

# Mid-facial Fractures: a 5-year Retrospective Review in a Nigerian Teaching Hospital

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## SUMMARY

**OBJECTIVE:** The aim of this study is to establish the pattern and aetiology of mid-facial fractures, of patients seen and treated at the Lagos University Teaching Hospital, Lagos, Nigeria over a 5-year period.

**MATERIALS AND METHODS:** All cases of mid-facial fractures diagnosed and treated at the Department of Oral and Maxillofacial Surgery, Lagos University Teaching Hospital (LUTH), Lagos between January 2004 and December 2008 were reviewed. Data collected from case records of patients included age, sex, aetiology of fracture, anatomic site of fracture, associated maxillofacial fracture, types of treatment and postoperative complications.

**RESULTS:** The leading cause of mid-facial fractures was road traffic crashes (RTC) which occurred in 93% of cases, followed by falls (3.8%) and gunshot (2.6%). The highest incidence of mid-facial fractures (36.5%) occurred in the age group of 21-30 years and the lowest in the age group of 60 years and above (2.6%); with male preponderance in nearly all age groups. Female patients were significantly younger than their male counterparts ( $P=0.000$ ). The most common site of mid-facial bone fractures was the zygomatic complex ( $n=89$ , 44.5%), followed by dento-alveolar ( $n=26$ , 13%), and Le fort II ( $n=23$ , 12%). Conservative management of the fractures was employed in 2.6% ( $n=4$ ) of the cases while 97.4% ( $n=152$ ) of the patients required surgical intervention.

**CONCLUSIONS:** Mid-facial fractures were most common in the 3rd decade of life; with a male-to-female ratio of 3.7: 1. Over 93% of the cases were due to road traffic crashes. Zygomatic complex was the most commonly fractured site. The fact that road traffic crashes still remain the major cause of mid-facial fracture in the studied environment is an indication that the enforcement of legislation to prevent road traffic crashes needs to be re-emphasised.

**KEYWORDS:** Mid-facial fractures; Lagos; Nigeria

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## INTRODUCTION

The mid-facial skeleton is an area bounded superiorly by a line drawn along axial plane, across the skull from the frontozygomatic suture across the frontonasal and frontomaxillary sutures to the frontozygomatic suture on the opposite side, and inferiorly by the occlusal plane

of the upper teeth, or if the patient is edentulous, by the upper alveolar ridge.<sup>1</sup> The mid-facial skeleton is made up of a number of bones which are rarely fractured in isolation<sup>1</sup>. Mid-facial fractures are less common than fractures of the mandible.<sup>1,2</sup> Nahum<sup>3</sup> conducted an experiment and found out that fractures of the mid-facial bones occurred with forces between one-fifth and one-third of those required to produce simple fracture of the mandible.

A clearer understanding of the demographic patterns of mid-facial fractures has been reported to assist providers of health care as they plan the treatment of maxillofacial injuries.<sup>4</sup> An understanding of the cause, severity, and temporal distribution of maxillofacial trauma could assist in establishing clinical and research priorities for effective treatment and prevention of these injuries.<sup>4</sup> Such epidemiological information on maxillofacial trauma is reported to be used as a guide to the future funding of public health programmes geared towards prevention of such injuries.<sup>5,6</sup>

Worldwide, as well as in Nigeria, fractures of the middle third of the facial skeleton are reported to be relatively uncommon in comparison with fractures of the mandible.<sup>7-14</sup> Fashola et al<sup>8</sup> reported that mid-facial fractures constituted 21.3% of all maxillofacial fractures seen over a 5-year period in Ibadan. Ugboko et al<sup>7</sup> also reported that about 36% of all maxillofacial fractures seen and treated at Ile-Ife between 1982 and 1995 involved the mid-facial skeleton. In Lagos, Arotiba reported that 36.2% of all maxillofacial fractures seen involved the mid-facial skeleton.<sup>12</sup> Although, less common than mandibular fractures, fractures involving the mid-facial skeleton are of particular clinical importance because of the closeness of the region to the skull, brain, nasal airway, orbit and paranasal sinuses.<sup>1</sup>

Previous studies have consistently reported road traffic crashes (RTC) as the major cause of mid-facial fractures in Nigeria, and legislation at preventing road traffic crashes have been recommended.<sup>7-12</sup> About 79% of mid-facial fractures seen in Ibadan, Nigeria were due to RTC,<sup>8</sup> and also, RTC was responsible for 74.2% of zygomatic complex fracture in a suburban Nigerian population.<sup>10</sup> In contrast, reports from developed countries show that assaults/interpersonal violence are the major cause of maxillofacial fractures.<sup>13,14</sup>

Records of patients seen and treated at our centre were

reviewed to identify any changes in pattern and aetiology of mid-facial fractures in comparison with previous studies in Nigeria.

The aims of this study, therefore, are to establish the pattern and aetiology of mid-facial fractures of patients seen and treated at the Department of Oral and Maxillofacial Surgery, Lagos University Teaching Hospital, Nigeria between January 2004 and December 2008.

## MATERIALS AND METHODS

All cases of mid-facial fractures diagnosed and treated at the Department of Oral and Maxillofacial Surgery, Lagos University Teaching Hospital (LUTH), Lagos, between January 2004 and December 2008 were reviewed. Data collected from patients record included age, sex, aetiology of fracture, anatomic site of fracture, associated maxillofacial fracture, types of treatment and postoperative complications. In all cases, anatomic site of fracture and associated maxillofacial fractures were extracted from clinical and radiological findings (plain radiographs and computed tomographic scan) in the case records.

Data was analysed using the SPSS for Windows (version 12.0; SPSS Inc, Chicago, IL) statistical software package; and presented in descriptive and tabular forms.

## RESULTS

A total of 156 patients (Male=123; Female=33) who sustained mid-facial fractures with or without other facial fractures were analyzed. The mean age ( $\pm$ SD) of patients was 31.5 ( $\pm$ 12.4) years (range, 2-77 years). The highest incidence of mid-facial fractures (36.5%) occurred in the age group of 21-30 years and the lowest in patients above 60 years; with male preponderance in nearly all age groups (Table i). Female patients (mean  $\pm$ SD = 27.7  $\pm$  17.4 years) were significantly younger than their male counterparts (mean  $\pm$ SD 32.5  $\pm$  10.6 years) ( $P=0.000$ ). The male-to-female ratio was 3.7: 1.

Table i

Age group (years)	Sex distribution		Total (%)
	Male	Female	
0-10	2	6	8 (5.1)
11-20	10	6	16 (10.3)
21-30	49	8	57 (36.5)
31-40	36	6	42 (26.9)
41-50	20	4	24 (15.4)
51-60	3	2	5 (3.2)
61-70	3	0	3 (2.0)
71-77	0	1	1 (0.6)
Total	123	33	156 (100)

The leading cause of mid-facial fractures was road traffic crashes (RTC) which occurred in 145 cases (93%), followed by falls ( $n=6$ ; 3.8%) and gunshot ( $n=4$ ; 2.6%). A 44-year old female sustained an assault-related isolated orbital blowout fracture with herniation of globe

into the antrum (Figures 1 and 2). Table ii shows the aetiology of mid-facial fractures according to age group of patients. RTC were the leading cause in all age groups, except in first decade of life where half of the cases was due to falls.

Table ii

Age group (years)	Aetiology				
	Road crashes	Assault	Gunshot	Falls	Total (%)
0-10	4	0	0	4	8 (5.1)
11-20	15	0	0	1	16 (10.3)
21-30	56	0	1	0	57 (36.5)
31-40	39	0	3	0	42 (26.9)
41-50	22	1	0	1	24 (15.4)
51-60	5	0	0	0	5 (3.2)
61-70	3	0	0	0	3 (2.0)
71-77	1	0	0	0	1 (0.6)
Total	145	1	4	6	156 (100)

There were a total of 200 fractures. The most common site of mid-facial bone fractures was the zygomatic complex ( $n=89$ ; 44.5%), followed by dento-alveolar ( $n=26$ ; 13%), Le fort II ( $n=24$ ; 12%) and Le fort I ( $n=23$ ; 11.5%) (Table iii). Five patients (2.5%) sustained palatal split. Isolated mid-facial fractures occurred in 104 (66.7%) patients, and in 52 (33.3%) patients there were associated mandibular bone fractures. Of the 156 patients, 114 (73%) had a single mid-facial bone fracture, while 42 (27%) patients had more than one mid-facial bone fractures.

Table iii

Type of Fractures	Frequency (%)
Zygomatic complex	89 (44.5)
Isolated zygomatic arch	6 (3.0)
Lefort I	23 (11.5)
Lefort II	24 (12.0)
Lefort III	5 (2.5)
Nasal complex	21 (10.5)
Dentoalveolar	26 (13.0)
Palatal split	5 (2.5)
Isolated orbital blowout fracture	1 (0.5)
Total	200 (100)

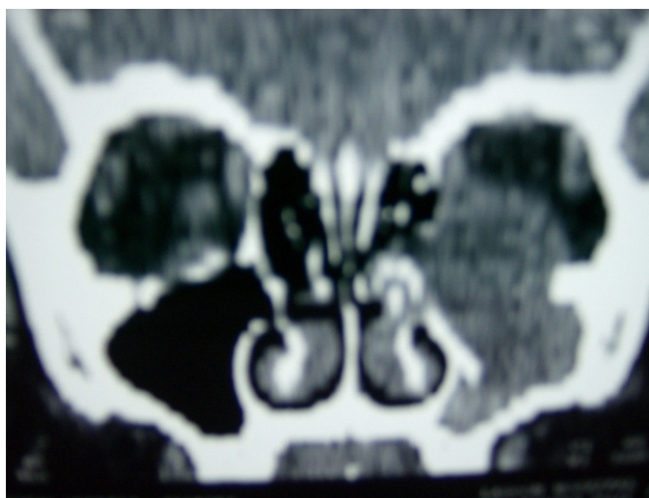
Conservative management of the fractures was employed in 4 patients (3 un-displaced zygomatic complex fractures, and 1 palatal split) while 152 patients required surgical intervention. Zygomatic complex fractures were managed by: Gillies approach, upper buccal sulcus approach, or elevation with Poswillo zygomatic bone hook. Le fort I, II, and III fractures were managed by internal wire suspension within the tissues (circum-zygomatic, fronto-mandibular or fronto-zygomatic wiring) and frontozygomatic wiring. Nasal

fractures were elevated with Walsham and Asch forceps and immobilized with plaster of Paris for 1-2 weeks. Dento-alveolar fractures were manually reduced and immobilized with arch bars and wires. Palatal fractures were either managed conservatively in isolated case (1 patient) or reduced and immobilized in 4 patients who sustained other fractures.

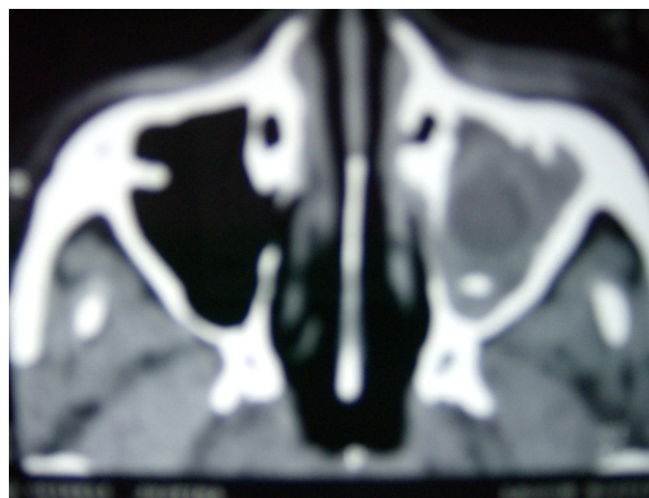
The isolated orbital blowout fracture was approached through a combination of trans-antral and infra-orbital approaches. The globe was gently reduced into the orbit and the orbital floor was reconstructed with a titanium mesh.

In 140 patients (90%), healing of fractures was considered satisfactory with no complication. Postoperative complications were recorded in 16 patients (10%): (malocclusion=6; paraesthesia=3; enophthalmous=2; oro-antral fistula=2; limited mouth opening=2 loss of vision=1).

**Figure 1: Coronal computed tomography scan of a 44-year-old female with an extensive orbital blowout fracture and herniation of orbital content into the left antrum**



**Figure 2: Axial computed tomography scan of the patient in Fig. 1 showing the shadow of the left globe in the antrum**



## DISCUSSION

Differences between populations regarding the aetiology of maxillofacial fractures have been reported to be due to risk factors and cultural differences between countries.<sup>15</sup> Previous studies carried out in Nigeria suggested that RTC occurred largely through recklessness and negligence of the driver, poor maintenance of vehicles, often driving under the influence of alcohol or drugs and complete disregard of traffic rules.<sup>7</sup> In vehicular accidents, the maxillofacial area is the most frequently injured body region,<sup>16</sup> and between 20-60% of all individuals involved in automobile collisions have some level of facial fractures.<sup>17</sup>

In the present study, road traffic crashes were responsible for the majority (93%) of mid-facial fractures in almost all age groups. This is consistent with findings in many developing nations where traffic crashes remain the most common cause of maxillofacial fractures,<sup>8,18</sup> but contrasts reports from developed countries<sup>13,14</sup> where assaults/interpersonal violence are the commonest cause of injury. RTC were responsible for 81.6% and 74.2% of cases of zygomatic complex fractures reported by Fasola et al<sup>9</sup> and Ugboko et al<sup>10</sup> respectively.

Half of the cases of mid-facial fractures in children 10 years and below were due to falls. Falls have been reported as a frequent cause of maxillofacial injuries in children.<sup>19</sup> Hall<sup>19</sup> reported falls and play accidents to be the most common cause of facial fractures in children.

The findings of the present study is in agreement with previous reports<sup>8,9,11,15</sup> on mid-facial fractures, particularly regarding age and sex of patients. The highest incidence of mid-facial fractures in the present study was in the age group of 21-30 years and in males. This is in agreement with many reports in the literature.<sup>8-10,15</sup> This has been explained on the basis that men in this age group drive vehicles carelessly, take part in dangerous activities and are most likely to be involved in violence.<sup>20</sup> Children less than 10 years and adults aged 60 years and above were least frequently involved with mid-facial fractures in the present study. This is consistent with previous reports on mid-facial fractures.<sup>8-10,21</sup> Mid-facial fractures are universally less frequent in children than in adults.<sup>8</sup> Reasons for this are reported to be elasticity of facial bones and the infrequent exposure of children to violence and road traffic crashes.<sup>22</sup> The low incidence of mid-facial fractures (2.6%) in the elderly in the present series might be due to less involvement of the elderly population in active commercial outdoor activities as reported in earlier study.<sup>21</sup> Fasola et al<sup>21</sup> reported that patients above 60 years constituted only 3.1% of cases of maxillofacial fractures treated at the University College Hospital

between 1984 and 1998.

About 27% of patients in this series sustained injuries to more than one mid-facial bone. The mid-facial skeleton is made up of a considerable number of bones which are closely related; and are rarely, if ever, fractured in isolation.<sup>1</sup>

In this series, the most common site of fractures was the zygomatic complex. The prominence of zygomatic complex and multiple articulations with other bones of the facial skeleton is reported to render zygomatic complex vulnerable to fracture when injuries affect the facial region.<sup>10</sup> Zygomatic complex has been widely reported as the most frequently fractured mid-facial bone.<sup>8,13,18,23</sup> However, others have reported nasal complex as the most frequently fractured mid-facial bone.<sup>16,24,25</sup> Dento-alveolar fractures ranked second to the zygomatic complex fractures in the present study. Traumatic dentoalveolar injuries are frequent accidents that typically involve teeth in the anterior maxillary/mandibular segment.<sup>13</sup> Dento-alveolar fracture was reported as the most common fractures by Gassner et al.<sup>13</sup> in their series on cranio-maxillofacial trauma.

About 2.6% of patients in this series were managed conservatively. Maxillofacial skeleton is hardly a load bearing region, and un-displaced/minimally displaced fractures can be managed conservatively.<sup>26</sup> Back and his colleagues<sup>26</sup> developed a set of criteria for the conservative management of maxillofacial fractures in their practice. These include un-displaced fracture, minimally displaced fracture, asymptomatic/minimal symptoms fracture, as well cases of treatment refusal and in medically unfit patients. It is also reported that not all mid-facial fractures need active fixation following reduction. Most simple nasal fractures and a number of zygomatic complex fractures are stable and do not need further surgical intervention.<sup>1,10,26,27</sup> Paludetti et al<sup>27</sup> reported that 12% of mid-facial fractures in their series were treated conservatively due to the absence of functional or aesthetic deficits at presentation.

Various close and open reduction procedures are available as treatment options for zygomatic complex fractures and other mid-facial fractures. However, the choice of technique depends on the clinician's evaluation of the fracture, experience and preference as well as availability of equipments and facilities.<sup>10</sup> In the present study, mid-facial fractures were treated mostly with older treatment modalities (dental wiring and internal wire suspension). These methods are now considered obsolete in most developed countries of the world. Rather, the preferred method of treatment for most mid-facial fractures involves open reduction and internal fixation using titanium plates and screws.<sup>1,28,29</sup>

However, most of our patients did well with these traditional methods (simple and cheap), despite the unavailability of open reduction and internal fixation technique. Many reports from developing countries have also attested to the satisfactory results obtained using traditional techniques.<sup>6,7-11</sup> Although, it has been previously reported that the skill and full compliment of equipments and materials for plate and screw osteosynthesis is not readily available in our environment due to high cost,<sup>10,11</sup> this mode of treatment is gradually becoming popular in our environment, especially for the treatment of mandibular fractures.<sup>6</sup>

## CONCLUSIONS

Mid-facial fractures were most common in the 3rd decade of life; with a male-to-female ratio of 3.7: 1. Over 93% of the cases were due to road traffic crashes. Road traffic crashes were the leading cause of mid-facial fractures in nearly all age groups. The most common site of fracture was zygomatic complex, followed by dentoalveolar segment. The fact that road traffic crashes still remain the major cause of mid-facial fracture in the studied environment is an indication that the enforcement of legislation to prevent road traffic crashes needs to be re-emphasised.

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