

Incidence and Prevalence of Maxillofacial Injuries in Government Theni Medical College – Two Years Retrospective Study

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Abstract

Introduction: The incidence of maxillofacial fractures varies widely between different countries. The large variability in reported incidence and etiology is due to a variety of contributing factors, including environmental, cultural, and socioeconomic factors.

Aim: This study aimed to assess retrospectively the incidence and prevalence of maxillofacial injuries in patients reported in Government Theni Medical College.

Materials and Methods: The data collected included age, sex, place, date and month, time, etiology, influence of alcohol, nature, and pattern of the facial bone fractures, associated injuries.

Results: As per records a total of 10589 patients were reported. Of which, 1325 patients had maxillofacial injuries. Nearly 72.3% of the patients were men, and the most frequently affected age group was 21-30 years (33.5%) with males outnumbering females in all age groups. A maximum number of trauma cases were reported at 6 pm-12 am (40.3%). Road traffic accidents (RTAs) (57.2%) were the primary etiological factor followed by assault (21.6%). Among the maxillofacial fractures, mandible (27.9%) was most frequently involved followed by the midface, particularly zygomaticomaxillary complex region (24.2%).

Conclusion: RTAs remain the major cause of maxillofacial injuries. Periodic review of driving skills and strict implementation of traffic rules is must to minimize maxillofacial trauma.

Key words: Facial injury, Facial trauma, Maxillofacial trauma, Retrospective study

INTRODUCTION

Nowadays, maxillofacial injuries are commonly encountered in a day-to-day human life and are often associated with other injuries. For the past few decades, there has been a significant increase in maxillofacial traumas. Maxillofacial fractures result from blunt or penetrating trauma. Blunt injuries are far more common, including motor-vehicle accidents, sports-

related trauma, personal violence, occupational injuries, and falls. Penetrating injuries include gunshot wounds, stabbings, and explosions. Trauma of maxillofacial region frequently involves the soft tissues and facial skeleton including maxilla, mandible, zygoma, orbit, nasal bone, etc.

Several studies have been conducted to investigate the epidemiological features of maxillofacial fractures in different population groups, such as Austria,¹ Australia,^{2,3} Iran,^{4,5} India,^{3,6} New Zealand,⁷ Nigeria,⁸⁻¹⁰ Scotland,¹¹ United Arab Emirates,¹² and the United States.³

A large number of patients with maxillofacial injuries are reported in Government Theni Medical College casualty. Hence, retrospective study is conducted to determine various parameters with respect to maxillofacial injuries.

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MATERIALS AND METHODS

This is a retrospective descriptive study conducted in the Government Theni Medical College Hospital, Theni. It is the main referral center for all places in and around the area. Included all trauma patients were reported to Government Theni Medical College casualty from March 2014 to April 2016. Pathology cases such as toothache, dentoalveolar abscess, space infection, pathological fracture, temporomandibular joint dislocation other than trauma were excluded from the study.

Study Variable

Data regarding age, sex, place, date and month, time, etiology, the influence of alcohol, nature, and pattern of the fractures, associated injuries. The etiological factors were classified as road traffic accidents (RTAs), falls, assault, occupational, and sports, injuries caused by animal and others (blasts, gunshot). The RTAs were further subdivided according to the type of vehicle (bicycle, two-wheelers, three- and four-wheelers, and others). The anatomic locations of mandibular fractures were divided into six groups as symphysis, parasymphysis, body, angle, condyle, and coronoid. Middle-third of the face as frontal, zygomaticomaxillary complex (ZMC), zygomatic arch alone, nasal, naso-orbito-ethmoid (NOE), Le Fort I, Le Fort II, Le Fort III, dentoalveolar. Associated injuries were taken including head injury, chest and abdominal injury, upper limb fracture, lower limb fracture, pelvic fracture, and cervical spine injury.

RESULTS

As per casualty records, a total of 10589 patients were reported. In which, 1325 patients had a maxillofacial fracture.

Sex Distribution (Table 1 and Graph 1)

Among 1325, 72.3% of patients were males and 27.6% were females, with a male and female ratio of 3:1.

Age Group Distribution (Table 2 and Graph 2)

In all age groups, there was a preponderance of the male gender. The peak incidence was in the 21-30 age group (33.5%), followed by 31-40 age group and the 11-20 age group with 22.8% and 16.3%, respectively. In the age group, 21-30 majority were male 31% ($n = 1308$) and majority of female reported with maxillofacial injuries were in the age group of 31-40 (22.0%, $n = 227$).

Distribution of Time of Injury (Table 3 and Graph 3)

The maximum number of cases were reported at 6 pm-12 am (40.3%) followed by 12 pm-6 pm (24.7%).

Table 1: Sex distribution

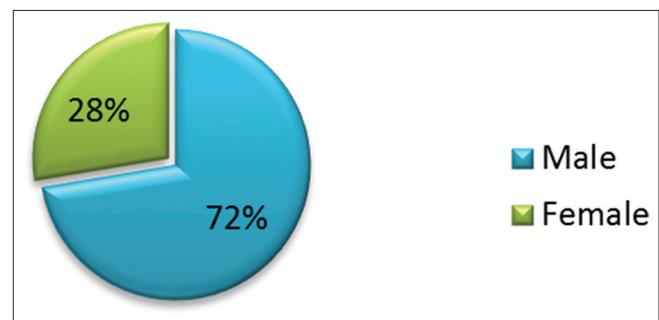
| Sex | Frequency (%) |
|--------|---------------|
| Male | 958 (72.3) |
| Female | 367 (27.6) |
| Total | 1325 (100.0) |

Table 2: Age group distribution

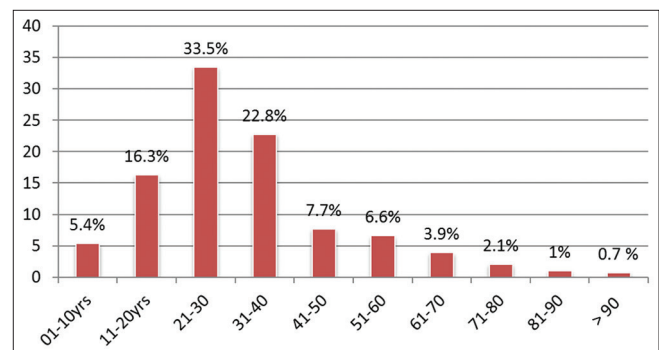
| Age group (years) | Frequency (%) |
|-------------------|---------------|
| 1-10 | 72 (5.4) |
| 11-20 | 216 (16.3) |
| 21-30 | 445 (33.5) |
| 31-40 | 302 (22.8) |
| 41-50 | 102 (7.7) |
| 51-60 | 87 (6.6) |
| 61-70 | 52 (3.9) |
| 71-80 | 28 (2.1) |
| 81-90 | 13 (1.0) |
| >90 | 08 (0.7) |
| Total | 1325 (100.0) |

Table 3: Distribution of time of injury

| Time | Frequency (%) |
|------------|---------------|
| 12 am-6 am | 178 (13.4) |
| 6 am-12 pm | 285 (21.6) |
| 12 pm-6 pm | 328 (24.7) |
| 6 pm-12 am | 534 (40.3) |
| Total | 1325 (100.0) |



Graph 1: Sex distribution



Graph 2: Age group distribution

Month Wise Distribution of Injuries (Table 4 and Graph 4)

Maxillofacial traumas were highest in the months of September (20.8%) followed by October (14.6%), with least incidence in the month of April (3.3%).

Distribution of Aetiology of Trauma (Table 5 and Graph 5)

RTA was the leading cause of maxillofacial injuries with the incidence of 57.2%, followed by assault (21.6%) and fall (10.9%). Only least number cases were reported due to injuries caused by animals (1.0%) and others (blasts, gunshot) (0.6%).

Distribution of Injuries by Type of Vehicle (Table 6 and Graph 6)

Regarding vehicle involved RTA, two-wheeler was the leading cause with the incidence of 51.8% followed by four-wheeler 27.7%, three-wheeler 13.1%, and least percentage of cases were reported due to bicycle-related accident 7.4%, respectively.

Distribution of Alcohol Influence (Table 7)

Majority cases were affected under the influence of alcohol with the occurrence of 66.1% ($n = 876$).

Table 4: Month wise distribution of injuries

| Month | Frequency (%) |
|-----------|---------------|
| January | 98 (7.3) |
| February | 67 (5.0) |
| March | 56 (4.3) |
| April | 44 (3.3) |
| May | 101 (7.6) |
| June | 84 (6.5) |
| July | 66 (5.0) |
| August | 53 (4.0) |
| September | 276 (20.8) |
| October | 193 (14.6) |
| November | 105 (7.9) |
| December | 181 (13.70) |
| Total | 1325 (100.0) |

Table 5: Distribution of etiology of trauma

| Etiology | Frequency (%) |
|----------------------------|---------------|
| RTA | 758 (57.2) |
| Fall | 133 (10) |
| Assault | 286 (21.6) |
| Occupational injury | 58 (4.4) |
| Sports injury | 69 (5.2) |
| Injuries caused by animals | 12 (1.0) |
| Others (blasts, gunshot) | 09 (0.6) |
| Total | 1325 (100.0) |

RTA: Road traffic accident

Table 6: Distribution of injuries by type of vehicle

| Type of vehicle | Frequency (%) |
|-----------------|---------------|
| Bicycle | 56 (7.4) |
| Two wheeler | 393 (51.8) |
| Three wheeler | 99 (13.1) |
| Four wheeler | 210 (27.7) |
| Total | 758 (100.0) |

567 cases other etiology

Distribution of Pattern of Maxillofacial Fractures (Table 8 and Graph 7)

Increased number of cases were affected with mandibular fracture (27.9%), followed by ZMC (24.2%), and dentoalveolar fracture (16.1%). NOE complex fracture showed 0.7% which was found to be least among the all.

Distribution of Mandible Fracture (Table 9 and Graph 8)

Patients affected of parasymphysis fracture showed greater incidence with 37.6% followed by condylar fracture (27.3%), symphysis (11.6%), and angle (10.3%). Least number of cases were reported with coronoid fracture with 2.4%.

Distribution of Associated Injuries (Table 10)

Head injury (72.9%) accounted for the greater majority of associated injuries followed by lower limb fracture (10.6%),

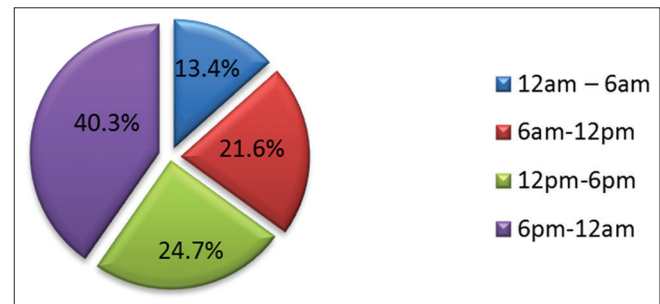
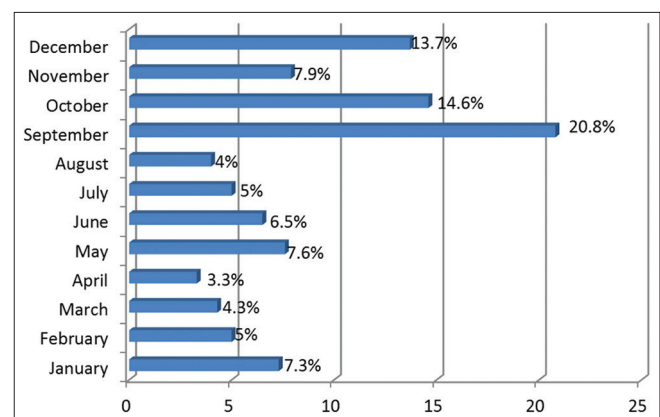
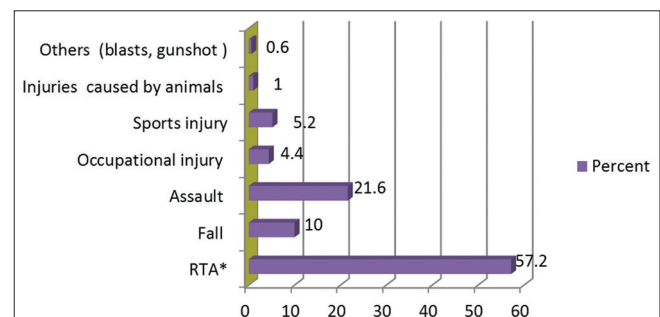
**Graph 3: Distribution of time of injury****Graph 4: Month wise distribution of injuries****Graph 5: Distribution of etiology of trauma**

Table 7: Distribution of alcohol influence

| Alcohol influence | Frequency (%) |
|-------------------|---------------|
| Yes | 876 (66.1) |
| No | 449 (33.9) |
| Total | 1325 (100.0) |

Table 8: Distribution of pattern of maxillofacial fractures

| Pattern of fracture | Frequency (%) |
|----------------------|---------------|
| Frontal | 73 (5.5) |
| ZMC | 321 (24.2) |
| Nasal | 65 (4.9) |
| Orbit | 115 (8.7) |
| Le Fort I | 49 (3.7) |
| Le Fort III | 31 (2.3) |
| Le Fort III | 14 (1.1) |
| Mandible total** | 370 (27.9) |
| Dento-alveolar*** | 213 (16.1) |
| Zygomatic arch alone | 65 (4.9) |
| NOE | 9 (0.7) |
| Total | 1325 (100.0) |

ZMC: Zygomatico maxillary complex, **Sum of mandibular condyle, parasymphysis, angle, body, symphysis, coronoid process, and ramus, ***Dento-alveolar fracture included upper and lower arch together, NOE: Naso-orbito-ethmoid complex

Table 9: Distribution of mandible fracture

| Mandible fracture | Frequency (%) |
|-------------------|---------------|
| Symphysis | 43 (11.6) |
| Parasymphysis | 139 (37.6) |
| Body | 28 (7.6) |
| Angle | 38 (10.3) |
| Ramus | 12 (3.2) |
| Condyle | 101 (27.3) |
| Coronoid | 9 (2.4) |
| Total | 370 (100.0) |

Table 10: Distribution of associated injuries

| Associated injuries | Frequency (%) |
|----------------------------|---------------|
| Head injury | 296 (72.9) |
| Chest and abdominal injury | 17 (4.2) |
| Upper limb fracture | 23 (5.7) |

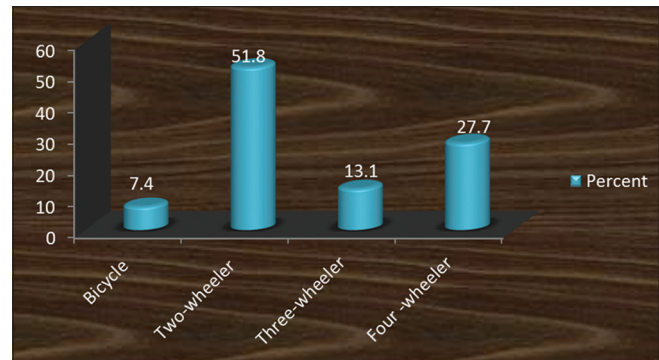
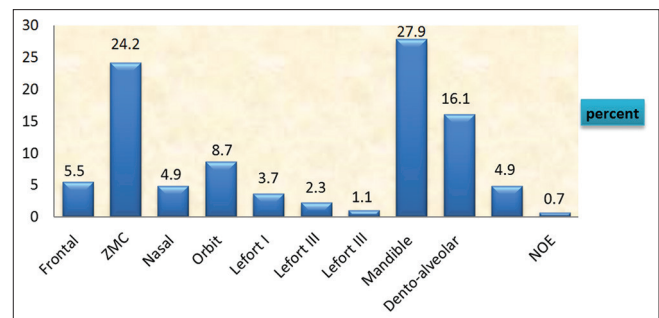
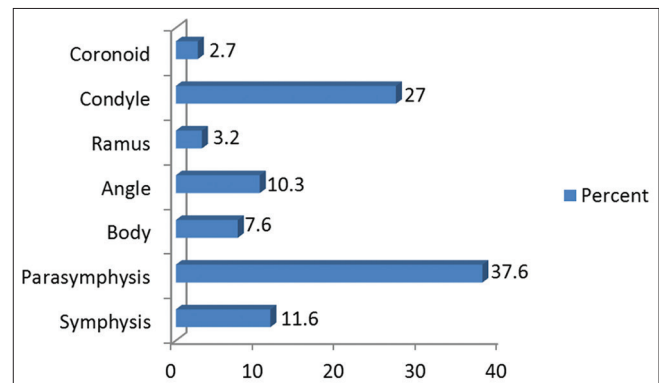
upper limb fracture (5.7%), cervical spine injury (4.7%), chest and abdominal injury (4.2%), and pelvic fracture (2.0%).

DISCUSSION

The etiological factors and pattern of maxillofacial injuries have been reported to vary from one country to another depending on the socioeconomic status, geographic condition, and cultural characteristics.

Sex and Age Distribution

In this study, males (72.3%) were predominately affected than females (27.6 %); the male to female ratio was

**Graph 6: Distribution of injuries by type of vehicle****Graph 7: Distribution of pattern of maxillofacial fractures****Graph 8: Distribution of mandible fracture**

3:1. The most of the studies showed similar to as the present one. The sex ratio in various studies ranges from 2.3:1¹³ to 11.8:1.¹⁴ In most of the studies it was around 3:1. The preponderance of male because the males are more likely the earners of the family and also plays an active role in social work; therefore, they are more prone to be affected by accidents, violent contact, and sports. Age of the patients suffering from maxillofacial trauma ranged from 1 year to 95 years (mean age 47.5 years) the most commonly affected peoples in the age group was 21-30 years (33.5%), similar results showed in various studies.^{5,6,9,10,15-17} The people in this age group are more active regarding sports, fights, violent activities, industrial work, and high-speed transportation. In the study, second commonly affected age groups were 31-40 (21.3%) and 41-50 (18.7) (Tables 1 and 2; Graphs 1 and 2).

Time and Monthly Distribution

This study shows peak incidence of fractures occurring at late evening particularly 6 pm-12 am (40.3%). This is mainly due to people rushing back to home from office, colleges, and schools, and from various other works. It was followed by incidences at 12 pm-6 am (24.7%), 6 am-12 pm (21.6%), and 12 am-6 am (13.4 %). Chandra Shekar and Reddy,³ Kapoor and Kalra¹⁷ reported a maximum number of trauma has occurred in the late evening.

The number of maxillofacial trauma cases was significantly high in the months of September (20.8%) and October (14.6%) in this study. This is because of the rainy season and increased consumption of alcohol. In contrast, Ogundare *et al.* reported facial injuries were a peak in summer (31%) and winter (28%) months (Tables 3 and 4; Graphs 3 and 4).

Etiology of Trauma

This study shows that the most common etiological factor of maxillofacial injuries was RTAs (57.2%). Similar to ours, RTA was the major cause in various studies.^{6,10,14,16} However, contrast to other studies carried out in developed countries, which reported assaults as the most common cause of maxillofacial injuries.^{3,8,17-19} The high number of maxillofacial injuries attributed to RTA in the present study was due to recklessness and negligence of the driver, often driving under the influence of alcohol and complete disregard of traffic laws, over speeding, overloading, underage driving and poor conditions of roads and vehicles. Assault (31.0%) was the second most common cause of injury followed by fall (10.9%), sport-related injury (5.2%), and occupational injury (4.4 %), injuries caused by animals (1.0%). In contrast to other studies carried out in developed countries, reported assaults as the most common cause of maxillofacial injuries.^{13,18,19}

Regarding vehicles involved in RTA, two-wheelers (51.8%) were the predominant cause of injury followed by four-wheelers (27.7%), three-wheelers (13.1%), and bicycle (7.4%). Two-wheeler was the main causative factor as reported by Chandra Shekar and Reddy,³ Subhashraj *et al.*,¹⁵ Calderoni *et al.*¹⁶ In contrast, four wheeler remains to be the major cause for RTA in developed countries. Verification of the etiological factors of maxillofacial fractures may help to assess the proficiency of road safety measures such as speed limits, drunk driving, seat belt laws, and behavioral patterns (Tables 5 and 6; Graphs 5 and 6).

Influence of Alcohol

Excessive consumption of alcohol is strongly associated with facial injuries. Alcohol impairs judgment, cognitive ability and once ability to assess the risk and protect them which probably brings out aggression, often leads to

interpersonal violence and is also a major factor in motor vehicle accident and assault. The prevalence of alcohol consumption among the middle-aged group was due to high income, peer pressure, lack of parental supervision, and unemployment. In this study, alcohol consumption before the injury was recorded in 66.1% of cases. In contrast, Al Ahmed *et al.*²⁰ reported alcohol does not play a major role for facial fracture etiology in the Middle East where it is forbidden in some countries (Saudi Arabia, Iran, and Libya) and consumed minimally in the other countries due to religious and cultural beliefs. This discrepancy may be explained by differences between one country to another, in the strictness of laws governing the sale and consumption of alcohol which may be effective in preventing alcohol-related injuries (Table 7).

Site, Nature, and Pattern of Fractures

Mandible was the most common site of fracture followed by mid-face. Various studies have supported this result.^{1,14} This preponderance could be because the mandible is the most prominent and only moveable facial bone, and hence has a greater chance of being fractured than the well-articulated mid-facial bones.

In this study, also mandibular fractures (27.9%) were the major one; particularly para-symphysis (37.6%) was the most common site followed by the condyle area (27.3%) similar to other studies.^{2,7,20} The most common combination of fracture in this study was parasymphysis with sub condyle accounting for 2.4%, probably due to the horizontally directed impact to parasymphysis resulting fracture at the site of impact. This axial force of impact against parasymphysis proceeded along the mandibular body to the cranial base through the condyle leading to the concentration of the tensile strain at the condylar neck, hence resulting in its fracture. In this study, symphysis (11.6%), angle (10.3%), body (7.6%), ramus (3.2%), and coronoid (2.4%) in descending orders (Table 8 and Graph 7). The primary causes of mandible fractures were RTA and falls. Other significant causes were assault and sports injuries.

Among fractures of the mid-facial region, ZMC fracture (24.2%) was the most common site of the fracture, similar results were also reported by other studies.^{4,5,11,12,15} Followed by dento-alveolar (16.1%), orbit (8.7%), frontal (5.5%), nasal (4.9%), zygomatic arch alone (4.9%), Le Fort I (3.7%), II (2.3%), III (1.1%), and NOE (0.7%). Orbital fracture was third most common site of fracture in the present study, similar report were obtained in other studies.³

Associated Injuries

Head injury (72.9%) accounted for the greater majority of associated injuries followed by lower limb fracture (10.6%),

upper limb fracture (5.7%) cervical spine injury (4.7%) chest and abdominal injury (4.2%), and pelvic fracture (2.0%) (Table 10).

CONCLUSION

Since RTAs continue to be the leading cause for the maxillofacial injury with increased predominance in male population, certain criteria are need to be followed such as public awareness about RTAs and importance of road traffic legislation, legal prohibition of drunk and driving, usage of cell phone while driving, incorporation of safety factors such as seat belt, helmet should be recommended compulsorily to reduce the incidence of maxilla-facial injuries.

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