JURNAL
REKONSTRUKSI DAN ESTETIK

ANALYSIS OF MAXILLARY FRACTURE PATIENTS PROFILE IN A TERTIARY GENERAL HOSPITAL (2018-2020)

I Dewa Gde Daniswara Suarta[a], Agus Santoso Budi[b]*, Rosy Setiawati[c], Magda Rosalina Hutagalung[d]

[a]Department of Anatomy, Histology, and Pharmacology, Faculty of Medicine, Universitas Airlangga, Surabaya, Indonesia
[b]Department of Plastic Reconstructive and Aesthetic Surgery, Faculty of Medicine, Universitas Airlangga, Surabaya, Indonesia
[c]Musculoskeletal Consultant of Indonesian Musculoskeletal Radiologist Society (IMRS), Surabaya, Indonesia
[d]Australian Craniofacial Unit, Adelaide, South Australia, Australia

ARTICLE INFO

Keywords: Human risk, Le Fort Fractures, maxillary fracture, medicine

***Corresponding author*:**
Agus Santoso Budi
Email address:
agus.santoso@fk.unair.ac.id

***History*:**
Received: April 7, 2023
Revised: May 12, 2023
Accepted: May 22, 2023
Published: June 1, 2023

JRE : Jurnal Rekonstruksi dan Estetik
e-ISSN:2774-6062; p-ISSN: 2301-7937
DOI: 10.20473/jre.v8i1.37353
Open access :

Available at:
https://e-journal.unair.ac.id/JRE/

***How to cite*:** Suarta IDG, Budi AS, Setiawati R & Hutagalung MR. ANALYSIS OF MAXILLARY FRACTURE PATIENTS PROFILE IN A TERTIARY GENERAL HOSPITAL (2018-2020). Jurnal Rekonstruksi dan Estetik.2023; 8(1): 29-38.

ABSTRACT

Introduction: The maxilla is a crucial bone in the midface, playing a significant role both functionally and cosmetically. Analyzing the medical records of maxillary fractures at Dr. Soetomo General Academic Hospital would offer an overview of the various treatments used and their corresponding outcomes were the aim of this study. This data would provide a general understanding of the patient's conditions during maxillary fracture treatment and could potentially support further research in this field.

Methods: In this study, data on the profile, treatment, and management of maxillary fractures were taken from patient medical records at Dr. Soetomo General Academic Hospital between 2018 and 2020.

Result: The study examined 144 cases of maxillary fractures at Dr. Soetomo General Academic Hospital, analyzing medical records and surgery reports from 2018 to 2020. Most of the patients (92.36%) were adult males (78.47%) aged between 18 and 64. The most common type of maxillary fracture observed was Le Fort 3 (47.22%), while other Le Fort classes accounted for fewer cases. The preferred treatment method was ORIF mini plating (81.25%), and the average hospital stay was around 12.56 days. Only one patient experienced post-treatment malocclusion in the 144 cases. In terms of complications, there were minimal instances of infections and exposed plates, with a total of four cases reported.

Conclusion: The treatment outcomes at Dr. Soetomo General Academic Hospital showed lower incidence rates of post-surgical issues like malocclusion, infections, and exposed plates when compared to other current datasets.

Highlights:

1. Maxillary fractures predominantly affected adult males aged between 18 and 64, comprising 92.36% of the cases studied.
2. The most common type of maxillary fracture observed was Le Fort 3, followed by other Le Fort classes.
3. The preferred treatment method for maxillary fractures was ORIF mini plating, which resulted in favorable outcomes with minimal complications.

INTRODUCTION

The viscerocranium receives structural support from the maxilla, which also adds to the aesthetics of the face. The maxilla is fundamental to the midfacial unit's function and appearance due to its critical position. Serious repercussions from damage or deformities to the maxilla might include issues with swallowing, orbital function, speech, and self-image[1].

The primary objective of managing maxillary fractures is to maintain both functionality and aesthetic appearance. The choice of treatment depends on various factors such as the severity of the injury, fracture location, presence of other injuries, and the condition of the airway. The main treatment options include conservative approaches for minor or non-displaced fractures without significant cosmetic or functional issues, reduction without fixation for slightly displaced fractures, and reduction with a fixation for extensively displaced or fragmented fractures[2].

As urban populations grow and lifestyles change due to industrial development, there has been an increase in maxillofacial injuries. Among these injuries, maxillary fractures are highly prevalent, second only to mandibular fractures in terms of incidence rate. Motor vehicular accidents are often the leading cause of maxillary fractures, with males being the primary demographic affected[3,4,5].

Surabaya, an urban city in Indonesia, experiences a high number of vehicles due to rapid motorization, resulting in an increased incidence rate of motor vehicular accidents[6]. These accidents contribute significantly to the occurrence of maxillofacial injuries in the region. With the rising number of maxillofacial injuries in Surabaya, there is an urgent need for accurate and effective treatment options. Dr. Soetomo General Academic Hospital, as the primary healthcare provider in East Java, handles the majority of maxillary fracture cases, addressing the growing demand for treatment in the area.

The purpose of this study is to analyze the medical records of maxillary fractures at Dr. Soetomo General Academic Hospital. This analysis will offer insights into the various treatment methods employed and their respective outcomes. By examining this data, a comprehensive overview of the patient's conditions during maxillary fracture treatment can be obtained. Additionally, the findings may contribute to future research in this field.

METHODS

This retrospective study focuses on analyzing the management and treatment of maxillary fractures at Dr. Soetomo General Academic Hospital using medical records from 2018 to 2020. The study examines various variables including patient demographics (age and gender), maxillary fracture types, types of treatment, and treatment outcomes. Age of the patient was classified into age groups which consists of infants (<1 year old), children (1-11 years old), teenagers (12-17 years old), adults (18-64 years old), and the elderly (>65 years old). Gender is categorized as male and female. Maxillary fracture sites are categorized based on the Le Fort classification system, such as Le Fort 1, Le Fort 2, Le Fort 3, and Le Fort combinations (Le Fort 1 + Le Fort 2, Le Fort 1 + Le Fort 3, Le Fort 2 + Le Fort 3, Le Fort 1 + Le Fort 2 + Le Fort 3). Treatment types include conservative approaches and various operative methods. Types of treatment correlate to the type of management deployed towards the patient to treat their corresponding maxillary fractures, were classified into conservative treatment and operative (ORIF mini plating, ORIF mini plating + arch bar, ORIF mini plating + interdental wiring, ORIF mini plating + arch

bar + interdental wiring). Treatment outcomes are evaluated based on the average length of stay, malocclusion, infections, and exposed plates.

RESULTS

The study included a total of 144 patients with maxillary fractures from the year 2018 to 2020. The average hospital stay for patients diagnosed with a maxillary fracture at Dr. Soetomo General Academic Hospital was found to be 12.56 days. The results of data extraction are as follows:

Table 1. The patient's age classification

Age Group	n	%
Infants	0	0%
Children	2	1.39%
Teenagers	8	5.56%
Adults	133	92.36%
Elderly	1	0.69%

Table 1 shows that adults within the age range of 18 - 64 have the most cases of maxillary fracture in Dr. Soetomo General Academic Hospital, 133 out of 144 cases are adults (92.36%). Epidemiologically, adults within the age range of 18 - 24 are the most prone to suffer from maxillofacial trauma, further supported by other studies from various regions.

Table 2. The patient's gender classification

Gender	n	%
Male	113	78.47%
Female	31	21.53%

Table 2 shows that there is a higher proportion of male patients (78.47%) compared to female patients (21.53%) in the given population (144 patients).

Table 3. The Maxillary Fracture Site Classification

Le Fort Classification	n	%
Le Fort 1	52	36.11%
Le Fort 2	15	10.42%
Le Fort 3	68	47.22%
Le Fort 1 + Le Fort 2	6	4.17%
Le Fort 1 + Le Fort 3	1	0.69%
Le Fort 2 + Le Fort 3	1	0.69%
Le Fort 1 + Le Fort 2 + Le Fort 3	1	0.69%

Table 3 shows the classification of maxillary fractures according to the Le Fort classification system. The majority of maxillary fractures in the given population are classified as Le Fort 3 (47.22%), followed by Le Fort 1 (36.11%) and Le Fort 2 (10.42%). There are also a few cases where combinations of Le Fort types are observed, but they represent a smaller proportion of the total fractures.

Table 4. The Treatment Type Classification

Operation Technique	n	%
ORIF mini plating	117	81.25%
ORIF mini plating + archbar	16	11.11%
ORIF mini plating + interdental wiring	1	0.69%
ORIF mini plating + arch bar + interdental wiring	10	6.94%

The higher maxillary fracture treatments in the given population involved the use of the ORIF mini plating technique (81.25%). There were also cases where a combination of techniques was used, such as ORIF mini plating + arch bar (11.11%) and

ORIF mini plating + arch bar + interdental wiring (6.94%). A very small proportion of treatments involved ORIF mini plating + interdental wiring (0.69%).

Table 5. The Malocclusion and Infections and Exposed Plates Classification

	Malocclusion		**Infections and Exposed Plates**	
	n	**%**	**n**	**%**
Present	1	0.69%	4	2.78%
Absent	143	99.31%	140	97.22%

The majority of cases with maxillary fractures did not include malocclusion (99.31%), infections, or exposed plates (97.22%). These problems were only seen in a small number of cases (0.69% for malocclusion and 2.78% for infections and exposed plates).

Table 6 appears to be showing the distribution of maxillary fracture sites in infants (<1 year old) categorized by different Le Fort classifications. There are no recorded cases of maxillary fractures in infants (< 1 year old) across all the Le Fort classifications (LF 1, LF 2, LF 3, combinations). the distribution of age-maxillary fracture sites in children, categorized into different age groups. In the age group of children (1-11 years old), all cases of maxillary fractures occurred at LF 3, with no fractures observed at LF 1 or LF 2. There were no cases where fractures occurred at multiple fracture sites simultaneously in this age group. It is worth noting that the sample size seems to be very small, with only two cases recorded for this analysis.

Table 6. Age-Maxillary Fracture Site

Age Group	**LF 1 (n (%))**	**LF 2 (n (%))**	**LF 3 (n (%))**	**LF 1 + LF 2 (n (%))**	**LF 1 + LF 3 (n (%))**	**LF 2 + LF 3 (n (%))**	**LF 1 + LF 2 + LF 3 (n (%))**
Infants (< 1-year-old)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Children (1-11 years old)	0 (0%)	0 (0%)	2 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Teenagers (12-17 years old)	3 (37.50%)	2 (25.00 %)	2 (25.00%)	1 (12.50%)	0 (0%)	0 (0%)	0 (0%)
Adults (18-64 years old)	48 (36.09%)	13 (9.77%)	64 (48.12%)	5 (3.76%)	1 (0.75%)	1 (0.75%)	1 (0.75%)
Elderly (>65 years old)	1 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)

Table 6, The distribution of maxillary fractures among teenagers aged 12-17 years old. The most common fracture site is LF 1, followed by LF 2 and LF 3. There is also one case where both LF 1 and LF 2 fractures are present. Among the adults (18-64 years old), maxillary fractures are most commonly observed at LF 3, followed by LF 1. There are also a few cases of fractures involving combinations of LF 1, LF 2, and LF 3. In the elderly (>65 years old) group, LF 1 is the only observed fracture site. The majority of maxillary fractures were observed in adults, with LF 3 being the most common fracture site. Teenagers also experienced a significant number of maxillary fractures, predominantly at LF 1. Among the elderly, LF 1 was the only observed fracture site.

Table 7. Gender-Maxillary Fracture Site

Gender	LF 1 (n (%))	LF 2 (n (%))	LF 3 (n (%))	LF 1 + LF 2 (n (%))	LF 1 + LF 3 (n (%))	LF 2 + LF 3 (n (%))	LF 1 + LF 2 + LF 3 (n (%))
Male	38 (33.62%)	11 (9.73%)	55 (48.67%)	6 (5.31%)	1 (0.88%)	1 (0.88%)	1 (0.88%)
Female	14 (45.16%)	4 (12.90%)	13 (41.94%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)

Table 8. Types of Treatment-Maxillary Fracture Site

Operation Technique	LF 1 (n(%))	LF 2 (n (%))	LF 3 (n (%))	LF 1 + LF 2 (n (%))	LF 1 + LF 3 (n (%))	LF 2 + LF 3 (n (%))	LF 1 + LF 2 + LF 3 (n (%))
ORIF mini plating	45 (38.46 %)	11 (9.40%)	55 (47.01%)	4 (3.42%)	1 (0.85%)	0 (0%)	1 (0.85%)
ORIF mini plating + arch bar	4 (25.00 %)	1 (6.25%)	8 (50.00%)	2 (12.50%)	0 (0%)	1 (6.25%)	0 (0%)
ORIF mini plating + interdental wiring	0 (0%)	0 (0%)	1 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
ORIF miniplating + arch bar + interdental wiring	3 (30.00 %)	3 (30.00%)	4 (40.00%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)

Table 9. Malocclusion and Infections and Exposed Plates-Maxillary Fracture Site

Present	LF 1 (n (%))	LF 2 (n (%))	LF 3 (n (%))	LF 1 + LF 2 (n (%))	LF 1 + LF 3 (n (%))	LF 2 + LF 3 (n (%))	LF 1 + LF 2 + LF 3 (n (%))
Malocclusion	1 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Infections and Exposed Plates	4 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)

Table 7 shows the number and percentage of maxillary fracture sites for males and females. It indicates that the most common fracture site for males is LF 3 (48.67%), followed by LF 1 (33.62%), and LF 2 (9.73%). In contrast, for females, LF 1 is the most common site (45.16%), followed by LF 3 (41.94%), and LF 2 (12.90%). There are no reported cases of combined fracture sites (LF 1, LF 2, LF 3, LF 1 + LF 2, LF 1 + LF 3, LF 2 + LF 3, LF 1 + LF 2+ LF 3) for females.

Table 8 provides information on the types of treatment used for different maxillary fracture sites. The table shows the number and percentage of different treatment techniques for each maxillary fracture site. The most common treatment across all fracture sites is ORIF mini plating. For specific fracture sites, LF 3 has the highest number of cases treated with ORIF mini plating, followed by LF 1. LF 2 has the lowest number of cases overall. The combined use of treatment techniques is less common, with only a few cases reported.

For various maxillary fracture sites, table 9 gives information on the presence of malocclusion, infections, and exposed plates. The table shows the number and percentage of cases with malocclusion and infections/exposed plates for each maxillary fracture site. Only LF 1 has reported cases of malocclusion, with one case (100%). However, no cases of malocclusion are reported for the other fracture sites or their combinations. Similarly, LF 1 has reported cases of infections and exposed plates, with four cases (100%). There are no reported cases of infections or exposed plates for the other fracture sites or their combinations.

DISCUSSIONS

This study found that the majority of maxillary fracture cases at Dr. Soetomo General Academic Hospital were among adults aged 18 to 64, accounting for 133 out of 144 cases (92.36%)(Table 1). This aligns with epidemiological trends indicating that young adults, particularly those in the age range of 18 to 24, are more susceptible to maxillofacial trauma. This observation is consistent with findings from previous studies conducted in Brazil (2006), Taiwan (2017), and Australia (2013)[6,7,8], which also reported higher incidences of maxillofacial fractures in similar age groups.

The higher prevalence of maxillary fractures among adults aged 18 to 64 may be linked to the frequency of vehicular accidents in the region, as this age range corresponds to the demographic of drivers in Indonesia. Surabaya, the urban city where Dr. Soetomo General Academic Hospital is situated, has been experiencing a gradual increase in the number of vehicles due to rapid motorization among its citizens[9]. The rise in motorization in

Surabaya has resulted in an increased incidence rate of motor vehicular accidents, making it a leading cause of maxillofacial trauma. Similar findings have been reported in other parts of Indonesia, such as Bali, where a 2020 study highlighted that motor vehicle accidents (MVA) were the primary cause of maxillofacial injuries[5]. International studies have also revealed that vehicular accidents contribute significantly to the prevalence of maxillofacial fractures in other countries. For example, in Brazil, traffic accidents account for the majority (45%) of maxillofacial injuries, highlighting the impact of vehicular accidents as a leading cause of such injuries worldwide[3]. In Taiwan, road traffic accidents (RTA) have been identified as the leading cause of maxillofacial injuries, as reported in a study[7]. Similarly, in Australia, motor vehicular accidents (MVA) contribute to a significant portion (23.88%) of the overall cause of maxillofacial injuries. These findings emphasize the consistent pattern of vehicular accidents playing a prominent role in maxillofacial trauma across different countries[8].

Adults with an age range of 18 to 64 are also included in the productive age range, in which work-related injuries that occur could additionally contribute towards the high percentage of maxillofacial injuries.

All 2 of the children within the range of 1 to 11 years old in this study are diagnosed with Le Fort 3 fractures (100%). The high percentage of Le Fort 3 fractures in children may be attributed to the skull structure of children and infants, in which the ratio of the cranium to the midface is larger than in skulls of older age groups, leading to a higher chance of impact points that may lead to complete separation of the cranium and the midface (Table 6).

Le Fort 1 cases are the majority for teenagers in the age range of 12 to 17 years old with 3 out of the 6 in the range (37.50%). Adults within the age range of 18 to 64, being the prime age for working and the majority of vehicle users, have the most cases of maxillary fracture, most of them from the Le Fort 3 classification (64 out of 133 (48.12%)). A single case of the elderly age group is a Le Fort 1 diagnosis (100%) (Table 6).

This study shows that males have a significantly higher number of cases compared to females. 113 out of 144 cases were male (78.47%) and 31 out of 144 cases were female (21.53%) (Table 2). Male cases being the majority in maxillary fractures is consistent throughout the years. Multiple studies from 1980 until 2014 show that males are a constant majority in maxillary fracture cases[10].

Males suffer most maxillary fracture cases, with most being a Le Fort 3 type classification, 55 out of 113 cases from this study being a Le Fort 3 fracture (48.67%). Females, however, have Le Fort 1 fractures as a majority (14 out of 31 (45.16%)), although Le Fort 3 is a close second with 13 cases (41.94%) (Table 7).

Among 144 cases of maxillary fracture at Dr. Soetomo General Academic Hospital, 52 out of 144 cases were diagnosed as Le Fort 1 (36.11%), 15 were Le Fort 2 (10.42%), 68 were Le Fort 3 (47.22%), 6 were Le Fort 1 + Le Fort 2 (4.17%), 1 was Le Fort 1 + Le Fort 3 (0.69%), 1 was Le Fort 2 + Le Fort 3 (0.69%), and 1 was Le Fort 1 + Le Fort 2 + Le Fort 3 (0.69%) (Table 3).

Le Fort 3 being the most common fracture site for maxillary fractures aligns with other studies, in which Le Fort 3 fractures appear to also be a majority (2065 out of 6989 (30%)) from a total of 15 different studies[10].

In all cases of maxillary fracture gathered from medical records at Dr. Soetomo General Academic Hospital from 2018 until 2020, an operative approach for treatment is deployed. ORIF mini plating is also a primary

staple on treatment for all the cases, what varies upon the treatment are the additions of arch bar installation and interdental wiring. 117 cases out of 144 were treated with ORIF mini plating (81.25%), 16 out of 144 with ORIF mini plating + arch bar (11.11%), 1 out of 144 with ORIF mini plating + interdental wiring (0.69%), and 10 out of 144 with ORIF mini plating + arch bar + interdental wiring (6.94%) (Table 4).

Treatments in this study consist of all operational approaches. ORIF mini plating is deployed in most of the surgeries, most often on Le Fort 3 cases, 55 out of 117 of the maxillary fracture cases treated with ORIF mini plating (47.01%). ORIF mini plating with arch bar installation is most often deployed in Le Fort 3 (8 out of 16 (50%)). A single case of ORIF mini plating with interdental wiring surgical operation is for a Le Fort 3 fracture (100%).4 out of the 9 cases of maxillary fractures being treated with ORIF mini plating an arch bar installation, and interdental wiring are deployed for treating Le Fort 3 fractures (40%) (Table 8)

Patients diagnosed with maxillary fractures in Dr. Soetomo General Academic Hospital from 2018 until 2020 have an average length of stay of 12.56 days, which starts from admission to completion of treatment, compared with other studies with an average of 9 days[10].

The presence of post-treatment malocclusion in Dr. Soetomo General Academic Hospital during 2018 until 2020 is low, data from the medical records show only 1 out of 144 maxillary fracture cases have malocclusion present (0.69%). Compared to other similar studies, malocclusion rates for Dr. Soetomo General Academic Hospital are lower (2.80%)(9) (Table 5). A single case of malocclusion present out of all the cases in this study is from a case of Le Fort 1 fracture (100%) (Table 9).

The presence of post-treatment infections and exposed plates in Dr. Soetomo General Academic Hospital from 2018 until 2020 is 4 cases out of 144 (2.78%). Comparison with other studies yields data such as infected metalware (3.20%), and plate exposure (1.60%) (Cabalag et al., 2014) (Table 5). All 4 incidents of infections and exposed plates occurred in cases of Le Fort 1 fractures (100%) (Table 9).

This study collected patient profiles from Dr. Soetomo General Academic Hospital who underwent treatment for maxillary fractures. The study focused on variables such as age, gender, maxillary fracture sites, types of treatment, and treatment outcomes.

The data provided is from a single hospital (Dr. Soetomo General Academic Hospital) during a specific period (2018-2020). This limits the generalizability of the findings and may not reflect the overall population or different healthcare settings. The data is limited to a relatively short time frame of three years. A longer duration of data collection could provide a more comprehensive understanding of the patterns and trends in maxillary fractures. The sample size of 144 cases may be considered relatively small, which might limit the statistical power and precision of the findings. A larger sample size could strengthen the reliability and validity of the study. The characteristics and demographics of the patients in this hospital might not be representative of the wider population. The statement mentions that the outcomes of treatment in Dr. Soetomo General Academic Hospital have relatively lower incidence rates of complications compared to other existing datasets. However, specific comparative datasets or studies are not provided, making it difficult to assess the significance of the findings.

CONCLUSION

A study conducted at Dr. Soetomo General Academic Hospital from 2018 to 2020 examined 144 cases of maxillary fractures. The majority of patients were adult males (78.47%) between the ages of 18 and 64 (92.36%). The most common type of fracture observed was Le Fort 3 (47.22%), with other Le Fort classifications being less frequent. Treatment primarily involved ORIF mini plating (81.25%), with an average hospital stay of 12.56 days. Post-treatment complications such as malocclusion, infections, and exposed plates were rare, occurring in only a small number of cases. These findings suggest favorable treatment outcomes compared to other datasets and provide valuable data for future research. Overall, outcomes of treatment in Dr. Soetomo General Academic Hospital result in relatively lower incidence rates of post-surgical complications such as malocclusion, infected, and exposed plates compared to other existing datasets.

ACKNOWLEDGMENTS

The authors thank the Department of Anatomy, Histology, and Pharmacology, and Department of Plastic Reconstructive and Aesthetic Surgery, Faculty of Medicine, Universitas Airlangga Surabaya, Indonesia, Musculoskeletal Consultant of Indonesian Musculoskeletal Radiologist Society (IMRS), Surabaya, and also Australian Craniofacial Unit, Adelaide, South Australia, Australia for their encouragement to share their support in this study.

CONFLICT OF INTEREST

None.

FUNDING DISCLOSURE

None.

AUTHOR CONTRIBUTION

IDGS the study and approved the final draft. RS drafted the manuscript. ASB and MRSH critically revised the manuscript for important intellectual content. All authors facilitated all project-related tasks and read and approved the final draft.

REFERENCES

1. Dalgorf D & Higgins K. Reconstruction of the Midface and Palate. *Semin Plast Surg* 2020; 34: 77–85.
2. Peretti N & MacLeod S. Zygomaticomaxillary complex fractures: Diagnosis and treatment. *Curr Opin Otolaryngol Head Neck Surg* 2017; 25: 314–319.
3. Samieirad S, Aboutorabzade MR, Tohidi E, Shaban B, Khalife H, & Hashemipour MA et al. Maxillofacial fracture epidemiology and treatment plans in the Northeast of Iran: A retrospective study. *Med Oral Patol Oral Cir Bucal* 2017; 22: e616–624.
4. Bataineh AB. Etiology and incidence of maxillofacial fractures in the north of Jordan. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1998; 86: 31–5.
5. Riasa NP, Parama A, Budiapsari PI & LD. The pattern of facial injury among foreign travelers in Bali: A retrospective study. *Maced J Med Sci* 2020; 8: 988–993.
6. Brasileiro BF & Passeri LA. Epidemiological analysis of maxillofacial fractures in Brazil: A 5-year prospective study. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2022; 102: 28–34.
7. Yang CS, Chen SCC, Yang YC, Huang LC, Guo HR &Yang H. Epidemiology and patterns of facial fractures due to road traffic accidents in Taiwan: A 15-year retrospective study. *Traffic Inj Prev* 2017; 18: 724–729.
8. Cabalag MS, Wasiak J, Andrew NE, Tang J, Kirby JC & MD. Epidemiology and

management of maxillofacial fractures in an Australian trauma center. *J Plast Reconstr Aesthetic Surg* 2014; 67: 183–189.
9. Soehodho S. Motorization in Indonesia and Its Impact On Traffic Accidents. *IATSS Res* 2007; 31: 27–33.
10. Phillips BJ & Turco LM. Le Fort Fractures: A Collective Review. *Bull Emerg Trauma* 2017; 5: 221–230.