Etiology, Pattern, Treatment and Outcome of Maxillofacial Fractures at Dhulikhel Hospital

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ABSTRACT

Background

Maxillo-Facial region is one of the prominent parts of human body and is more vulnerable to injury when any form of trauma is encountered. Injury to this region can result in fractures and pattern of fractures often depends upon the mechanism of injury as well as direction of impact.

Objective

To determine the etiology, pattern, treatment, and outcome of maxillofacial fractures presenting to Dhulikhel hospital.

Method

The records of all the patients with maxillofacial injuries presenting to the department of oral and maxillofacial surgery of dhulikhel hospital between period of December 2012 to November 2019 were included in the study. The data regarding age, sex and etiology were recorded. The etiologies were classified as Motor vehicle accidents (MVA), interpersonal violence, fall injuries, sports related injuries, occupational hazards, gunshot injuries and animal attacks and others. Similarly, the pattern of fractures was recorded according to classification by anatomical site. The types of treatment performed was also recorded. Treatment outcome in the form of any post-operative complications were recorded.

Result

Out of 1366 patients with maxillofacial injuries, 378(27.7%) patients had fracture of maxillofacial region. The most common etiology was motor vehicle accidents (53.7%) followed by fall injury (31.2%). Zygomatico-maxillary complex was the most common type of fracture (27.9%). Open reduction and internal fixation were the most common form of treatment provided (85.4%) and post-operative complications were minimal (5.0%).

Conclusion

Motor vehicle accidents still remain the most common cause of maxillofacial fractures. Midface fractures are more common than mandible fracture. The present study provides an insight into changing etiology and pattern of maxillofacial fractures and open reduction and internal fixation remains the most favored treatment of maxillofacial fractures with minimum complications.

KEY WORDS

Maxillofacial trauma, Maxillofacial fractures, Motor vehicle accidents, Treatment outcome

INTRODUCTION

Maxillo-Facial region is one of the prominent parts of human body and is more vulnerable to injury when any form of trauma is encountered.[1] Injury to this region can result in fractures and pattern of fractures often depends upon the mechanism of injury as well as direction of impact.[2] The facial region establishes an identity of an individual and any form of injuries to the face can vastly affect the quality of life of an individual.[3] Thus, the management of fractures of maxillofacial region is a challenging job; as not only the function but esthetics also needs to be considered. This avoids any disfigurement and negative impact on quality of life.[4] Understanding the etiology, patterns and treatment outcome of maxillofacial fractures in a population helps us to understand the behavioral pattern of the people and implement preventive measures to avoid or minimize those types of injuries.[5] To our understanding, no such study has been carried out in this region.

Dhulikhel hospital covers the population of approximately 1.9 million people from Kavre-palanchowk, Sindhu-palchowk, Dolakha, Sindhuli, Ramechhap, Bhaktapur and other surrounding districts. It receives and treats patients with maxillofacial injuries from these districts as well as patients from all over Nepal. So, the study will provide an important data on etiology, pattern and treatment outcome of patients with maxillofacial fractures of this region, thus helping us to plan and implement preventive measures to avoid such injuries.

METHODS

This retrospective study was carried out at department of oral and maxillofacial surgery of Dhulikhel hospital after approval of institutional review board. The records of all the patients with maxillofacial injuries presenting to the department of oral and maxillofacial surgery of dhulikhel hospital between period of December 2012 to November 2019 were included in the study. The patients with maxillofacial injuries presenting to emergency department are taken care under our department so those patient's records were also included in the study. Exclusion criteria included unavailability of complete treatment record, patients who were referred to other center for certain reason and those who presented with soft tissue injuries only without any fracture of maxillofacial reason.

The data regarding age, sex and etiology were recorded. The etiologies were classified as Motor vehicle accidents (MVA), interpersonal violence (IPV), fall injuries, sports related injuries, occupational hazards, gunshot injuries, animal attacks and others. Similarly, the pattern of fractures in mandible was recorded as condylar head, condylar neck, sub-condyle, coronoid process, ramus, angle, body, para-symphysis, symphysis and dento-alveolar. Pattern of fracture in middle third of face was recorded as zygomatico-maxillary complex (Involving Fronto-zygomatic suture, infra-orbital rim, zygomatico-maxillary buttress and with or without zygomatic arch), isolated zygomatic arch, isolated infra-orbital rim, lefort 1, lefort 2, lefort 3, nasal, Naso-orbito-ethmoid, frontal bone and dento-alveolar fracture. The types of treatment performed was also recorded. Treatment outcome in the form of any post-operative complications were recorded.

RESULTS

The total number of patients presenting with maxillofacial injuries were 1366. Out of 1366 patients, 378 (27.7%) patient had fracture of maxillofacial region. Total number of male patients were 297 (78.6%) and female patients were 81 (21.4%). Majority of patients were in the age group 31 to 40 years with mean age of 29.82±10.9 (table 1).

Table 1. Age distribution of patients with maxillofacial fractures

Age (years)	Male	Female	Total
0-10	5	4	9 (2.6%)
11-20	43	23	66 (17.5%)
21-30	91	11	102 (27.0%)
31-40	131	25	156 (41.3%)
41-50	18	10	28 (7.4%)
51-60	7	6	13 (3.4%)
61-70	2	2	4 (1.0%)
Total	297 (78.6%)	81 (21.4%)	378

Table 2. Etiological distribution of patients with maxillofacial fracture

Etiology	Number of cases (N=378)	Percentage (%)
MVA	201	53.7
Two-wheelers	113	56.2
Four-wheelers	88	43.7
Fall	118	31.2
Inter personal violence	51	13.4
Occupational hazard	5	1.3
Sports related injury	2	0.6
Gunshot injury	1	0.2

N= total number of cases with fractures

The most common etiology of maxillofacial fractures was motor vehicle accident (MVA). Two-wheelers were involved in majority of MVA (56.2%). Etiological distribution is shown in table 2. Out of 378 patients, 192 patient (50.8%) had isolated fracture of middle third of face, 161 patient (42.6%) had isolated mandible fracture and 25 patients (6.6%) had fracture of both the middle third of face and mandible. The total number of fractures observed in 378 patients were 458. The distribution pattern of fractures is shown in table 3. Out of 378 patients, 323 (85.4%) were treated by open reduction and internal fixation whereas 55 (14.6%) were treated by closed reduction. The total number of patients

who presented with post-operative complications were 19 (5.0%). Post-operative complications are presented in table 4.

Table 3. Distribution of Pattern of fracture

	Pattern of fracture	Number of fracture (N=458)	Percentage
Midface	Zygomatico-maxillary complex (Involving F-Z suture, infra-orbital rim, Z-M buttress with or without Arch)	128	27.9
	Isolated zygomatic arch only	31	6.7
	Isolated Infra orbital rim	5	1
	Lefort 1	23	5.0
	Lefort 2	9	1.9
	Lefort 3	2	0.4
	Nasal	22	4.8
	Naso-orbito-ethmoid	12	2.6
	Frontal	3	0.6
	Dento alveolar	18	3.9
Mandible	Head of condyle	10	2.2
	Neck of condyle	9	2.0
	Sub condyle	27	5.9
	Angle	37	8.1
	Body	23	5.1
	Para-symphysis	59	12.9
	Symphysis	21	4.6
	Dento-alveolar	19	4.1
Total		458	

*F-Z: Frontozygomatic
**Z-M: Zygomaticomaxillary

Table 4. Post-operative complications

Complications	Number (%)
Wound dehiscence	9 (2.4%)
Infection	5 (1.3%)
Implant fracture	2 (0.5%)
Occlusal disharmony	1 (0.3%)
Infra-orbital nerve paresthesia	2 (0.5%)
Total	19 (5.0%)

DISCUSSION

Fractures of the maxillofacial region forms a major workload for the maxillofacial surgeons. These fractures are more common in the young age group between second to fourth decades of life.[6] It has been attributed to increase in number of youngsters driving motor vehicles, violation of road traffic rules, involvement in athletics as well as violence related issues.[4] Males are more commonly affected than females.[6-8] The etiology of these type of fractures are often influenced by geographic, culture and socioeconomic status of the region.[7,9] Not only the socio-economic status but also the mode of transport plays an important role in etiology of these fractures. Motor vehicle accidents (MVA) are the commonest cause of maxillofacial fractures.[4,6,10,11] The result of present study is in accordance with many such studies carried out worldwide. The result of present study shows that majority of MVA are due to motorbike accidents and these were among age group twenty to forty. Reckless driving of motor bikes, over-speeding, not abiding by traffic rules seems to be the prime reason for involvement of motor bikes in majority of motor vehicle accidents. Besides motor bike accidents, public transport accidents are also involved in MVA. The geography of this part of Nepal has high hills and mountains due to which steep inclination and declination can be seen. Some portions of the roads are also unpitched with numerous potholes. These conditions of roads along with over loading of vehicles, faulty conditions of vehicles seem to be the major cause of public transport accidents.

Different studies carried out in different parts of world have found interpersonal violence (IPV) to be the second leading cause of maxillofacial fracture after MVA and is usually found to be the common cause of maxillofacial fracture in the developed part of the world.[10-12] In our present study, we found that fall from height was the second leading cause of maxillofacial fracture. Similar study carried out in other parts of Nepal has also found fall to be a second leading cause of maxillofacial fractures.[6,13] As we have mentioned earlier that we receive most of the patient from an area which has many villages, difficult terrain, steep narrow roads and poor socio-economic status, people from the villages have to go to nearby jungles to get wood for their house hold works. In the process of gathering woods, they climb trees and difficult terrains without any safety measures. This results in fall from height. This is the reason that second leading cause of maxillofacial fracture is fall from height in our study.

Pattern of fractures of maxillofacial region also shows wide variation based upon the area of study worldwide. The zygomatic bone and nasal bones are the most prominent bones in the middle third of facial region. So, when an impact is directed from the lateral side, zygomatic bones are more susceptible to fracture where as an impact from the frontal direction commonly result in le-fort and nasal fractures.[2] In addition to the prominence of zygomatic bone, the anatomic architecture of midface region is more brittle making it susceptible to injury.[2] So, when there is an impact to midface, high energy forces are sometimes dissipated towards more rigid zygoma and along its articulations leading to fracture.[2] Similarly, mandible is the prominent bone in lower third of face. An impact to lower third of face often results in mandible fracture.[2] Some studies have shown mandible fracture to be common than midface fractures.[5,6,14] In contrast to those studies, our study has found isolated midface to be common than mandible fracture and in midface, the zygomatic fractures to be the commonest fracture. This can be explained by

the fact that zygomatic bone is the most prominent bone in midface and after MVA or fall, the impact would have been to this bone. As we can see in our study, majority of MVA were due to bike accidents and fall, the victim could have fallen to his side with impact to zygomatic bone.

Mandible is considered to be one of the strongest bones in facial region. Despite being the strongest bone, it is frequently fractured bone in facial region and some studies have shown the frequency of mandible fracture to be two to three times the midfacial fracture.[15] Pattern of fracture in mandible often varies according to the direction of impact. Frontal impact often results in symphysis, parasymphysis and condylar fracture whereas lateral impact results in angle, body and contra-lateral condyle fracture.[16] Distribution of fracture in mandible shows wide variation in the literature.[7,15,17-19] The present study shows that parasymphysis was the most common site of fracture in mandible which is in accordance with similar study conducted in different region of Nepal and other parts of the world.[2,6,20,21]

Open reduction and internal fixation (ORIF) are considered to be the most favored treatment for maxillofacial fractures as it reduces the morbidity associated with closed treatment.[17] ORIF offers stable anatomic reduction of the fragments, decreases the risk of post-operative displacement of the fractured fragments and eliminates or shortens the duration of maxillo-mandibular fixation in the post-operative period as well as it allows rapid recovery.[22] However, the treatment chosen often depends upon cost of treatment, affordability of patient, facilities available, surgeon's skill and patient's willingness to accept the treatment offered.[7] As we can see from the result of present study, the majority of fractures in our center have been treated by ORIF. The reason for that is the availability of well-equipped operation theaters and other hospital facilities, easy availability of implants for ORIF and skill full team of maxillofacial surgeons.

Post-operative infection after ORIF is the most common complication reported in literature.[22-24] Introduction of hardware in a contaminated oral cavity has been attributed as a main reason for this Wound dehiscence is another factor which can lead to post-operative infection as it exposes the underlying hardware resulting in colonization by bacteria leading to infection.[25,26] To reduce the incidence of post-operative infection, it has been suggested that immobilization of fractures in the maxillofacial region should not be delayed beyond 48 to 72 hours.[27] However, there is no clear consensus on whether delaying treatment increases the incidence of post-operative infection.[25] The result of present study shows that wound dehiscence and infection were the most common type of post-operative complication however, the incidence were only 2.4% and 1.3% respectively. When we compare the results to other worldwide studies, the incidence is quite low.[22-24] This could be due to use of proper aseptic technique, proper use of anti-microbial agents and good post-operative wound care.

The present study describes the etiology, pattern and treatment outcome of maxillofacial fractures in this region, however there are some limitations of this study. The study is a retrospective study and we could have missed the exact number of patients presenting with maxillofacial fractures due to unavailability of hospital records. Some of the patients may have been referred from the emergency departments to other center due unavailability of ICU care or other multispecialty care at our hospital. Thus, we plan to conduct a long-term prospective study in a near future.

The limitations of the study are that we might have missed some patients who were referred to other centers for advanced neurosurgical interventions or for any other reasons. Similarly, the complete hospital records of some patients were not available.

CONCLUSION

Despite of implementation of no drink and drive rule, motor vehicle accidents still remain the most common cause of maxillofacial fractures. However, other modes of injuries; especially fall is also one of the commonest modes of injury in this part of Nepal. The present study provides an insight into changing etiology and pattern of maxillofacial fractures and open reduction and internal fixation remains the most favored treatment of maxillofacial fractures with minimum complications.

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