

## Original Article

### An epidemiologic survey of maxillofacial fractures and concomitant injuries in Kaduna, Nigeria

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#### Abstract

**Background:** There is an upward trend in facial injuries following changes in population pattern, increasing industrialization and urbanization, hence maxillofacial trauma is becoming a burden and a leading medical problem in emergency rooms worldwide.

**Method:** A retrospective study of patients with maxillofacial fractures seen and treated at the Oral and Maxillofacial Unit, Ahmadu Bello University Teaching Hospital, Kaduna, Nigeria between January 1993 to January 2003.

Data extracted from the patients' records include aetiology, age, sex, types and sites of fractures, treatment modality and concomitant injuries.

**Results:** There were 820 fractures of the maxillofacial skeleton and 70 concomitant injuries from 543 patients. Road traffic accident (50.8%) was the most common aetiological factor, followed by falls (22.3%) and fights (18.8%). The age range was from 3½ years to 67 years (mean=39.7) with a peak incidence in the 4<sup>th</sup> decade (n=197, 36.3%) with a male–female sex ratio of 3.7:1. The most common location of maxillofacial fractures was the mandible 615(75%) and middle third 205(25%). There were 316(58.2%) isolated mandibular fracture, 124(22.8%) isolated middle third fractures and 65(12%) combined mandibular and middle third fractures. Majority of the patients were treated by closed reduction. Concomitant injuries were 8.5% with orthopaedic injuries accounting for the majority (67.10%).

**Conclusion:** Maxillofacial fractures are on the increase. We advocate the establishment of regionalized trauma centers.

Key words: Maxillofacial, trauma, aetiology, concomitant.

#### Introduction:

The maxillofacial skeleton because of its exposure is vulnerable to injury, thus trauma to this region continues to attract the attention of the maxillofacial surgeons. Because of the upward trend in facial injuries following changes in population pattern, increasing industrialization and urbanization, maxillofacial trauma is becoming a burden and a leading medical problem in emergency rooms worldwide. Considerable mortality in maxillofacial trauma is due to the proximity to the brain and the aero-digestive tract. Also, concomitant injuries may be fatal. The variability in the global incidence of facial fractures is attributed to a variety of factors

such as sex, age, level of industrialisation, socioeconomic status of the patient, geographical location and seasonal variation<sup>1,2</sup>. The management of fractures of the maxillofacial apparatus remains a challenge to the maxillofacial surgeons in the third world as this usually demands a lot of skill and sophisticated westernized equipments for diagnosis and treatment such are frequently lacking in developing economies. Therefore, this paper aims to analyse cases of maxillofacial injuries seen and managed between January 1993 and January 2003 at

the Oral and Maxillofacial Unit, Ahmadu Bello University Teaching Hospital, Kaduna, Nigeria

**Materials and methods:** This retrospective study deals with patients with maxillofacial fractures seen and treated at the Oral and Maxillofacial Unit, Ahmadu Bello University Teaching Hospital, Kaduna, Nigeria between January 1993 to January 2003. Medical records of these patients were reviewed. Data extracted from the patients' records include aetiology, age, sex, types and sites of fractures, treatment modality and concomitant injuries. Anatomic location of mandibular fractures was classified according to Ivy and Curtis<sup>3</sup> system, while maxillary fractures were classified using the Lefort<sup>4,5,6</sup> system. Concomitant injuries were categorized into orthopedic, cranio-cerebral, pulmonary, ocular and abdominal injuries.

### Results:

A total of 820 fractures of the maxillofacial skeleton and 70 concomitant injuries from 543 patients were encountered during the period under review. Road traffic accident (50.8%) was the most common causative factor, followed by falls (22.3%) and fights (18.8%) (Table 1). The age range was from 3½ years to 67 years (mean=39.7) with a peak incidence in the 4<sup>th</sup> decade (n=197, 36.3%) (Table 2). The male predilection was 78.9%, with a male-female sex ratio of 3.7:1. Males were frequently more involved irrespective of the age. Three hundred and sixteen (58.2%) of the patients had isolated mandibular fractures, 124 (22.8%) had isolated middle third fractures, and 65(12%) had combined middle third and mandibular fractures. Associated injuries were recorded in 70(12.9%) of the patients.

Table 1 Aetiology of maxillofacial fractures

Aetiology	No	(%)
Road traffic accidents	276	(50.8)
Falls	121	(22.3)
Fights and assaults	102	(18.8)
Industrial accidents	15	2.8)
Sport	20	(3.7)
Road traffic Acc	276	50.8)
Falls	121	(22.3)
Fights and assaults	102	(18.8)
Animal-related	95	(1.6)
Total	43	(100)

Table 2 Age and sex

Age (years)	Sex		Total/ (%)
	M	F	
0-10	9	4	13 (2.4)
11-20	45	17	62(11.4)
21-30	123	25	148(27.3)
31-40	157	40	197(36.3)
41-50	64	22	86(15.8)
51-60	19	4	23(4.2)
61-70	11	3	14(2.6)
Total	428	115	543(100)

Table 3 Anatomic distribution of mandibular fractures.

Location	No of fractures / (%)
Symphysis	56 (9.1)
Body	164 (26.7)
Angle	145 (23.6)
Condyle	40 (6.5)
Ramus	121 (19.6)
Dento-alveolar	89 (14.5)
Total	615 (100)
Types	
Unilateral	380 (61.8)
Bilateral	137(22.3)
Multiple	98(15.9)
Total	615(100)

Table 4 Middle-1/3 fractures

Site	No. / (%)
Dento-alveolar	11(5.4)
Lefort I	22(10.7)
Lefort II	54(26.3)
Lefort III	8(3.9)
Zygomatic	86 (42.0)
Fronto-naso-ethmoidal	18(8.7)
Palatal split	6(3.0)
Total	205 (100)

Table 5. Other injuries with maxillofacial fractures

Type of injury	No of patients/ (%)
Cranio-Cerebral	11 (15.7)
Orthopaedic	
Limb fracture	41 (58.6)
Pelvic fracture	4 (5.7)
Clavicular fracture	2 (2.9)
Pulmonary Injury	6 (8.6)
Ocular Injury	4 (5.7)
Abdominal Injury	4 (5.7)
Total	70(100)

There were 615 (75%) mandibular fractures and 205 (25%) middle third fractures. With regards to mandibular fractures, the body (26.7%) was the commonest sites, followed by the angle (23.6%), ramus (19.6%), dentoalveolar (14.5%), symphysis (9.1%), condyle (6.5%) while in the middle third, the zygomatic bone (42%) was the most common, followed by Lefort II (26.3), Lefort I (10.7%), frontonasomethmoidal (8.7%), dentoalveolar (5.4%), Lefort III (3.9%) and palatal split (3.0%) (Tables 3 and 4). Concomitant injuries with maxillofacial fractures was 8.5% with orthopaedic injuries accounting for majority (67.10%) (Table 5). Treatment modalities of mandibular fractures were by closed reduction (86.2%) and transosseous wiring (13.8%) (Table 6). Table 7 shows the treatment modalities of the middle third of the facial skeleton.

#### Discussion:

In this study an incidence of 543 patients with 820 maxillofacial fractures gave a fracture patient ratio of 1.5:1 which conformed with reported incidence in other countries<sup>7,8,9</sup>. The report of 563 patients with 756 maxillofacial fractures by Batainah<sup>8</sup> is in close agreement with our study. An annual incidence of 53 patients in this study is in close agreement with other previous Nigerian studies<sup>9,10,11,12</sup> whose incidence ranged from 23 to 52. In our study the mandibular bone was involved in 75% and the maxilla in 25% in contrast with other studies that have recorded between 36 % to 89 %<sup>7,8,13</sup> respectively. Sojat<sup>1</sup> attributed the worldwide variability in the incidence of maxillofacial fractures to factors such as sex, age, environment, socioeconomic status of the patient and mechanism of injury. Ever since the report of RTA fatality on 17<sup>th</sup> August, 1896 there has been an upward trend in RTA as a cause of mortality and morbidity. RTA remains the leading cause of facial fractures particularly in the developing countries accounting for between 56%-80.77%<sup>9,11,12,13,14,15</sup>. In the developed world where assaults, alcohol/drug abuse and interpersonal violence accounts for more cases (40%-68.09%) than RTA<sup>1,16,17,18,19,20, 21</sup>. The increasing use of auto-bikes

as a mode of commercial transport account for the increase in RTA rates in Nigeria. Furthermore there is the absence of safety driving mechanisms (seat belts, airbags and enforcement of traffic regulations, wearing of crash helmets) in many developing countries. Van Beek and merckx<sup>20</sup> emphasized the benefits of these measures. The 2002 world health report documented 1.18 million mortality and 20 to 50 million morbidity following RTA<sup>20</sup>. The Global Burden of disease index for Africa predicts an upward movement of mortality due to RTA from the 9<sup>th</sup> position in 1990 to the 3<sup>rd</sup> position in 2020<sup>19</sup>. This is a pointer towards an epidemic of road traffic accidents in the developing countries such as Nigeria if urgent legislation towards the provision and enforcement of safety mechanisms are not put in place. Because of the repeated ethnic militia clashes in Nigeria and the vulnerable position of the face it was expected that the interpersonal violence would account for more cases of maxillofacial fractures but this was not the case. This may be due to such cases reporting to peripheral centers due to their minor nature or some with polytraumas do not survive the journey to care centers or the cumbersome legal system which discourages the victims. Our findings of highest frequency of facial fractures in the 3<sup>rd</sup> and 4<sup>th</sup> decades of life are in agreement with those reported elsewhere<sup>22,23</sup>. This is easily attributed to the fact that is the most active phase of life. The low incidence in the 1<sup>st</sup> decade is due to the anatomico-morphologic peculiarities of the infantile bone, the small body size in proportion to the head, high bone to tooth ratio, low social and outdoor activities and parental guidance and supervision<sup>24, 25, 26, 27, 28, 29</sup>. In line with the global picture<sup>9, 11,18,21,23,30</sup> the male population are predominantly affected by maxillofacial trauma. From this study the maxillofacial fractures occur approximately four times as often in males as in females. In most male dominated communities, such as Nigeria and Saudi Arabia their greater involvement in socio-economic activities results in their exposure to the aetiologic factors of facial trauma especially RTA. There is a considerable variation in the rate of injuries concomitant with maxillofacial fractures ranging from 12 % to 22.2%<sup>10,12,13,20,21</sup>. This is because there are no standard definitions of such injuries accepted worldwide. While reports from developing world have recorded orthopaedic<sup>10,12,13</sup> injuries as the most frequent, reports from the developed world have favoured cranial injuries<sup>20,30, 31</sup>. In this study, 8.5% of maxillofacial fracture cases had concomitant injuries with orthopaedic cases as the majority (67.1%). These differences reflect the predominant means of transportation in the population and the level of medical care for maxillofacial trauma. In our environment, most of the cranio-cerebral injured victims die on the way to treatment centres because of poor pre-hospital management

The management of fractures of the maxillofacial apparatus remains a challenge to trauma surgeons in general and the oral and maxillofacial surgeons in particular. It usually demands the skills of various other practitioners in the hospital to achieve an optimum result. Despite the advantages of open reduction and internal fixation (ORIF) which negates the use of intermaxillary fixation<sup>32,33,34</sup>, only 13.8% of mandibular transosseous wiring was done in our study. The remaining cases had various types of closed reduction with intermaxillary fixation with satisfactory results. Previous results<sup>10,12</sup> from developing countries attest to the satisfactory results obtained from closed reduction of jaw fractures and the low rate of complications. Most authors from this environment usually employ closed manipulation as the mode of treatment because of the cost of open reduction and the armamentarium involved are beyond the financial reach of the patients and the surgeons involved in their care.

### Conclusion:

This study shows that fractures of the facial skeleton while not restricted to any age or sex shows a bias for occurrence in the young adult male between ages 20-40 years. Any facial bone can be fractured but in our environment, mandibular fractures are predominant with RTA as the main cause. The high frequency of maxillofacial fractures due to RTA in our population highlights the need for the enforcement of seat belt regulations and the wearing of safety helmets by motorcyclists. Also there is the need for repair of bad roads and the resuscitation of the rail transport system as an alternative to road transport for man and goods. In view of the avoidable morbidity and mortality due to inadequate treatment, we advocate the establishment of regionalized, efficient, and focused trauma centers in various parts of the country particularly for acute trauma.

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