

Pattern of paediatric maxillofacial fractures in Lagos, Nigeria

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Summary. *Background.* Maxillofacial fractures in children are rare when compared to those occurring in adults.

Aim. To establish the incidence, pattern, and aetiology of maxillofacial fractures in children aged 15 years and below in Lagos, Nigeria.

Design. A review of patients with maxillofacial fractures aged 15 years and below seen and treated at the Lagos University Teaching Hospital, Lagos, Nigeria between January 1997 and December 2004 was conducted.

Results. Of the 225 patients with maxillofacial fractures seen within the study period, 37 (16.4%) were children aged 15 years and below, with a male-to-female ratio of 1.5 : 1. The highest incidence recorded was found within the age group 12–15 years (41%), with the lowest incidence occurring in the age group 0–5 years (27%). Multiple fractures were commoner in older patients ($P > 0.05$), and in boys ($P > 0.05$). There were no statistically significant relationships between the age of the patients, gender distribution, and mechanisms of injury. Road traffic crashes were the most common aetiological factor (64.9%), with the mandible being the most involved facial bone (63.8%). Majority of the mandibular fractures (33.3%) were located in parasymphyseal region. Zygomatic complex fractures were the most common in the mid-facial region. Most of the fractures (81.1%) were immobilized by simple methods (arch bars, eyelet wires, acrylic splint with circum-mandibular wiring) with or without intermaxillary fixation. Of the cases, 18.9% were managed conservatively.

Conclusion. The incidence of facial fractures in this study was found to be higher than previously reported in Nigeria and worldwide, with almost two-thirds of cases a result of road traffic crashes. There is a need to enforce legislation aimed at preventing road traffic crashes to reduce maxillofacial injuries in children.

Introduction

Maxillofacial fractures in children are proportionally rare when compared to those occurring in adults [1–6]. This low incidence has been explained on the basis of child's anatomy and psychosocial factors [1,6]. Social, cultural, and environmental factors vary from one country to another and even within the same country, and these have been reported to influence the incidence and aetiology of maxillofacial trauma [6]. Overall, facial fractures in the paediatric population comprise less than 15% of all facial fractures [2,6]. Haug and Foss [1] in a review of the English literature reported an incidence of 1–14.7% for victims under 16 years of age and 0.87–1% in children below 5 years. Studies carried out in different parts of Nigeria show

incidences varying from 3.5% to 11.6% [2–4,7–9]. Falls, road traffic crashes (RTC), sports-related injuries, assault, and child abuse are the most frequent causes of facial fractures in children [6,10,11].

Although few studies on paediatric maxillofacial fractures from Nigeria are found in medical literature [2–4,7–9], up till now, none has been reported from Lagos, which is the commercial capital and the second most densely populated city in Nigeria [12].

The aim of this study, therefore, is to establish the incidence, pattern, and aetiology of maxillofacial fractures in children aged 15 years and below in Lagos, Nigeria, based on patients seen and treated at the Department of Oral and Maxillofacial Surgery, Lagos University Teaching Hospital, Nigeria between January 1997 and December 2004.

Materials and methods

A review of all radiographically confirmed maxillofacial fractures in children aged 15 years and

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Table 1. Aetiology of fractures in relation to age and sex.

Aetiology of fractures											
Age group (years)	*Vrtc		*Mcrtc		Falls		Assault		Gunshot		Total Number of fractures (%)
	M	F	M	F	M	F	M	F	M	F	
0–5	4	2	0	0	4	0	0	0	0	0	10 (27)
6–11	4	2	0	2	1	2	1	0	0	0	12 (32)
12–15	3	3	2	2	1	1	2	0	0	1	15 (41)
Total	11	7	2	4	6	3	3	0	0	1	37 (100)

Vrtc, vehicle-related road traffic crashes; Mcrtc, motorcycle-related road traffic crashes.

below, seen and treated at the Department of Oral and Maxillofacial Surgery of the Lagos University Teaching Hospital between January 1997 and December 2004 was conducted.

Patients' case notes and radiographs were retrieved to obtain the following data: age, sex, aetiology of fracture, anatomical site of fracture, associated injuries, methods of treatment, treatment outcome, and complications. Mandibular fractures were grouped into condylar, coronoid, ramus, angle, body, parasymphyseal, symphyseal, and dentoalveolar. Middle third fractures were classified into Le Fort types I, II, III; zygomatic complex, isolated zygomatic arch, orbital blow out, split palate, and dentoalveolar. Patients with solitary dental and nasal complex fractures were excluded.

The patients were grouped into three age bands: 0–5, 6–11, and 12–15 years.

Data were analysed using the SPSS for Windows (version 11.5; SPSS Inc., Chicago, IL, USA) statistical software package; and presented in descriptive, tabular, and graphic forms. Chi-squared analysis and Fischer's exact test were used to check for differences between groups, and the critical level of significance was set at $P < 0.05$.

Results

Of the 225 patients with maxillofacial fractures seen within the study period, 37 (16.4%) were children aged 15 years and below, with a total of 47 fractures (an average of 1.3 fractures per patient), and a mean age of 9.1 ± 4.6 years (range 1.3–15 years). The overall male-to-female ratio was 1.5 : 1. Most fractures occurred in the age group 12–15 years (41%) and the least number of fractures (27%) were seen in the age group 0–5 years (Table 1).

Almost two-thirds (64.9%) of the patients sustained fractures from road traffic crashes (RTCs), and this was followed by falls (24.3%), and assault

Table 2. Anatomic site of facial fractures.

Site	Number of fractures (%)
Mandible	30 (63.8)
Le Fort I	0 (0.0)
Le Fort II	4 (8.5)
Le Fort III	0 (0.0)
Zygomatic complex	6 (12.8)
Orbital blow-out	1 (2.1)
Split palate	2 (4.3)
Dentoalveolar (maxilla)	4 (8.5)
Total	47 (100)

(8.1%). A quarter (25%) of road traffic-related injuries was a result of motorcycle accidents. Children aged 5 years and below sustained more facial fractures because of falls in comparison to other age groups. Assault-related injuries occurred only in patients above 5 years of age. The only case of gunshot-related injury recorded was seen in a 13-year-old female patient. There were no statistically significant relationships between the age of the patients ($P = 0.39$), gender distribution ($P = 0.25$), and mechanisms of injury.

The anatomic site of facial fractures is as shown in Table 2 where 63.8% of the fractures were sustained in the mandible, followed by zygomatic complex fractures (12.8%), Le Fort II (8.5%), and dentoalveolar fractures (8.5%) in the maxilla. A third of mandibular fractures (33.3%) occurred in the parasymphyseal region followed by the body (16.7%) and dentoalveolar fractures (16.7%) (Table 3). There were a total of 47 fractures from the 37 patients. Twenty-eight patients sustained single fractures, whereas nine patients had multiple (two or three) fractures. The only case of three facial fractures in a patient was recorded in a 15-year-old boy. Multiple fractures were commoner in patients above 5 years of age ($P > 0.05$) (Table 4) and in boys ($P > 0.05$).

Table 3. Site and relative frequency of mandibular fractures.

Site	Number of fractures (%)
Symphysis	2 (6.7)
Parasymphysis	10 (33.3)
Body	5 (16.7)
Angle	4 (13.3)
Ramus	0 (0.0)
Condyle	4 (13.3)
Coronoid	0 (0.0)
Dentoalveolar	5 (16.7)
Total	30 (100)

Table 4. Single versus multiple fractures in relation to age of patients.

Age group (years)	Number of patients		Total
	Single	Multiple*	
0–5	9	1	10
6–11	8	4	12
12–15	11	4	15
Total	28	9	37

*Male, 7; Female, 2.

 $P > 0.05$.

In most patients (81.1%), simple method of treatment, e.g., arch bars, eyelet wires, continuous loop wiring, acrylic splint, and suspension wires were used to immobilize the fractures after closed reduction. In few cases (18.9%), which included condylar fractures and undisplaced fractures, no active treatment was undertaken, and patients were placed on soft diet, jaw exercise, and randomly observed until bone healing occurred.

Almost half (48.6%) of the patients seen had associated injuries, of which facial lacerations accounted for 55.6% of the cases, followed by fracture of the long bones (22.2%), head injury (11.0%), blindness (5.6%), and facial nerve palsy (5.6%).

Twenty-nine (78.4%) patients were judged to have been satisfactorily treated based on functional and aesthetic restoration. Complications were seen in eight (21.6%) patients. Infection (50%) was the most common complication seen, followed by malocclusion (25%), hypertrophic scar (12.5%), and oro-antral fistula (12.5%). The only case that was complicated by hypertrophic scar was associated with gunshot injury.

Discussion

The pattern of maxillofacial fractures in children is different from that of adults because of unique

features of the paediatric patients. At birth, the ratio between cranial volume and facial volume is approximately 8 : 1. By the completion of growth, this ratio becomes 2.5 : 1 [13]. The retruded position of the face relative to the 'protecting' skull is an important reason for the lower incidence of midface and mandibular fractures and higher incidence of cranial injuries in young children (less than 5 years of age) [14,15]. With increasing age and facial growth, in a downward and forward direction, the midface and the mandible become prominent and the incidence of facial fractures increases, whereas cranial injuries decrease [14].

Facial fractures in children are reported to occur less frequently than in adults and they are more often minimally displaced [16,17]. This is because a thicker layer of adipose tissue covers the more elastic bones, and the suture lines are flexible. In addition, stability is increased by the presence of tooth buds within the jaws and the lack of sinus pneumatization [6,16,17].

Social, cultural, and environmental factors vary from one country to another and even within the same country; and these have been reported to influence the incidence and aetiology of maxillofacial trauma [6]. In children, the incidence and aetiology are also affected by age-related activities. Facial fractures in the paediatric population are reported to be less than 15% of all facial fractures, and they are rare below the age of 5 years (0.6–1.4%); the incidence increasing as children begin school [4,16]. In this study, the incidence of facial fractures was 16.4%. This figure is higher than earlier reports from different parts of Nigeria [2–4,7–9], and worldwide [1,2,6,18–20]. This may be a result of the fact that street trading among children is a common practice in Lagos, Nigeria. Akinwande [21] and Arotiba [22] reported a high prevalence of pedestrians hit by vehicles and motorcycles in Lagos. This is peculiar to the overpopulated city, like Lagos with many highways but few pedestrian foot bridges and zebra crossings. In agreement with previous reports [1,2,4,6,18–20], however, fracture in children aged 5 years and below was rare in comparison to older children in this study.

The incidence of facial fractures increasing with age in our study is in agreement with most reports in the literature [1–4,6–9,23]. This is attributed to increased unsupervised physical activity and sports in this age group [2,6,23]. It also agrees with the suggestion of McGraw and Cole [14] and Posnick

et al. [16] that as the children grow older, maturational changes in their facial anatomy make them more susceptible to orofacial fractures. In addition, children older than 12 years tend to become more independent and involved in more social activities with less parental protection [3,24]; and it is also this same group of children that are involved in street trading in Lagos. Maturational changes in facial anatomy may also explain susceptibility of the older children to multiple fractures in this study.

This study supports earlier studies [1–9,14,16,17,19,23,25] that reported higher incidence of paediatric facial fractures in boys than in girls of all age groups. There were more cases of multiple fractures in boys than in girls in our study. This male preponderance has been attributed to greater and more dangerous physical activities engaged by boys. The tendency towards equal male-to-female ratio was, however, observed in our study in contrast to earlier Nigerian studies [2–4,7–9].

Road traffic crashes were the most common aetiological factors of facial fractures in our study. This confirms earlier reports by Adekeye [2], McGraw and Cole [14], Fasola *et al.* [8,9], and Olasoji *et al.* [7], but differs from observations of other authors [4,26–28] who reported that fall as the most common aetiological factor. Fall was the second most common aetiological factor, and mostly occurred in children < 5 years of age. Although young children are reported to sustain injuries from low-velocity forces (e.g., falls), older children are more likely to be exposed to high-velocity forces (e.g., RTC) [6]. Assaults and interpersonal violence are rare causes of facial fractures in children, and when they occur, are commonly seen in older age groups [6,16,26] as confirmed in our study. Only one case of gunshot injury was seen during the period of our study. Injuries sustained from gunshots in infants and young children may be underreported because of their high mortality from concomitant neurocranial injuries [6]. Child abuse is not an uncommon cause of orofacial injury [29,30]. Naidoo [29] reported 2.3% cases of facial fractures in victims of child abuse, whereas, only orofacial soft-tissue injuries were reported in another group of physically abused children [30]. In this study and other previous Nigerian studies [3,4,7–9], however, no specific case of child abuse was recorded.

The mandible was more involved in facial fractures than the mid-face in this study, confirming

observations of earlier studies [2,4,7,8,14,16,17]. When the facial region is injured, the mandible is more vulnerable than the midface. The relative large size of the mandible and the cranium in children has been suggested as providing protection for the maxilla. The anterior mandible (symphyseal and parasymphyseal) was the commonest site affected in contrast to the condyle and body reported by others [3,7–9,16,28]. Dentoalveolar fractures were less commonly seen than zygomatic fractures in our study in contrast to reports by Gassner *et al.* [31], and Iizuka *et al.* [32]. Le Fort fractures (at all levels) as observed in our study are reported to be less common and are almost never seen before the age of 2 years [6].

Treatment of maxillofacial fractures in children depends on the type and site of fractures as well as the stage of skeletal and dental development [25]. Nondisplaced fractures can be treated by observation, combined with a liquid-to-soft diet, avoidance of physical activities, and analgesics [6,14,16]. This method was used to treat few undisplaced fractures in this study. Immobilization and fixation of displaced fractures can be achieved with maxillo-mandibular fixation, or open reduction and internal fixation [6], or a combination of both techniques. Open reduction and internal fixation is not yet popular in our environment because of technical and financial constraints [3,7,10]. Previous Nigerian reports have, however, attested to the satisfactory results obtained using simple conservative methods (as used in this study) of closed reduction and maxillo-mandibular fixation [3,7,8].

Patients with facial fractures often have concomitant injuries. Associated injuries are reported in 25–75% of children with facial fractures [3,16,33]. These include closed head trauma, neurocranial injuries, extremity fractures, abdominal and thoracic injuries, and soft-tissue lacerations [2,3,6,7]. Almost half (48.6%) of patients seen in this study had associated injury. Facial lacerations were the commonest associated injury recorded in this study in agreement with previous studies [2,3,7].

In conclusion, the results of this study have shown that the incidence of facial fractures in Lagos, Nigeria is higher than previously reported elsewhere, and mainly because of road traffic crashes. There is a need to enforce legislation aimed at preventing road traffic crashes to reduce maxillofacial injuries in children.

What this paper adds

- This paper highlights the increasing incidence of maxillofacial fractures in Nigerian children which may be related to urbanization.
- It also adds to the growing literature on paediatric maxillofacial fractures.

Why this paper is important to paediatric dentists

- It highlights the incidence and pattern of maxillofacial injuries in children which is important for treatment planning.
- It creates awareness on the incidence and pattern of maxillofacial fractures in children and shows the need for preventive measures to be taken.

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