**Patterns and etiologies of maxillofacial trauma among traumatic patients visiting Dental clinic of Gondar university hospital: 2 years retrospective study**

 Amare teshome¹\*, Getaneh Andualem¹, Rediet Tsigie¹, Samuel Seifu¹

¹Department of Dentistry, school of medicine, college of medicine and public health, Gondar, Ethiopia.

 **Corresponding author:** Amare Teshome, Department of Dentistry, school of medicine, college of medicine and public health, university of Gondar, P.o.box 196, Gondar, Ethiopia.

Tel: +251910 51 70 02

 Email:teshomeamare78@yahoo.com

**Abstract**

**Statement of the problem**

Maxillofacial trauma is one of the major challenges for public health care services due to the high incidence rate and financial cost. The injuries result from falls, physical aggression and accidents involving motor vehicles, and sports the pattern of maxillofacial trauma varied from country to country and these variations can be attributed to social, cultural, and environmental factors. Developing countries account for over 85% of the deaths, and close to 90% of the disability caused by road traffic crashes globally .Ethiopia is one of the top ten countries sustaining death due to road traffic accident. In Ethiopia there is no research done on the patterns and etiology of maxillofacial trauma.

**Objectives:** To assess the pattern and etiology of maxillofacial trauma among traumatic patients visited Gondar university hospital dental clinic from September 2013 to August 30/2015.

**Methodology:**

A retrospective study was performed, and involved a chart review of traumatic patients treated in dental clinic of Gondar University Hospital, North West Ethiopia, between September 2013 and August 2015. Only patients who have sustained maxillofacial injuries were included in the study. Collected data was then analyzed for relevance using the SPSS version 20.0 statistical software.

**Result:** A total of 326 traumatic patients were visited dental clinic for the last 2 years with a mean age of 29.12±8.622.Interpersonal violence was the most frequent cause of maxillofacial trauma irrespective of gender .Men sustained more injuries as compared with women with a ratio of 4.02:1. Injuries were most commonly sustained in the age groups of 21-30 years, consisting about 47.2% of all injuries. Mandibular fracture was the most common fracture occurred and the body of it is mainly affected.

**Conclusion and recommendation:** Interpersonal violence was the major cause of maxillofacial trauma and mandible was the most affected bone of the maxillofacial area. So, we recommended the police and security of the area must create an awareness on the impact of trauma on quality of life and work with the community to reduce violence incidence.

Key words: maxillofacial trauma, interpersonal violence, mandible, maxilla

Introduction

Maxillofacial trauma is one of the major challenges for public health care services due to the high incidence rate and financial cost (making the loss of 518 billion us $ globally ). The injuries result from falls, physical aggression and accidents involving motor vehicles, and sports. The pattern of maxillofacial trauma varied from country to country and these variations can be attributed to social, cultural, and environmental factors([1](#_ENREF_1), [2](#_ENREF_2))

Trauma is the fourth ranking cause of death at all ages and the most frequent killer in the age group of 1–37 years. Developing countries account for over 85% of the deaths, and close to 90% of the disability caused by road traffic crashes globally .Ethiopia is one of the top ten countries sustaining death due to road traffic accident.

In developed countries of Europe, violence followed by road crashes are the predominant causes while in the developing world the causative factors are reversed with most being the result of road crashes([3](#_ENREF_3)). In Sub-Saharan Africa, males sustained more facial fractures than females; the ratios were reported to be 5:1 in Zimbabwe([4](#_ENREF_4))

A crossectional study done in Brazil found that maxillofacial injuries were most frequent in males (89.2%) and in the 19-28 year age group (46.8%). Traffic accidents/motorcycle (23.7%) and physical violence (20.4%) were the most common etiological factor. Facial fractures were detected in 90.9%. The most common facial fracture was maxilla (29.1%), followed by the mandible (27.5%)([5](#_ENREF_5)).But some other studies showed mandibular fracture was the common facial fracture occurred in maxillofacial traumatic patients, mainly the fracture is frequent in the body of mandible([6](#_ENREF_6), [7](#_ENREF_7)).

A crossectional study done at St. Luke Hospital on interpersonal violence showed that the great majority of the victims were male (91%) and the age group of 21-30 were the most vulnerable (38%)([8](#_ENREF_8)).Another retrospective study done in Addis Ababa on patterns of trauma showed among patients visiting trauma department of black lion hospital (62.6%) were male, a male to female ratio of 1.7:1. The majority of the patients, (65.9%), were within the age groups of 15-44 years. Falls were the most common cause of reported unintentional injuries seen and accounted for 37.7% of cases and road traffic accident (RTA) ranked second to falls as a leading cause of injury reported in (33.8%) of cases([9](#_ENREF_9)).

Data on epidemiology, pattern and etiology of maxillofacial injuries in sub-Saharan Africa is scarce. In Ethiopia there is no research done on patterns and etiology of maxillofacial trauma to the knowledge of us. so, assessing maxillofacial injuries will help in identifying and managing such injuries more efficiently. It will also aid health care policy makers in planning and implementing more effective preventive and treatment plans. The aim of this study is to assess the pattern, etiology of maxillofacial fractures and to locate site of fracture or trauma.

**2. Methods and materials**

A predesigned questionnaire was used to collect the data for this retrospective analysis.  After obtaining permission from the concerned hospital authorities, and Ethical clearance from IRB of university of Gondar , the hospital records of all  the patients treated for  maxillofacial  injuries  in the department during the year from 2013and 2015 (September 2013–august  2015)  were  checked. The information pertaining to age and sex, residency, distribution, etiology of fracture, type of fracture and month of trauma was entered in the pro forma.  The data was then computerized and subject to statistical analysis, using Statistical Package  for Social  Sciences (SPSS) windows version 20.0

The fractures of the mandible were grouped as condylar, Ramus, angle, body, and symphysis fractures. The fractures of the middle face included Le fort I, II, III, zygomatic arch, and nasal complex fractures.  The etiological factors were classified into RTA, fall, interpersonal violence, and sport.

Results

Clinical records of 326 patients who attended the clinic between September 2013 and August 2015 were evaluated. The majority of these were male (n=261; 80.1%) and rural dwellers (n=198; 60.7%). The male to female ratio was found to be 4.02:1. The mean age was 29.12 years (SD=8.622).The most common cause of maxillofacial fracture was Interpersonal violence (75.8%) followed by road traffic accident (21.5%) (**Table 1**).

Table 1. Etiologic distributions among the study participants (n=326)

|  |  |  |
| --- | --- | --- |
| Etiology  | Number of patients (%) | Total  |
| Road traffic accident Bajaj  Motorbike  Mini bus/ bus | 22(6.7) | 70(21.5%) |
|  6(1.8) |
| 42(12.9) |
| Interpersonal violence | Axe/Knife |  7(2.1) | 247(75.8) |
| Boxing  |  71(21.8) |
| Bullet  |  1(0.3) |
| Stick |  94(28.8) |
| Stone  | 74(22.7) |
| Fall  |  6(1.8) | 6(1.8) |
| Sport  |  3(0.9) | 3(0.9) |

The prevalence of maxillofacial trauma is high among males (80.1%) and those who live in rural area (60.7%).The male to female ratio was found to be 4.02:1. Stick injury and minibus/bus accidents were more common in the rural dwellers.

Highest number of patients was associated with age group 21-30 years (47.2%) followed by 11-20 years (21.2%) **(Table2**)

Table 2. The distribution of etiology according to gender, residency and age groups (n=326)

|  |  |  |  |
| --- | --- | --- | --- |
| Etiology  | Gender  | Residency  |  Age groups  |
| Male  | Female  | Urban  | Rural  | <10  | 11-20 | 21-30 | 31-40 | >40 |
| RTA | Bajaj  | 7 | 15 | 17 | 5 | 0 | 2 | 16 | 1 | 3 |
|  Motorbike  | 5 | 1 | 1 | 5 | 0 | 3 | 3 | 0 | 0 |
| Minibus/bus  | 32 | 10 | 7 | 35 | 0 | 11 | 13 | 12 | 6 |
|  Violence  | Stick  | 81 | 13 | 19 | 75 | 0 | 14 | 42 | 13 | 25 |
| Boxing  | 53 | 18 | 58 | 13 | 0 | 21 | 34 | 10 | 6 |
| Axe/knife  | 7 | 0 | 0 | 7 | 0 | 0 | 5 | 2 | 0 |
| Bullet  | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| Stone  | 69 | 5 | 23 | 51 | 0 | 15 | 35 | 15 | 9 |
| Sport  | 3 | 0 | 1 | 2 | 0 | 0 | 3 | 0 | 0 |
| Fall  | 3 | 3 | 2 | 4 | 0 | 3 | 2 | 1 | 0 |
| Total  | 261 | 65 | 128 | 198 | 0 | 69 | 154 | 54 | 49 |

Among 326 patients sustaining maxillofacial trauma 164 patients had at least one maxillofacial bone fracture. The most common type of facial fracture was mandibular fractures (75%) and maxillary fractures (20.1%). Mandibular body and symphysial fractures were the common among the mandibular fractures (32.9% and 14.6% respectively) and 17.7% of the patients sustained more than one maxillofacial fracture. Males and rural dwellers had more fractures.

Mandibular body fracture was high among males and rural dwellers. There is no angular and Ramus fracture among females (**Table 3&4).**

Table 3. Anatomical distribution of maxillofacial fractures (n=164)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Fracture type | Number (%) |  Gender  | Residency |  |
| Male  | Female  | Urban  | Rural  |
| Mandible  | **Condyle**  | 16 | 11 | 5 | 5 | 11 |
|  | **Ramus**  | 10 | 10 | 0 | 3 | 7 |
|  | **Angle** | 19 | 19 | 0 | 7 | 12 |
|  | **Body** | 54 | 49 | 5 | 9 | 45 |
|  | **Symphysis** | 24 | 19 | 5 | 8 | 16 |
| Maxilla  | **Lefort I** | 28 | 23 | 5 | 10 | 18 |
|  | **Lefort II** | 5 | 3 | 2 | 2 | 3 |
|  | **Lefort III** | 0 | 0 | 0 | 0 | 0 |
|  | **Nasal**  | 4 | 3 | 1 | 3 | 1 |
|  | **Zygomatic**  | 4 | 4 | 0 | 1 | 3 |

Combined injury of symphysis and Body area was high and was observed in 6 patients. This was followed by combined injury of condyle with body and symphysis area which was found in 4 patients **(Table5).**

Table4. Distribution of more than one fracture in a single person (n=29)

|  |  |
| --- | --- |
| Combined injuries  | Number  |
| Condyle + angle  | 3 |
| Condyle +body  | 4 |
| Condyle + symphysis  | 4 |
| Angle +body | 2 |
| Angle +symphysis  | 1 |
| Body +Ramus  | 2 |
| Body +symphysis  | 6 |
| Ramus +symphysis  | 1 |
| Lefort I+II | 2 |
| Lefort I+ body of mandible  | 2 |
| Body +zygomatic  | 2 |
| Total  | 29 |

The common treatment modalities done for the facial fractures were mainly closed reductions (46.9% arch bar fixation and 37.2% with inter maxillary fixation).Those that needs open reduction (9.1%) were referred for oral and maxillofacial surgeon.

Table5. Treatment modalities of the maxillofacial trauma (n= 164)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Fracture type  | Wire Splinting/composite  | Arch bar fixation  | Intermaxillary fixation  | Referral  |
| Condyle  | 0 | 0 | 12 | 4 |
| Ramus  | 0 | 0 | 10 | 0 |
| Angle  | 0 | 2 | 16 | 1 |
| Body  | 0 | 38 | 16 | 0 |
| Symphysis  | 0 | 17 | 7 | 0 |
| Lefort I | 11 | 17 | 0 | 0 |
| Lefort II | 0 | 3 | 0 | 2 |
| Nasal  | 0 | 0 | 0 | 4 |
| Zygomatic  | 0 | 0 | 0 | 4 |
| Total  | 11 | 77 | 61 | 15 |

Majority of the patients (46.6%) visit dentist within 24 hours of post traumatic period which is a right time for fixation and the prognosis of fracture will become good, but 0.6% was visiting after one month **(Table 6).**

Table6. Time lag between trauma incidences to dental first visit according to residency (n=326)

|  |  |  |
| --- | --- | --- |
|  Time lag  | Residency  | Total  |
| Urban  | Rural  |
| <24 hours  | 69 | 83 | 152 |
| 24-48 hours  | 31 | 53 | 84 |
| 3-7 days  | 25 | 47 | 72 |
| 8-29 days | 3 | 13 | 16 |
| >1 months  | 0 | 2 | 2 |
| Total  | 128 | 198 | 326 |

The common trauma occurring days of the week were Sunday (22.7%), and Saturday (16.3%) this may be due to this two days are weekend and there is no work and people takes alcohol and frequency of personal contact increases (**Figure 1**)

 Figure1. Distribution of maxillofacial trauma according to days of a week among the study participants (n=326)

The majority of cases were occurred in 2014/15 which is 1.5 times the cases occurred in 2013/14. October to March was the most trauma occurring months of the year in both years. (Figure 2).

 **\*2013/14** from September 2013 to august2014

 **\*2014/15** from September 2014 to august 2015.

Figure2. Yearly distribution of maxillofacial trauma among the study participants (n=326).

 **Discussion**

In this study maxillofacial injuries were most frequent among males (80.1%) which are similar with the study done in Brazil and in St.luke hospital in Ethiopia (89.2%, 91% respectively)([8](#_ENREF_8), [10](#_ENREF_10)).

In Sub-Saharan Africa, males sustained more facial fractures than females; the ratios were reported to be 5:1 in Zimbabwe ([4](#_ENREF_4))which corresponds with our study with male to female ratio of 4.02:1. This may be due to Males are at greater risk due to their greater participation in high risk activities which increases their exposure to risk factors such as driving vehicles, sports that involve physical contact, and an active social life, including alcohol drinks .

In the present study maximum number of maxillofacial injuries was found from rural area which is in contrast with the study done in Kashmir([11](#_ENREF_11)). This may be due to stick injury was the major cause of the trauma in our study which is mainly occurred in rural area.

In agreement with other studies ([8](#_ENREF_8), [10](#_ENREF_10), [12](#_ENREF_12)) the majorities of patients in the present study were young adult in their third decade (21-30 years). The possible reasons for the higher frequency of maxillofacial injuries in third decade may be attributed to the fact that people in this period of life are more active regarding fights, violent activities, and high speed transportation.

In this study the prevalence of maxillofacial trauma is high in the age groups of 21-30(n=154) years and followed by 11-20 years (n=69) which is similar with the study done in Brazil, India and St.luke hospital in Ethiopia ([8](#_ENREF_8), [10](#_ENREF_10), [12](#_ENREF_12)).

From the overall patients 50.3% of them sustained at least one maxillofacial fracture which is low relative to the study done in Brazil (90.9%)([10](#_ENREF_10)).

The present study shows that the most common cause of maxillofacial injuries was interpersonal violence, which is in contrast to other studies in developing countries which reported road traffic accident as a major cause of maxillofacial trauma ([3](#_ENREF_3), [10](#_ENREF_10), [12-14](#_ENREF_12)). These etiological differences reflect differences in socio- economic factors, national infrastructure development and other behavioral practices such as alcohol consumption and other criminal activities.

In this study mandibular fracture was the most frequent type of fracture. Similar finding was also reported by other study ([13](#_ENREF_13)). This could be due to the fact that the mandible is the most prominent and only moveable facial bone, and hence has a greater chance of being fractured than mid-facial bones. Other studies reported maxillary fractures as the most frequent site of injury ([10](#_ENREF_10), [11](#_ENREF_11)). This difference in injury patterns may be due to differences in the mechanism of injury.

In this study mandibular body fracture was the highest among all age groups which agrees with other studies([6](#_ENREF_6), [7](#_ENREF_7)). This may be due to the type of trauma mechanism.

The monthly incidence of maxillofacial fractures was fairly constant with seasonal variations, as reported in several studies ([15](#_ENREF_15), [16](#_ENREF_16)). But in this study the incidence was high from December to March with a peak level of on February. This may be due to rural areas of Ethiopia are free from work during these months since harvesting is completed in the early November and farmers are mostly spending their time by taking alcohol.

The incidence of maxillofacial trauma is increasing in this study but the study done by ***Rajanikan****th* in India showed the incidence is decline from 2008 to 2012([17](#_ENREF_17)).The incidence of trauma in our study is increasing by 1.5 times from 2013/14 to 2014/15.

In our study Sunday and Saturday were the common trauma occurring days of a week this may be due to this days are weekends and people wants recreation ,sport activities and transportation from one place to other.

In this study majority of the patients (46.6%) visit dentist within 24 hours of post traumatic periods. This is real time for effective treatment of fracture and other injuries before infection develops. All of the patients treated in our hospital had closed reduction as the treatment and few patients were referred for open reduction to oral and maxillofacial surgeon. Open reduction and internal fixation has been reported to be the “gold standard” of treatment of maxillofacial fractures. How- ever, this form of treatment has not become popular in our environment due to lack of expertise (i.e. maxillofacial surgeons) and facilities for open reduction and internal fixation is not readily available.

 **Conclusion and Recommendation**

Interpersonal violence was the major etiological factor of maxillofacial injuries in our setting and the young adult males were the main victims. Rural dwellers were more affected by the trauma. Mandibular fracture was the most frequently occurring type of injury. The majority of maxillofacial fractures were treated by closed reduction.

Based on the above finding we recommended:

* To reduce the incidence of interpersonal violence , the police and regional security must work with the community
* An awareness campaign must be taken to educate the public about the impact of trauma on quality of life,
* The police and the community elders need  for  the  development  of  preventive  programs,  aiming  to   help individuals,  organizations,  and communities;  and  government  agencies  plan  proactively  for  the  successful  mitigation  of  unexpected violence.
* Gondar university hospital should have oral and maxillofacial surgeon with equipped facility to do open reduction for the fractures as early as possible in order to reduce the morbidity resulting from these injuries.

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 **Competing interests**

 The authors declare they have no competing interest. The study had no external funding. Operational costs were met by authors

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