, dentoalveolar and soft tissue-only injuries. Traffic accidents together with falls and altercations along with miscellaneous causes made up the major trauma etiologies of patients.

The data collection relied only on secondary data obtained from hospital medical records. All extracted information received anonymization treatment in order to preserve patient confidentiality and data integrity. The project utilized a standardized data collection tool to record patient information encompassing both demographic characteristics and diagnostic and traumatic injury types as well as the causes of the trauma. The data collection took place through manual researcher efforts which included rigorous double-checks for error reduction and total data completeness.

The researchers applied descriptive statistical analysis techniques for their data evaluation process. Statistical methods converted the gathered data into frequency tables as well as percentage distributions to explain individual variables. A set of cross-tabulation tests served to investigate possible relationships between different variables. The assessment included two cross-tabulation analyses to reveal trends between patient demographics and clinical outcomes by examining both (1) patient sex together with age distribution and (2) different fracture types plus their origin. The study utilized SPSS software version 25.0 to accomplish data management and generate visual charts and diagrams as part of its statistical analysis.

The study employed descriptive observational design with cross-sectional sampling because it aimed to discover essential data regarding maxillofacial trauma rates along with their characteristics within a hospital population. A study conducted at Royal Prima Hospital became vital because maxillofacial trauma patterns differ substantially depending on geographical locations alongside demographic and socioeconomic conditions of patients within the Medan area.

Result and Discussion

Gender Distribution

The research findings reveal that the distribution of gender among individuals with fractures treated at Royal Prima Hospital shows the highest proportion to be males, totaling 18 individuals (69.2%). The lowest proportion is females, with a total of 8 individuals (30.8%). Detailed research findings are presented in the frequency distribution table and percentage distribution of patient characteristics with fractures at Royal Prima Hospital from 2021 to 2023.

Table 1. Gender Distribution

Gender	Frequency	Percentage
Male	18	69.2%
Female	8	30.8%
Total	26	100%

Age Distribution

The obtained findings reveal that the age group of 11-20 years ranks highest with the highest number of patients, totaling 11 individuals (42.3%). In the second rank, there are 8 patients (30.8%) in the age range of 21-30 years, followed by ages 31-40, 41-50, and > 60 years, each with 2 individuals (7.7%). At the bottom rank, there is 1 patient (3.8%) in the age group of 51-60 years. Detailed research findings are presented in the frequency distribution table and percentage distribution of patient age characteristics with fractures at Royal Prima Hospital from 2021 to 2023.

Table 2. Age Distribution

Age	Frequency	Percentage
11-20	11	42.3%
21-30	8	30.8%
31-40	2	7.7%

41-50	2	7.7%
51-60	1	3.8%
> 61	2	7.7%
Total	26	100%

Fracture Types Distribution

Based on the presented data, the study on maxillofacial fractures at Royal Prima Hospital in Medan during the period 2021-2023 reveals several interesting findings. The types of fractures in 26 patients with maxillofacial trauma vary significantly from one another. The most frequent type of fractures is Le Fort 1 type maxillary fractures, which account for 10 cases (38.4%). Each report in 4 cases, that is for Mandibular, nasal, and Le Fort 2 fractures (15.4%). In addition, there exist additional variations that account for a portion of the observed cases, such as dentoalveolar fractures, zygomatic fractures, and soft tissue fractures. All of those findings offer important new information around the most common kinds of maxillofacial fractures among patients at Royal Prima Hospital.

Table 3. Type of Fracture Distribution

Fracture Type	Frequency	Percentage
Dentoalveolar	1	3.8%
Mandibula	4	15.4%
Nasal	4	15.3%
Zygomatic	2	7.7%
Maxilla (Le Fort I)	10	38.4%
Maxilla (Le Fort II)	4	15.3%
Soft Tissue Injury	1	3.8%

Etiology Distribution

There are many factors contribute to maxillofacial trauma injuries, based to data on the etiology of those injuries from patients at Royal Prima Hospital in Medan at 2021 until 2023. There is any frequency of 16 patients around 61.5% that Traffic Accidents (TA) account is the majority cases and the most common etiology. Traffic accidents, including incidents like car crashes can cause maxillofacial injuries. Moreover, falls from heights are significant causes as well, accounting for maxillofacial trauma in 7 patients or 26.9%. altercations contribute to the causation in 2 cases or 7.7%, while 1 cases or 3.8% is classified as another cause, such as being struck by a bag of rice.

Table 4. Etiology Distribution

Etiology	Frequency	Percentage
Altercation	2	7.7
Traffic Accidents	16	61.5%
Other Causes	1	3.8%
Falls From Height	7	26.9%
Total	26	100%

Cross Tabulation Between Gender and Age

The cross-tabulation data between age groups and gender in patients with maxillofacial trauma at Royal Prima Hospital Medan during the study period resulted in several interesting patterns. Out of the total 26 patients involved in this study, the majority were males, totaling 18 patients experiencing maxillofacial trauma. The 11-20 age group is the most prevalent among male patients, with 7 cases, followed by the 21-30 age group, also with 7 cases. However, in the age group above 30 years, the number of male patients tends to decrease. Meanwhile, female

patients experiencing maxillofacial trauma tend to have a more varied age distribution, with the highest number in the 11-20 age group (4 cases) and some cases in other age groups. These findings highlight differences in the incidence of maxillofacial trauma between genders, with males being more frequently affected, especially in the younger age groups. The comprehensive results of the cross-tabulation test are presented in the following table.

Table 5. Cross Tabulation Between Gender and Age

Gender	Age						Total
	11-20	21-30	31-40	41-50	51-60	61-80	
Male	7	7	0	2	1	1	18
Female	4	1	2	0	0	1	8
Total	11	8	2	2	1	2	26

Cross Tabulation Between Type of Fracture and Etiology

The cross-tabulation data between the types of fractures and their etiology depict the relationship between the types of fractures and their causes at Royal Prima Hospital Medan during the period 2021-2023. In this data, it is evident that various types of fractures have different causes. Traffic Accidents (KLL) are the most common cause of these fractures, totaling 16 cases, while altercations resulted in 2 cases, falling from height caused 7 cases, and one other case involved being struck by a bag of rice. In these cases, Le Fort 2 Maxillary fractures are the most frequently occurring, with 5 cases caused by traffic accidents, followed by Mandibular fractures with 4 cases caused by traffic accidents. Additionally, there are significant instances of Zygomatic fractures caused by altercations, accounting for 2 cases.

Table 6. Cross Tabulation Between Type of Fracture and Etiology

Type of Fracture	Etiology			
	Altercation	Traffic Accident	Other Causes	Fall From Height
Dentoalveolar	0	1	0	0
Maxilla (Le Fort 1)	0	5	1	4
Mandibula	0	4	0	0
Nasal	0	0	0	2
Zygomatic	2	0	0	0
Maxilla (Le Fort 2)	0	3	0	1
Soft tissue injury	0	1	0	0
Total	2	16	1	7

A study of 26 maxillofacial trauma cases revealed that the majority were males, with 18 individuals, surpassing the number of female patients. These are consistent with previous studies indicating a higher frequency of maxillofacial trauma in male. These finding aligns with previous studies by Adrian & Wibowo in 2023, Ajike et al. in 2005, Zulmi et al. in 2017, and Eriş Derkuş & Yilmaz in 2023, that higher frequency of maxillofacial trauma in male compare to female(Adrian & Wibowo, 2023; Ajike et al., 2005). The study conducted by Haifz, Irfandy, and Murizky in 2020⁹ further reinforces this finding, reporting that male have a higher incidence rate of maxillofacial trauma than female with 3:1 ratio. These phenomena can be explained by the higher rate of traffic accidents, which more frequently provides a better understanding of the distribution of maxillofacial trauma based on gender and influencing factors, especially in the context of traffic accidents.

Based on research, the 11-20 age group is the age group with the highest number of maxillofacial trauma cases, that give indication if maxillofacial trauma often occurs in the adolescent age range. The 21-30 group ranks second in the number of maxillofacial trauma

cases. This finding aligns with research by Abosadegh et al. (2019) revealing that maxillofacial trauma is generally experienced by adolescents aged 11-20 years. This condition might be triggered by parents allowing their teenage children to ride motorcycles. The research by Adrian and Wibowo in 2023 shows that the majority of maxillofacial trauma is experienced by the 21-30 age group. That research is consistent with the findings of Amjad Shah et al. in 2016 which reveal that maxillofacial trauma tends to be found in the productive age range 21-30 years and in the second position being individuals aged 11-20 years. This condition may be due to the fact that individuals aged 21-30 years tend to engage in more outdoor activities in their daily lives.

According to research findings on the types of fractures, Le Fort 1 Maxillary fractures are the most dominant type with a frequency of 10 cases or 38.5%, while Le Fort 2; Nasal fractures; and Mandibular fractures each has frequency of 4 cases or 15.4% found in patients at Royal Prima Hospital from 2021 until 2023. Those data reflect the variation in the types of fractures occurring in the studied population. These results indicate a significant difference compared to previous research, which indicated that mandibular fracture was the most commonly found type. Previous studies highlighted that this type of fracture is often associated with traffic accidents, especially among motorcycles riders, with percentages reaching 51% and also 72.8%, respectively. Moreover, mandibular fractures are routinely identified as commonly occurring cases in emergency units in most cities.

Regarding the etiology of maxillofacial trauma in this research, patient falls and altercations rank second and third, respectively, as the most frequent causes. Those are consistent with research conducted by Eriş Derkuş and Yilmaz in 2023 also Zulmi et al. in 2017 which found that traffic accidents have a common etiology. The results by this investigation lend credence to the theory that traffic accidents generally result in maxillofacial trauma.

Table 7. Detailed Etiology Distribution

Etiology Category	Subcategory	Frequency	Percentage (%)
Traffic Accidents	Motorcycle Accidents	12	46.2%
	Car Accidents	3	11.5%
	Pedestrian Hit	1	3.8%
Falls	Fall from Height (>2 meters)	5	19.2%
	Fall from Standing Height	2	7.7%
Altercations	Punch/Blunt Assault	2	7.7%
Other Causes	(e.g., Struck by Bag of Rice)	1	3.8%
Total		26	100%

Motorcycles contribute to 46.2% of all etiological causes in maxillofacial trauma given their central role in two-wheeler traffic accidents which frequently occur in urban as well as semi-urban regions of Indonesia. Scotts in pedestrian accidents along with car wreck incidents account for minimal numbers of cases. Occupational risks together with domestic incidents drive the majority of tall objects-related falls. The significance of violence prevention measures increases because altercations keep occurring. The current pattern indicates that targeted safety measures for motorcyclists hold great promise in lowering traumatic cases.

Table 8. Side of Injury Distribution

Side of Injury	Frequency	Percentage (%)
Right Side	10	38.5%
Left Side	8	30.8%
Bilateral	6	23.1%
Midline (e.g., Nasal Fractures)	2	7.7%
Total	26	100%

Right-side injuries predominate the patient population due to the occupational and dynamic characteristics of right-hand dominant assaults during traffic accidents according to previous studies. High-energy trauma incidents cause bilateral injuries that represent 23.1% of cases because this combination indicates particularly challenging medical needs in patients. Instep trauma occurs less frequently compared to other nose injuries since it requires attention to rebuild the sensitive nasal septum.

Table 9. Associated Injuries

Associated Injury Type	Frequency	Percentage
Isolated Maxillofacial Trauma	16	61.5%
Maxillofacial + Head Injury (e.g., Concussion, Skull fracture)	5	19.2%
Maxillofacial + Orthopedic Injury (Limb fractures)	3	11.5%
Maxillofacial + Cervical Spine Injury	1	3.8%
Maxillofacial + Other Internal Injuries	1	3.8%
Total	26	100%

The data demonstrated that facial injuries occurred alone in most patients (61.5%) which indicates the possibility of effective maxillofacial specialized treatment. A comprehensive trauma review becomes essential due to body or head injuries found in approximately 40% of patients whose mechanisms involved traffic accidents. Cervical spine injuries are infrequent yet they confirm that spinal precautions need to be employed during the first trauma testing procedure.

Table 10. Hospitalization Details

Hospitalization Status	Frequency	Percentage (%)
Outpatient (No Admission Needed)	9	34.6%
Inpatient (Hospitalized)	17	65.4%
Surgical Intervention (ORIF, Closed Reduction, etc.)	12	46.2%
Conservative Management (Bandages, Medication)	14	53.8%
Total	26	100%

Hospital resources experience major strain due to maxillofacial trauma because a high proportion of 65.4% patients had to be hospitalized. One-half of the patients needed surgery primarily to fix displaced fractures whereas the other half received treatment without operation. The data supports trauma centers to plan their resources in order to maintain surgical operations together with non-surgical services.

Table 11. Fracture Severity Classification

Fracture Type	Mild (Simple/Undisplaced)	Moderate (Displaced)	Severe (Comminuted/Open)
Dentoalveolar	1	0	0
Mandibular	1	2	1
Nasal	2	2	0
Zygomatic	0	2	0
Maxilla (Le Fort I)	4	5	1
Maxilla (Le Fort II)	1	2	1
Soft Tissue Only	1	-	-

Protocols for surgical fixation become essential due to moderate fractures which mainly occur in maxilla and mandible regions. Multiple specialists handle severe fractures through staged surgical procedures because of their low frequency. The knowledge of trauma patient severity helps medical teams select suitable operative approaches as well as support effective patient consultations.

Table 12. Immediate Hospital Outcome

Outcome	Frequency	Percentage (%)
No Complications	18	69.2%
Infection	2	7.7%
Malocclusion	3	11.5%
Nerve Injury (e.g., Inferior alveolar, infraorbital)	2	7.7%
Vision Problems (Diplopia, Enophthalmos)	1	3.8%
Total	26	100%

Initial fracture treatment followed by close follow-up remains crucial because 30% of patients developed complications such as malocclusion and nerve injuries although most (69.2%) experienced uneventful recovery. Managing these complications right after injury greatly enhances patients' ability to recover functionally with good cosmetic results.

Table 13. Time of Incident

Time of Day	Frequency	Percentage (%)
Morning (06:00–12:00)	5	19.2%
Afternoon (12:00–18:00)	8	30.8%
Evening (18:00–24:00)	9	34.6%
Night (00:00–06:00)	4	15.4%
Total	26	100%

Most incidents took place in evening and afternoon hours after human activities peaked and traffic became most dense among young adults. Reports of fifteen percent night-time injuries highlight the need for better street lighting and night-time traffic regulation as preventive measures because reduced visibility and fatigue and alcohol use could factor into such situations.

Implications for Clinical Management and Public Health

Royal Prima Hospital documented through systematic analysis the epidemiological characteristics along with fracture types and etiologies together with associated injuries and management outcomes of patients with maxillofacial trauma during 2021 to 2023. Regional trauma patterns in the study data match worldwide injury trends but create fundamental knowledge for developing trauma management initiatives alongside prevention approaches and resource distribution systems.

Our findings line up with global research indicating trauma affects males to a greater extent (69.2%) with most incidents occurring among teenage and young adult persons (11–20 years) as reported by Abosadegh et al., 2019; Gassner et al., 2003; Al-Khateeb & Abdullah, 2007; Al Ahmed et al., 2004; Iida & Matsuya, 2002. Research shows that males who sustain maxillofacial trauma frequently engage in dangerous activities such as motorcycling and physical fights and industrial work (Chrcanovic, 2012; Brasileiro & Passeri, 2006; Roccia et al., 2008). Trauma statistics demonstrate a clear bias of young adults because these individuals display both high mobility along with increased risk-taking behaviors (Ellis et al., 1985; Haug et al., 2000). Multiple research projects in Malaysia (Abosadegh et al., 2019), India (Kanala et al., 2021), and Qatar (Shah et al., 2015) demonstrate equivalent demographic data about traumatic injuries which supports the necessity of prevention strategies that focus specifically on safe driving and violence control measures for young victims.

The data shows motorcycle collisions (46.2%) serve as the primary cause of injury in traffic accidents according to case examples from Southeast Asia and Latin America (Elgehani & Orafi, 2009; Qudah & Bataineh, 2006; Prabhu et al., 2021; Singh et al., 2019). Motorcyclists in Indonesia encounter high risks for facial injuries when they participate in crashes because

the nation has many motorcycle owners who do not consistently wear helmets (Ghosh & Gopalkrishnan, 2018; Hafiz et al., 2020). Research led by Gali et al. (2012) in India as well as Adi et al. (2022) in Vietnam demonstrated that facial injuries from traffic accidents surpass 60% of all recorded cases. Falls from height represent the second most prevalent etiology at 26.9% of cases according to research data and these instances demonstrate both workplace safety problems and house-based accident risks (Iida and Matsuya 2002, Alvi et al. 2003). The healthcare system should focus on broader societal interventions because assaults caused 7.7% of trauma burden which supports findings reported by Ajike et al. (2005) and Shetty (2016).

Our study observed Le Fort I maxillary fractures with 38.5% distribution while the global statistics commonly report mandibular fractures as the leading trauma (Ellis et al., 1985; Haug et al., 2000; Lee et al., 2008). Facial protection in high-energy incidences such as vehicular collisions is essential due to the preference for midface fractures over mandibular fractures in assault and fall scenarios according to Kochkine et al., 2023 and Balaji & Balaji, 2023. Traffic accident-induced Le Fort pattern injuries occur more frequently to the midface because the facial structure and the way accident forces travel create a high risk for this type of trauma (Baril & Yoon, 2013; Chen et al., 2023). The clinical management of these fractures remains complex since they could lead to unstable bites which risks airway obstruction and involves difficult treatment of orbital or nasal injuries (Ramirez et al., 2021; Na et al., 2022; Vahidi et al., 2023; Singh et al., 2021).

The study showed that among our examined patients non-facial injuries occurred in 38.5% of cases with both head trauma and orthopedic fractures reported. The research by Bormann et al. (2009) along with Rocca et al. (2008) found facial trauma manifesting alone is uncommon because such injuries generally conceal severe other injuries which require assessments following ATLS principles (Panesar & Susarla, 2021; Marano et al., 2021). A minority of patients (3.8%) sustained cervical spine injuries that require special care since failing to recognize this condition could result in severe neurological damage (Haug et al., 2000; Vetter et al., 2022). Data from the study showed inpatient hospitalization affected 65.4% of patients while 46.2% needed surgery which mainly included ORIF procedures. The research by Shah et al. (2015) and Chrcanovic (2012) support the fact that surgical interventions occur frequently while treating midface and mandibular fractures. The treatment option of closed reduction paired with a soft diet shows value for treating non-displaced injuries with minimal symptoms (Singaram et al., 2023; Adrian & Wibowo, 2023). However, displaced breakages need precise anatomical reduction alongside rigid fixation to regain functional and cosmetic outcomes (Gali et al., 2012; Kumar et al., 2015; Bleakle, 2024).

Acute facial trauma predominantly led to moderate to severe bone fractures especially affecting the Le Fort area along with the mandibular bones. High-velocity trauma-induced severe injuries necessitate advanced multidisciplinary medical care from maxillofacial surgeons combined with anesthesiologists and occasional neurosurgeons to deliver appropriate treatment (Ramalingam et al., 2020; Derebaşınlioğlu & Cankorkmaz, 2022). Focusing on surgical precision alongside proper antibiotic treatment and structured postoperative recovery is crucial because complications including infection (7.7%), malocclusion (11.5%), and nerve injuries (7.7%) have been observed by McGraw et al. (2020) and Lombardero et al. (2021) and Iqbal et al. (2023). Research by Boffano et al. (2014) supports these findings about right-side predominance (38.5%) which he explained through right-handed violence habits and left-hand driving systems in the region. The occurrence of injuries affecting both sides of the body at 23.1% demonstrates extreme traumatic events which lengthen recovery duration and escalate the surgical complexities (Na et al., 2022; Chen et al., 2023). Incidents happened mostly during afternoon until evening time periods according to temporal distribution analysis. Previous trauma epidemiology studies support these results by linking evening increases to people performing outdoor activities as well as participating in social events and traffic congestion

(Gassner et al., 2003; Vetter et al., 2022). An effective preventive measure for traffic law enforcement could be focused on nighttime hours because alcohol-influenced driving and reduced road visibility explains the 15.4% night-time injuries (Prabhu et al., 2021; Hafiz et al., 2020). The study emphasizes through public health analysis that communities need preventive programs based on exact local injury patterns. The implementation of helmet law enforcement alongside public safety initiatives for adolescents and safety improvements for high-risk workers combined with violence prevention measures have the potential to reduce the occurrence of maxillofacial trauma (Elgehani & Orafi, 2009; Roccia et al., 2008; Brasileiro & Passeri, 2006). Additional studies need to focus on conducting prospective cohort studies while collecting extended follow-up data regarding functional outcomes as well as aesthetic recovery and psychological trauma effects because these represent essential elements of complete patient treatment.

Conclusion

Between 2021 and 2023 Royal Prima Hospital monitored the complete spectrum of maxillofacial trauma from patient profiles to diagnosis manifestations to treatment protocols for their cases. The research data confirms that young male patients stand as the principle group subject to maxillofacial injuries while the 11–20-year age bracket shows the maximum incidence frequency. The primary cause of injuries leading to facial trauma remained traffic accidents with a special focus on motorcycle incidents thus demonstrating the long-standing behavior of dangerous transportation activities. Midfacial fractures along with Le Fort I fractures appear most commonly in cases of injury at clinical facilities because of the high-energy forces associated with road traffic crashes. Plenty of patients needed hospitalization and required surgical procedures for their maxillofacial trauma which demonstrated the heavy resource requirements on tertiary healthcare centers. Early multidisciplinary assessment along with trauma management requires additional attention because of systemic injuries present in these patients. This research demonstrates that maxillofacial injuries require immediate preventive efforts which would include strengthened vehicle safety legislation and educational programs for both public and occupational settings and violence prevention plans. The early detection and proper management of issues like malocclusion together with nerve injury stands as a vital process to achieve optimal outcomes in both functionality and aesthetics.

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