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Retrospective Study of Maxillofacial Traumatic Injury Pattern on Plastic Surgery Unit at Bali Mandara General Hospital

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ABSTRACT

Introduction Trauma is a major cause of morbidity and mortality, often accompanied by maxillofacial injuries in a significant portion of patients. Maxillofacial trauma represents a serious public health problem and their epidemiology varies between populations. Bali Mandara General Hospital is a new government hospital operated in October 2017, that provides care for plastic surgery patients, including maxillofacial trauma patients. The current study aims to investigate the pattern of maxillofacial traumatic injuries, and management of maxillofacial traumatic injuries by our plastic surgery service.

Methods A hospital-based, single-centered study was conducted from January 1st, 2018 to December 31st, 2022 at Bali Mandara General Hospital. Medical records of maxillofacial patients undergoing surgical procedure were retrospectively reviewed Data is collected and analyzed using Microsoft Office Excel and SPSS Statistic version 26.

Results A total of 107 maxillofacial patients who received treatment for maxillofacial trauma in the departments during the study period were included; 76 (71.02%) are male and 31 (28.97%) female. The majority of patients belonged to the 21-30 years age group (27 patients, 25.23%). The mean age for the group was 32.26±17.31 years, ranging from 1 to 83 years. Soft tissue injuries (64; 29.63%) and maxilla fracture (35; 16.20%) were the two most common site of maxillofacial injuries. The most common associated injuries was upper extremity injuries (11; 30.56%), followed by lower extremity injuries (9; 25.00%). The most common surgical management were ORIF (61; 28.64%) and debridement (54; 25.35%).

Conclusion Young age and males were predominantly affected. Maxillary fracture was the most frequent maxillofacial fracture. Maxillofacial trauma was often associated with upper extremity injuries. ORIF was the most surgical common management.

KEYWORDS: maxillofacial fracture, maxillofacial injury, plastic surgery, trauma, retrospective

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INTRODUCTION

Maxillofacial trauma remains a critical concern in the field of surgery due to the complexity of the injuries and the significant impact they have on both functionality and aesthetics. Maxillofacial fractures are among the most frequent reasons for emergency department visits that can lead to mortality and severe morbidity. Retrospective studies are particularly useful in understanding injury trends, patient demographics, and treatment outcomes. Such insights are essential for developing targeted surgical approaches and improving the allocation of healthcare resources in hospitals.[1,2,3]

The patterns of maxillofacial fractures vary between populations, influenced by environmental, cultural, socioeconomic, and lifestyle factors.[4] Bali Mandara General Hospital is a new government hospital operated in October 2017, that provides care for plastic surgery patients, including maxillofacial trauma patients. This study aims to examine the patterns of maxillofacial injuries treated in the Plastic Surgery Unit of Bali Mandara General Hospital, Indonesia. The region presents unique healthcare challenges, serving a mix of local residents and tourists who often experience varying types of injuries. Understanding the characteristics of these injuries within the secondary care

Figure 1. Skull bone anatomy

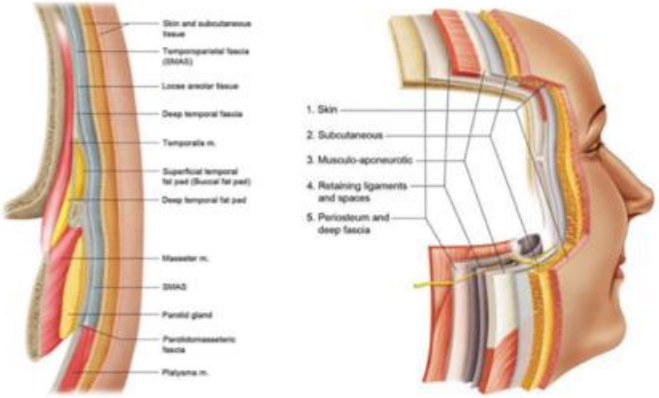

Figure 2. (Left to right) Soft tissue of head and face

Framework provides valuable data to inform clinical practice and improve patient outcomes. The findings from this study may offer a baseline for further studies and contribute to the existing body of knowledge on maxillofacial trauma management. By analyzing hospital records and treatment approaches, this study hopes to improve the quality of evidence-based practices in a regional context.

ANATOMY

The skull is divided into two parts: the neurocranium (which protects the brain) and the viscerocranium (which forms the facial bones). The neurocranium consists of eight bones: one frontal bone, ethmoid, sphenoid, and occipital bone, along with paired temporal and parietal bones. The viscerocranium is composed of 14 bones: one mandible and vomer, as well as paired maxillae, inferior nasal conchae, zygomatic, palatine, nasal, and lacrimal bones **(Figure 1)**.[5,6]

The facial bones provide structural support to each other through strong articulations. This support system is known as the buttress, which can be categorized as either vertical or horizontal. Horizontal buttresses are further divided into coronal and sagittal types. Coronal buttresses, responsible for stabilizing the width of the face, include the supraorbital, infraorbital rim, transverse maxilla, and mandible. Sagittal buttresses, which maintain facial projection, consist of the frontal bone, zygomatic arch, Le Fort I segment, and mandibular body. Vertical buttresses, which support facial height, include the orbit, nasofrontal, zygomatic, pterygomaxillary, and mandibular regions. The maxillofacial region is classified into three sections: the upper, middle, and lower face. The upper face includes the frontal region and frontal sinus. The midface comprises the orbit, zygomaticomaxillary complex (ZMC), nasal bones, naso-orbitoethmoid (NOE) complex, and maxilla. The lower face is formed by the mandible.[6,7]

The scalp is the soft tissue that covers the calvaria and consists of five layers: skin, subcutaneous fat (dense connective tissue), the galea aponeurotica, loose connective tissue, and the pericranium. The layers from the skin to the galea aponeurotica

are collectively referred to as the superficial fascia layer, while the loose connective tissue is known as the deep fascia layer. The soft tissue of the face comprises skin, subcutaneous fat, the superficial musculoaponeurotic system (SMAS), ligaments, periosteum, and deep fascia. Subcutaneous fat lies beneath the dermis and is present throughout most of the body **(Figure 2)**.[5]

Facial trauma is one of the most common cases encountered in plastic surgery practice. Such injuries can involve soft tissues, teeth, bones, muscles, and even facial nerves.[8] The mechanism of injury varies between patients, necessitating a comprehensive examination. Plastic surgeons are often consulted for facial laceration cases.[7]

MATERIALS AND METHODS

A hospital-based, single-centered study was conducted from January 1st, 2018 to December 31st, 2022 at Bali Mandara General Hospital. Medical records of maxillofacial patients undergoing surgical procedure were retrospectively reviewed. Data is collected and analyzed using Microsoft Office Excel and SPSS Statistic version 26.

The data collected includes demographic information (age and gender), trauma patterns, associated injuries, and interventions performed. Age groups are categorized into seven groups: 0-10 years, 11–20 years, 21–30 years, 31–40 years, 41–50 years, 51–60 years, and over 60 years. Trauma patterns are classified into soft tissue injuries, panfacial fractures, fractures of the frontal bone, orbit, zygoma, zygomaticomaxillary complex (ZMC), maxilla, nasal bones, naso-orbitoethmoid (NOE) complex, mandible, palate, and alveolar bone. Maxillary fractures are further subdivided into maxilla unspecified, Le Fort I, Le Fort II, and Le Fort III types.

The associated injuries include intracranial haemorrhage, cranial base fractures, and injuries to the upper extremities, lower extremities, and trunk. The interventions documented include Open Reduction and Internal Fixation (ORIF), debridement, bone graft, wound suture, placement of an arch bar, nasal reposition, flap reconstruction, temporomandibular joint (TMJ) reposition, and skin graft. Ethical approval was obtained from Health Researh Ethics Committee RSUD Bali Mandara with registration number 078/EA/KEPK.RSBM.DISKES/2024.

RESULTS

This study included 107 patients who underwent treatment for maxillofacial trauma in the plastic surgery departments during the study period; 76 (71.02%) are male and 31 (28.97%) female, with a male to female ratio of 2.45:1. In 2019, there were 29 cases of maxillofacial trauma (27.10%), making it the year with the highest number of cases during the study period. The second-highest was in 2022, with 27 cases (25.23%), while 2020 had the fewest cases, with only 11 patients (10.28%) **(Figure 3)**. Most of the patients were in the 21–30 age range, accounting for 27 patients (25.23%), followed by the 11–20 years age group with 25 patients (23.36%), and the 31–40 years age group with 19 patients (17.76%) **(Figure 4)**. The average age of the patients was 32.26±17.31 years, with a range from 1 to 83 years. Specifically, in 2020, the mean age was slightly higher at 32.90±15.20 years, with a range from 13 to 57 years. Soft tissue injuries were the most common maxillofacial trauma, affecting 64 patients (29.63%), followed by maxillary fractures in 35 patients (16.20%). Other common injuries included fractures of the zygomaticomaxillary complex (ZMC) and orbital region (28 patients, 12.96%), as well as mandibular fractures (22 patients, 10.19%) **(Figure 5)**.

Among the 35 cases of maxillary fractures, 10 (28.57%) were classified as Le Fort fractures, broken down as follows: Le Fort I (2 cases, 20%), Le Fort II (3 cases, 30%), Le Fort III (1 case, 10%), and combined Le Fort I-II (4 cases, 40%). In 2020, ZMC fractures were most prevalent (5 cases, 22.73%), followed by soft tissue injuries, orbital fractures, and maxillary fractures (4 cases each, 18.18%), and mandibular fractures (2 cases, 9.09%). The most common surgical management were ORIF (61; 28.64%) and debridement (54; 25.35%) **(Figure 6)**. The most common associated injuries was upper extremity injuries (11; 30.56%), followed by lower extremity injuries (9; 25.00%) **(Figure 7)**.

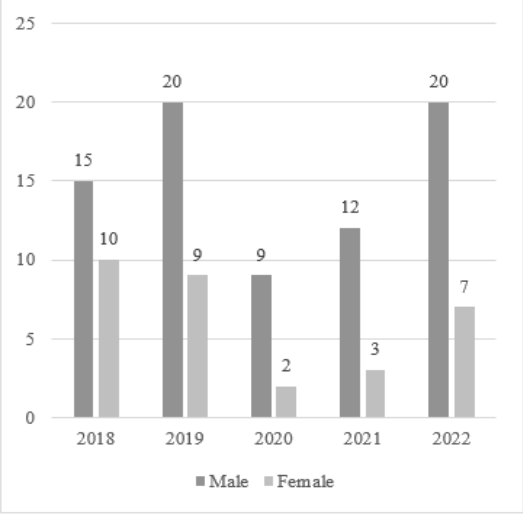

Figure 3. Gender wise distribution of maxillofacial injuries based on year

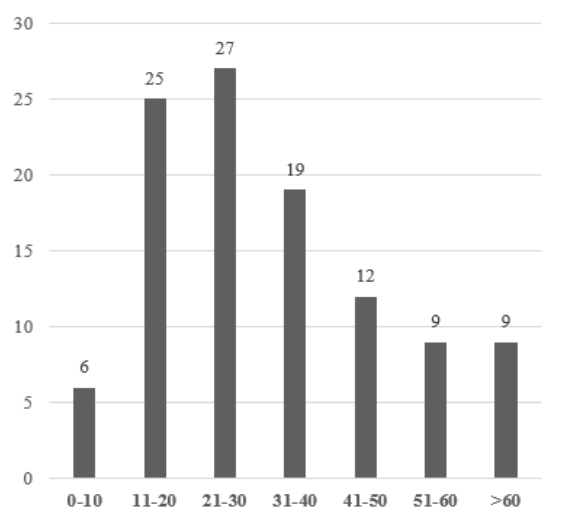

Figure 4. Age wise distribution of maxillofacial injuries

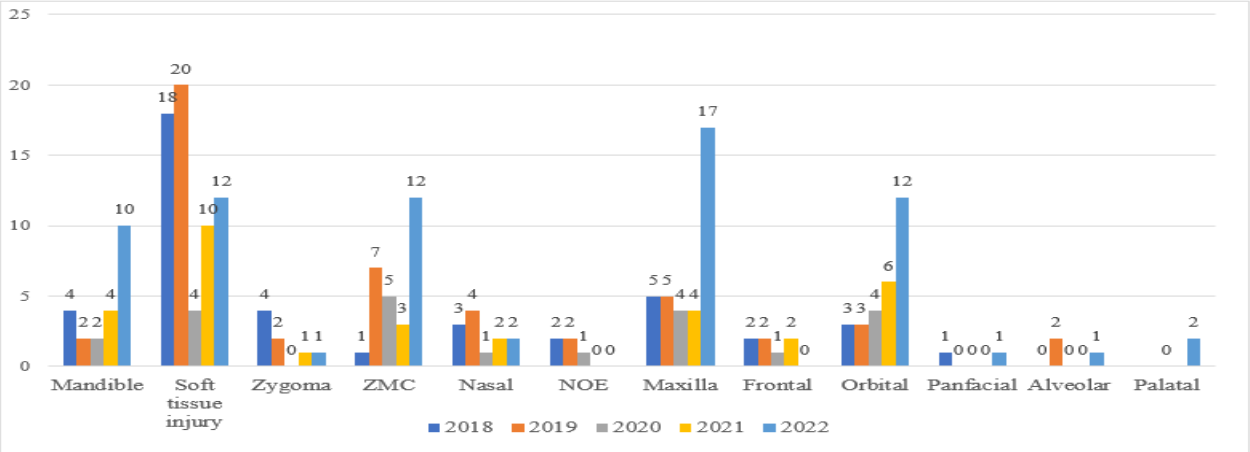

Figure 5. Anatomical distribution of maxillofacial trauma

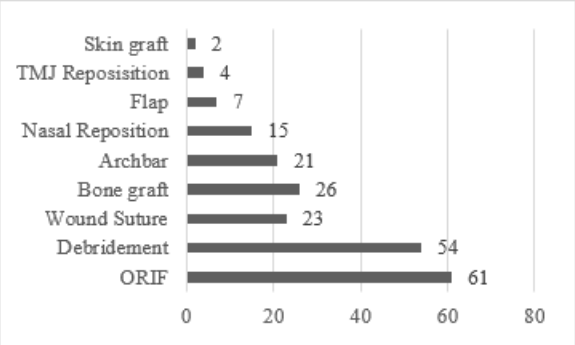

Figure 6. Treatment of maxillofacial injuries

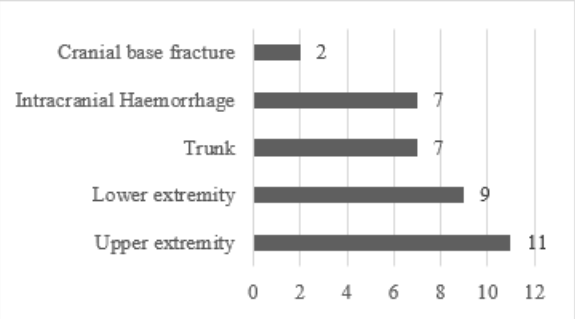

Figure 7. Distribution of associated injuries

DISCUSSION

Maxillofacial traumas are among the most frequent reasons for emergency department visits. Prompt diagnosis of maxillofacial trauma is crucial to identify associated injuries and urgent complications, plan the reconstruction of critical functions such as vision, chewing, and smelling, and support physical, psychological, and social recovery.[9] In this study, we found a decline in maxillofacial trauma surgeries in 2020 compared to 2019 and 2021, attributed to the COVID-19 pandemic. These findings align with research by Putra et al. at Moewardi Hospital, Surakarta, which reported a decrease in plastic surgery cases, including maxillofacial trauma, during lockdown periods.[10] The decline was caused by delays in elective surgeries and a reduction in emergency cases. Similar findings were reported by other researchers[11, 12,13,14,15,16,17,18,19,20,21,22,23], all of whom noted decreased visits for plastic surgery during the COVID-19 pandemic.

However, study by Dawoud et al. observed an increase in maxillofacial trauma cases related to outdoor activities such as cycling and running, which were influenced by government policies encouraging outdoor activities to curb COVID-19 spread.[24] Furthermore, Setiawan et al.'s study at Dr. Soetomo Hospital, Surabaya, showed no decline in maxillofacial trauma cases in 2020 when compared to 2015 and 2016.[25] The study also revealed that maxillofacial trauma consistently affected males more frequently than females, aligning with findings from many studies. [10,11,12,13,14,15,16,17,18,19,20,21,22,23,25]

From 2018 to 2022, the most affected age group was 21–30 years, followed by 11–20 years and 31–40 years. However, in 2020, the predominant age groups shifted to 10–20 years and 41–50 years, each comprising 36.36% of cases (4 patients). These findings are consistent with previous research, such as the study by Pandey et al[1], which identified the 21–30 age group as the most affected, accounting for 39.98% (443 patients). Similarly, Setiawan et al. also reported that during the pandemic, the highest prevalence of maxillofacial trauma was in the 11–20 age group, followed by 21–30 years.[25]

In this study, the average age of patients with maxillofacial trauma was 32.26±17.31 years. Specifically, in 2020, the average age was 32.90±15.20 years, with an age range of 13 to 57 years. These results are in agreement with findings from other studies. A study by Stanisce et al. reported an average patient age of 38 years before the pandemic and 41 years during the pandemic. Similarly, Dawoud et al. found that the average age of maxillofacial trauma patients was 33.21 years before the lockdown and 41.44 years during it. Paiva et al. observed a slight increase in the average age of plastic surgery patients from 38.8 years in 2019 to 41.8 years in 2020.

Meanwhile, M. de Boutray et al. noted an average age of 38.9 years among 106 maxillofacial trauma patients during the lockdown. Infante-Cossio et al. also reported that the average age of maxillofacial trauma patients was 36.9 years before the pandemic and dropping to 32.8 years during the pandemic, with the majority of cases falling within the 20–39 age range.

In terms of injury types, this study found that soft tissue injuries were the most common, followed by fractures of the maxilla, zygomaticomaxillary complex (ZMC), and mandible. A study by Setiawan et al. reported that maxilla, mandible, zygoma, nasal, and naso-orbitoethmoid (NOE) fractures were the most frequent. Study by Ludwig et al. showed that malar, maxillary/zygomatic, nasal, orbital, and mandibular fractures were the most prevalent both before and during the pandemic. Press et al. similarly found that midface fractures were the most common, followed by fractures in the upper third of the face and mandible However, several other studies present different findings. Several studies reported that mandibular fractures were the most frequent.[13,18,24,26] Paiva et al., on the other hand, identified nasal, orbital, midfacial, and mandibular fractures as the most common.[11] This study found Le Fort II fractures to be the most prevalent type among maxillary fractures, which contrasts with Pandey et al., who reported that Le Fort I fractures were the most common.

The maxillofacial area, being one of the most prominent parts of the human body, is particularly vulnerable to injuries. More than 50% of patients with such injuries are reported to have multiple traumas, requiring collaborative care between emergency teams and surgical specialists. Maxillofacial injuries can occur as isolated cases or in combination with injuries to areas like the head, chest, abdomen, spine, or extremities (Guruprasad, 2014). In our study, maxillofacial trauma was most commonly associated with injuries to the upper and lower extremities

CONCLUSION

Young males were the most commonly affected group. Maxillary fractures were the most frequent type of maxillofacial injury and were often associated with upper extremity trauma. The most common surgical treatment was open reduction and internal fixation (ORIF). To our knowledge, this is the first study on maxillofacial injuries conducted at Bali Mandara General Hospital, which is a referral center and one of the few hospitals in Bali offering plastic surgery services. The findings may provide fundamental data for maxillofacial epidemiology research, as there is no previous study in Bali Mandara General Hospital. However, because the data used were collected retrospectively, and due to small sample size from single center, the result of this study is limited in its interpretation of the results and generalizability. Understanding the patterns of maxillofacial fractures is essential for improving clinical decision-making and designing effective prevention strategies.

DISCLOSURE

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Conflicts of interest: There are no conflict of interest.

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