# Pattern of Maxillofacial Trauma in the Nigerian Population

**Badmos B, Kolawole F, Omo Lawal A, Oni I, Oso O, Salawudeen A, Talabi O.**
Faculty of Dentistry, College of Medicine, University of Ibadan, Ibadan

**Correspondence: Badmos B**
Email: badmosb@gmail.com

**Abstract**

**Introduction:** The pattern of trauma to the maxillofacial region differs in various parts of the world. Studies have shown that not only does it differ from one continent to the other, it differs from one country to another within the same continent and from one zone to another within the same country. These have been ascribed to the prevailing socioeconomic, cultural and environmental factors in the study area. It is important that patterns of maxillofacial injuries should be continuously evaluated so that efforts should be put in place to reduce the incidence. The aim of the present study is therefore to describe the patterns of maxillofacial injuries in the Nigerian literature.

**Methods:** The MEDLINE was used to conduct a computerized literature search using for publications on maxillofacial trauma in Nigeria. For this search, the medical subject headings on "maxillofacial fractures" or "mandible fractures" or "middle-third fractures" or "facial fractures" or "zygoma fractures" were combined with "Nigeria". Also, the publications cited in these articles to look for additional important articles but were not found on MEDLINE were searched for.

**Results:** Most of the studies were retrospective while the commonest geopolitical zone where studies were done was the South West region. The commonest cause of maxillofacial injuries was road traffic accident while the commonest age group was the 21-30 years.

**Conclusion:** Road traffic accident is the commonest cause of maxillofacial injuries. It is therefore recommended that the appropriate authorities should enforce seat belt and helmet laws. The government should provide street lights, good roads, pedestrian bridges and traffic lights to reduce vehicular/vehicular and human/vehicular/human collisions.

**Keywords: Maxillofacial, Trauma, Nigerian, Population**

## Introduction

Maxillofacial trauma can involve the soft and hard tissues of the face[1,2,3,4]. Maxillofacial trauma can occur in isolation or in conjunction with trauma to other parts of the body. When these associated injuries occur they may be of genuinely serious and life threatening nature Maxillofacial injuries can vary from a small laceration on the lip to a facial fracture to severe combination of the bones of the skull, which if not effectively treated could lead to death[5,6,7,8]. Maxillofacial factures are not uncommon and can be due to a variety of causes. These causes include road traffic accidents, assaults, falls, sports, gunshot injuries and industrial accidents[9,10,11,12,13]. In the past, road traffic accidents were the commonest cause of maxillofacial fractures in the developed countries[14,15,16,17,18]. However, enforcement of laws prohibiting drunk driving, speed limit and seat belt laws have reduced the road traffic accidents as a leading cause of maxillofacial fractures in these countries[19,20,21,22,23]. In the developing countries, socio-economic conditions such as poor roads, careless drivers, poor state of vehicles, inadequate enforcement of road traffic regulations, speed limit and seat belt laws have been found to be responsible for the predominance of road traffic accidents as being the commonest cause of maxillofacial fractures [24,25,26,27].

Trauma is as ancient as surgery[26,28]. Trauma has been defined as an injury to the tissues characterized by structural changes and resulting from acute exposure to mechanical, thermal, electrical, chemical or radiant energy[29]. Trauma is the leading cause of all visits to the physician and the fourth leading cause of death[30]. Trauma remains a major health burden worldwide despite the various preventive measures that have been developed. The major burden of trauma estimated at about 90% is borne by middle and low-income countries. Trauma affects people of all ages[31]. Trauma does not discriminate on the basis of age, races, gender or socioeconomic status[32]. Trauma is originally thought as a problem of the young urban males. However, due to the increase in the active elderly and female populations, injuries in the elderly and females occur more than ever before. During trauma; the maxillofacial region is highly vulnerable to injury either in isolation or in combination with other systems because of its exposure. Maxillofacial trauma is an injury that involves the maxillofacial region of the human body. The maxillofacial region is an area which extends from the point of chin to the frontal bone[33].

Injuries in this region are accompanied by various degrees of involvement of the overlying soft tissues and proximal structures such as the eyes, nasal airways, paranasal sinuses and the tongue therefore early and exact management are important for these injuries[34]. Injury to the face can cause permanent derangement of function such as vision, smell, taste, mastication and swallowing. Damage to the trigeminal and facial nerves will result in a naesthesia dolora and impaired facial expression respectively. In all societies, the appearance of the face is very important. Minor alterations in the facial appearance after trauma may cause severe psychological effect on the patient[35]. The psychological effects of the facial trauma can persist long after the injury. The low self-esteem generated by the patient's perception of their deformity limits their ability to achieve their full potential in the society. Each time the patients examine the mirror, the disfigurement reminds them of the traumatic effect that led to their injury[36].

The aim of the present study is therefore to present the pattern of maxillofacial injuries as reported from various studies done in Nigeria.

## Methodology

MEDLINE was utilized to search for articles published on maxillofacial trauma in Nigeria. The subject headings on "maxillofacial trauma" or "mandible fractures" or "middle-third fractures" or "facial trauma" or "zygoma fractures" were related to "Nigeria". The papers that were quoted in the articles were scrutinized in order to find out additional papers that were not found on MEDLINE. The publications were meticulously read. The investigators, (BB, KF, OA, OI, OO, SA and TO) performed the literature search and all the authors established the inclusion and exclusion criteria.

Inclusion Criteria

- Complete length publications published before 2019that have all the following relevant information (type of study, the geopolitical location of study, number of patients, target population, the bone mostly affected, the peak age incidence, the male: female ratio, the commonest cause of injury, the second commonest cause of injury, percentage motorcycle related).
- Complete length publications consisting of either prospective and retrospective studies
- Complete length publications consisting of maxillofacial injuries involving all the age groups
- Complete length publications of maxillofacial injuries sustained in civilian and war populations.

Exclusion Criteria

- Articles published before 2019 that did not contain all the following relevant information(type of study, the location of study, number of patients, target population, the bone mostly affected, the peak age incidence, the male; female ratio, the commonest cause of injury, the second commonest cause of injury, percentage motorcycle related)
- Articles that did not include the total population and incomplete text articles that did not report maxillofacial injuries sustained in war situations.
- Articles that were in form of case reports or series

### Data Collection, Entry and Analysis

Data collection was achieved through a data collection form that sought the following information from the articles obtained. The SPSS Statistical Software (Version 23.0) was used for data entry, validation and analysis. The information that were extracted included:

(a) The type of study done (b) Location where the study was done(c) The geopolitical region where the study was conducted(d) The commonest cause of maxillofacial fracture(e) The second commonest cause of maxillofacial fracture(f) The male; female ratio of subjects in the study(f) The type of study

(Retrospective or Prospective)(g) The number of subjects in the study(h) The type of bone mostly involved in the study(i) Peak age incidence of subjects in the study(j) The commonest treatment used to treat subjects in the study.

Descriptive statistics were used to summarize the data collected using frequencies and percentages and the data were presented using tables and graphs where appropriate.

**Results**

Over 101 articles were obtained from MEDLINE search. However, as a result of incomplete information in these articles only twenty-seven publications met the inclusion criteria and the full-texts of these publications were comprehensively inspected.

**Type of Study**

Of the 27 articles reviewed, 19 (70.0%) were retrospective studies, 7 (26.0%) prospective and one (4%) article was a comparative study of a prospective and a retrospective data **(Fig. 1**)

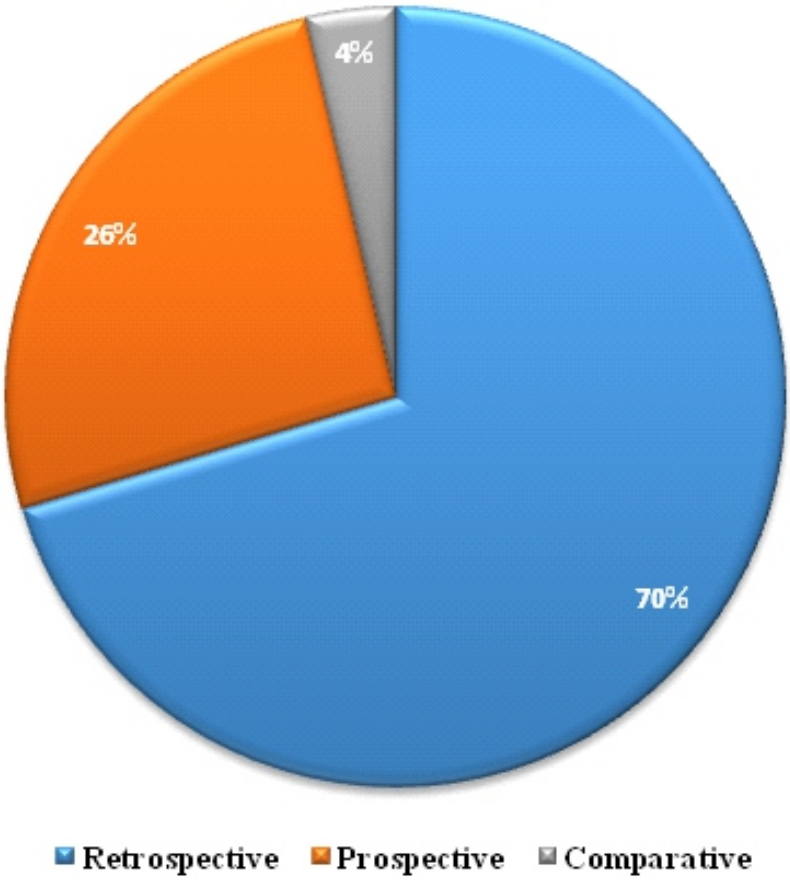


**Fig .1: The type of study conducted in the publications scrutinized**

**Geopolitical region of study**

Studies on the pattern of maxillofacial fractures that met the inclusion criteria were published from different centres of the six geopolitical zones of the country.(Table 1) including: Ibadan, South West (SW) [1, 3,10, 12, 18,20, 24, 25)], Lagos (SW) [6,8, 11,17], Ife (SW) [5,9,15], Ekiti (SW) [22] , Abeokuta (SW) [26] ( 17, 63.0%) , Combination of North (NE, NW and NC) [23] ( 1,4.0% ), Kaduna, North Central (NC) [4,13,16] (3,11.0%), Sokoto, North West (NW) [27] (1, 4.0%), Maiduguri, North East (NE) [7,19] (2, 7.0%) Enugu, South East (SE) [2,] (1, 4.0% ) , Benin City [14] and Port Harcourt, South South (SS) [21] (2, 7.0%).**(Table 1, Fig.2)**

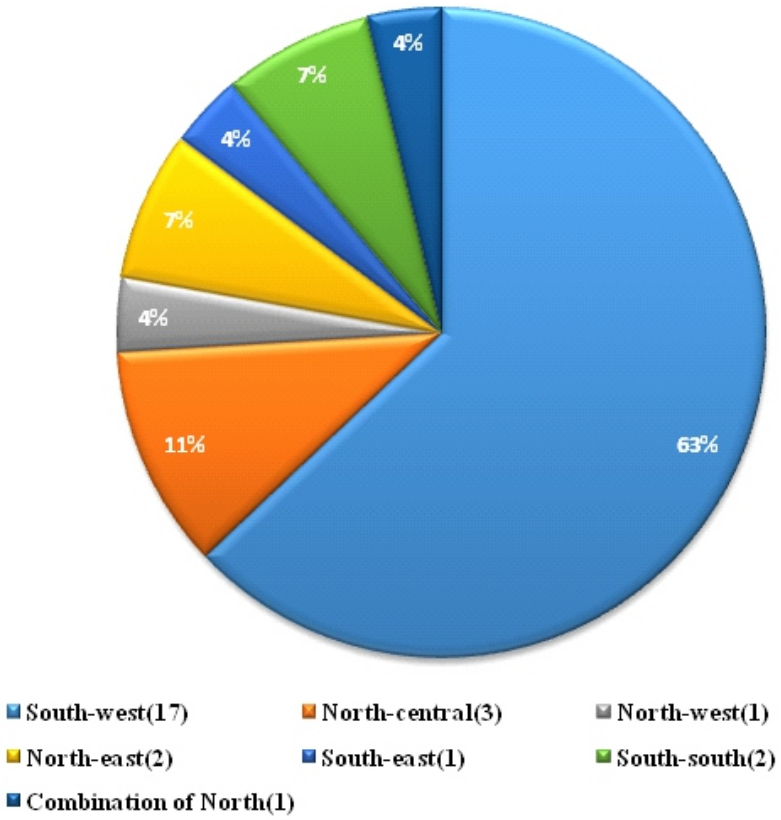


**Fig. 2**:**Geopolitical region of study**

**Commonest Cause of Maxillofacial Injuries**

Road traffic accident was the commonest cause of maxillofacial injuries in 23 (85.0%) articles. This was followed by Assaults (2, 7.0%), gunshot (1, 4.0%) and animal attacks (1, 4.0%)(**Fig. 3).**

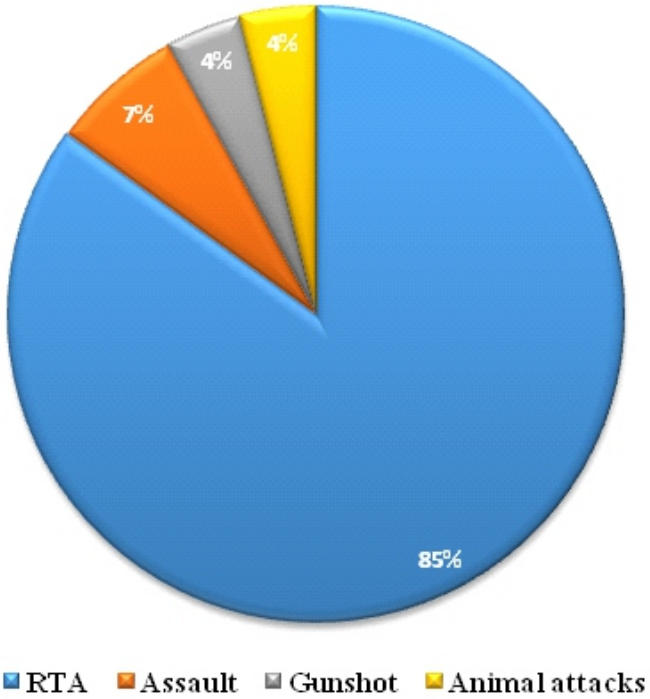


**Fig. 3: Commonest cause of maxillofacial injuries**

**The second most common cause of maxillofacial injuries**

Assault was the second most common cause of maxillofacial injuries in 14 (52.0%) articles. This was followed by falls (8, 29.0%), road traffic accident (4, 15.0%) and gunshot (1, 4.0%). **(Fig. 4)**.

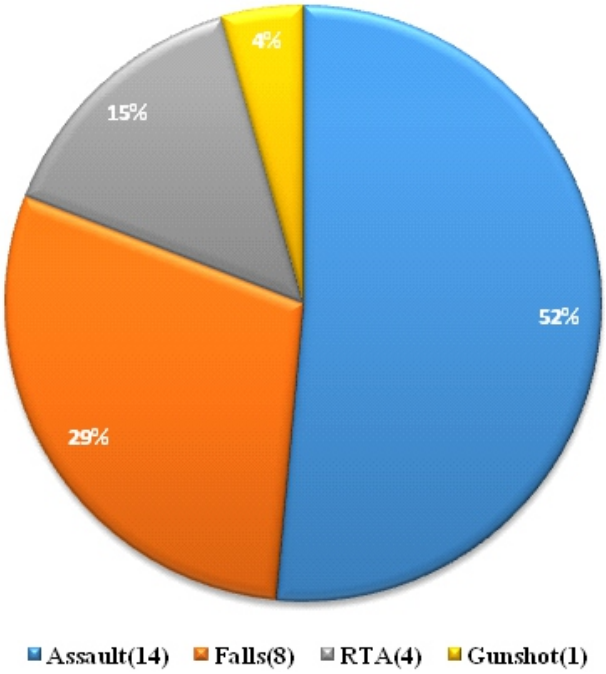


**Fig. 4: The second most common cause of maxillofacial injuries**

**The tissue investigated**

The maxillofacial bone alone was investigated in 16 (67.0%) of the articles while the bone and soft tissues were assessed in 9 (33.0%) of the articles.

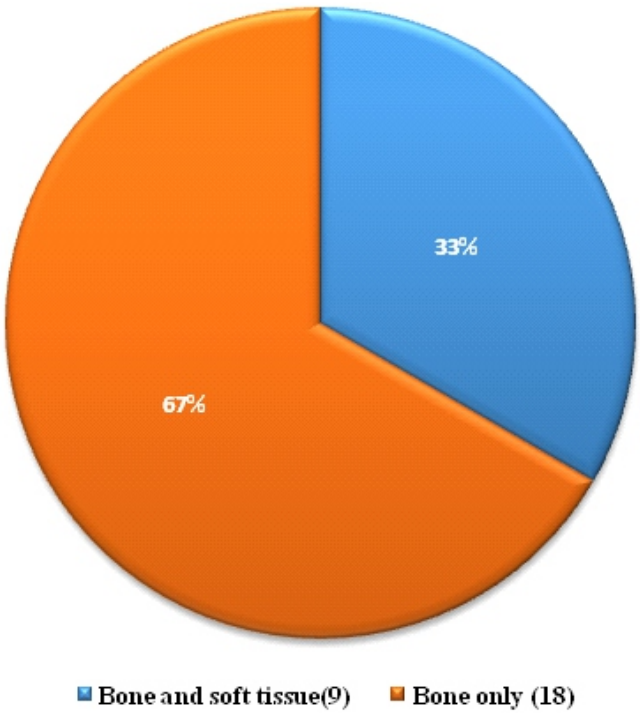


**Fig. 5: The type of tissue investigated in the publications**

**Peak age incidence of subjects in the study**

The peak age of incidence of maxillofacial injuries was 21–30 years in most centers followed by 31–40 years. **(Table 1)**.

Table 1. **AUTHOR' NAMES, LOCATION/GEOPOLITICAL REGION OF STUDY, TYPE OF STUDY, TOTAL NUMBER OF PATIENTS, COMMONEST CAUSE OF FRACTURE, 2ND COMMONEST CAUSE OF FRACTURE AND PEAK AGE INCIDENCE OF SUBJECTS IN 28 PUBLICATIONS ASSESSED.**

| Author (Ref.-No.) | Location/Geopolitical Region of Study | Type of Study | Total number of patients | Commonest cause of fracture | 2nd Commonest cause of fracture | Peak age incidence |
|---|---|---|---|---|---|---|
| Abiose (1) | Ibadan (SW) | Retrospective | 104 | RTA | Assaults | 21-30 |
| Oji (2) | Enugu (SE) | Retrospective | 900 | RTA | Assaults | 21-30 |
| Nyako (3) | Ibadan (SW) | Retrospective | 341 | RTA | Assaults | 21-30 |
| Adekeye (4) | Kaduna (NC) | Prospective | 1447 | RTA | Assaults | 21-30 |
| Ugboko et al (5) | Ife (SW) | Retrospective | 442 | RTA | Falls | 21-30 |
| Akinwande (6) | Lagos (SW) | Prospective | 208 | RTA | Assaults | 21-30 |
| Olasoji et al (7) | Maiduguri (NE) | Retrospective | 105 | Assaults | RTA | 20-29 |
| Arotiba (8) | Lagos (SW) | Prospective | 128 | RTA | Assaults | 20-29 |
| Odusanya (9) | Ife (SW) | Retrospective | 231 | RTA | Falls | 21-30 |
| Ajagbe et al (10) | Ibadan (SW) | Retrospective | 324 | RTA | Falls | 21-30 |
| Arotiba (11) | Lagos (SW) | Prospective | 202 | RTA | Assaults | 20-29 |
| Fasola et al. (12) | Ibadan (SW) | Retrospective | 77 | RTA | Falls | 21-30 |
| Adebayo et al. (13) | Kaduna (NC) | Retrospective | 443 | RTA | Falls | 20-39 |
| Saheeb et al. (14) | Benin (SS) | Retrospective | 250 | RTA | Assaults | 20-30 |
| Oginni et al (15) | Ife (SW) | Retrospective | 311 | RTA | Assaults | 21-30 |
| Ajike et al (16) | Kaduna (NC) | Retrospective | 820 | RTA | Falls | 21-30 |
| Akinwande et al. (17) | Lagos (SW) | Prospective | 35 | Gunshots | RTA | 20-34 |
| Ajagbe et al (18) | Ibadan (SW) | Retrospective | 203 | RTA | Falls | 21-30 |

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|---|---|---|---|---|---|---|
| Olasoji (19) | Maiduguri (NE) | Prospective | 306 | Assaults | RTA | 21-30 |
| Fasola et al. (20) | Ibadan (SW) | Pro/Retrospective | 824 | RTA | Assaults | 21-30 |
| Udeabor (21) | Port Harcourt (SS) | Retrospective | 86 | RTA | Assaults | 21-30 |
| Obimakinde (22) | Ado-Ekiti (SW) | Retrospective | 233 | RTA | Assaults | 21-30 |
| Ugboko et al (23) | North (NE, NW, NC) | Retrospective | 34 | Animal attacks | RTA | 11-30 |
| Fasola et al. (24) | Ibadan (SW) | Prospective | 159 | RTA | Assaults | 21-30 |
| Olusanya et al (25) | Ibadan (SW) | Retrospective | 259 | RTA | Assaults | 21-30 |
| Ogunmuyiwa (26) | Abeokuta (SW) | Retrospective | 70 | RTA | Fall | 21-30 |
| Taiwo et al (27) | Sokoto (NW) | Retrospective | 40 | RTA | Gunshot | 21-30 |

[a](SW) South-west, (SE) South-east (SS) South-south, (NW) North-west, (NE) North-east, (NC) North-central

**Total number of subjects investigated**

Less than 300 subjects were investigated in 17 (62.9%) articles,301 – 600 subjects in 6 (22.2%), 601 – 900 in 3 (11.1%) and more than 900 subjects in one ( 3.7%) article.

**The type of bone mostly fractured in the study**

The mandible was the most frequently involved bone in maxillofacial fractures in all the centers across the country, and the most frequently involved middle-third bone was the zygoma.

**The commonest treatment used to treat subjects in the study**

Closed reduction and dental wiring with arch bars, direct wires and eyelet wires combined with intermaxillary fixation were the most common form of treatment for mandibular fractures. Wire osteosynthesis was employed for open reduction and internal fixation of mandibular fractures in few cases.

**Discussion**

Maxillofacial injuries have been of concern to patients, surgeons and the general populace because the location of these injuries causes emotional and psychological disturbance for the patient. Most of the publications assessed for maxillofacial trauma were mainly retrospective studies. Although the data for retrospective studies are easy to obtain, there are always the challenges of missing data or incorrect data. In order to obtain the true state of maxillofacial trauma, more prospective studies should be encouraged.

Most of the studies on maxillofacial region in the study was done in the South Western geopolitical region of Nigeria. Most of the maxillofacial surgeons are located in this region of the country and majority of these surgeons are lecturers/researchers in the universities. They also practice as Consultants to the teaching hospitals affiliated to these universities. Therefore, it is expected that they would conduct research on trauma to the maxillofacial region.

The commonest cause of maxillofacial injuries was road traffic accident[13,14,15]. Road traffic accidents are still the leading cause of maxillofacial injuries in the developing countries. Poor roads, careless driving, inadequate vehicular maintenance and inadequate enforcement of traffic rules and regulations are some of the factors responsible for this finding[15,16,17]. Also many of the commercial drivers in the cities and towns are uneducated, frequently disobey rules and regulations and do not maintain their vehicles[15,16,17].

Assaults were the second most common cause of maxillofacial injuries in most of the studies. However, in the Northern part of the country, it was the most common cause because of communal clashes and violence between cattle rearers and farmers[7,36]. Cattles frequently eat the crops of farmers which would lead to violence between them. Also, religious and tribal riots are common in this part of the country[7,36].

The maxillofacial bone was more investigated in the studies. This is not surprising because most of the time, the patients would present late and the injuries in the soft tissues would have completely healed. Also, the maxillofacial surgeons usually focus on the bone injuries since the bone forms the skeletal support for the overlying soft tissues.

The peak age of incidence of maxillofacial injuries was 21–30 years in most centers[28,29,30]. This has been attributed to the dominant, outdoor activities of young adults in this age group. It had also been stated that individual in this age group participate in. hazardous exercises[31,32,33] and sports, drive motor vehicles dangerously and carelessly, and are most likely to engage in various forms of violence[34,35,36].

The mandible was the most frequently involved bone in maxillofacial fractures in all the centers across the country. The mandible is the most prominent and mobile bone in the maxillofacial region.

Closed reduction and dental wiring with arch bars, direct wires and eyelet wires combined with inter maxillary fixation were the most common form of treatment for mandibular fractures in this study. This method is still the cheapest method as the cost of bone plates is high and is not within the reach of most of the patients involved in these injuries[37].

**Conclusion**

In this study, road traffic accident was the commonest cause of maxillofacial injuries and most of the patients were in the third decade of life. The mandible was more involved than the mid-facial skeleton and closed reduction and dental wiring was the most common method employed in the study.

It is therefore recommended that the appropriate authorities should enforce seat belt and helmet laws. The government should provide street lights, good roads, pedestrian bridges and traffic lights to reduce vehicular/vehicular and human/vehicular/human collisions.

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