



Research article

Children mandibular fractures: Epidemiological and anatomico-clinical aspects

Koffi Konan Marc^{a,*}, Ouattara Bakary^a, Ory Opokou Alexandre De Misères^b,
Boka Koffi Laurent^a, Brou-Zoglo Annick^a, Yapo Aké Lucien Jonathan^a,
Koffi Affoué Linda Marie Pierre^a, Chapo Ahi Morel^a

^a Department of Stomatology, Maxillofacial and Plastic Surgery of the Face University Hospital of Cocody, Cote d'Ivoire

^b Department of Stomatology, Maxillofacial and Plastic Surgery of the Face University Hospital of Bouaké, Cote d'Ivoire

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ABSTRACT

Introduction: Maxillofacial trauma in children is uncommon, accounting for between 1 % and 14 % of all facial trauma in the general population.

Objective: To describe the epidemiological and anatomical-clinical aspects of mandibular fractures in children.

Material and method: This was a retrospective descriptive cross-sectional study with non-probabilistic accidental sampling. It took place in the maxillofacial surgery and stomatology department of Cocody University Hospital in the Republic of Côte d'Ivoire, over a 20-year period (2000–2019). The study population consisted of patients aged 0–16 years admitted to our department for a mandibular fracture. At the end of this study, we identified 58 patients. Data was entered using Excel 2016. Tables and graphs were processed using Excel version 2016.

Results: we have identified 58 patients. The mean age of patients was 9.35 ± 2.1 years, with extremes of 1 and 16 years, and a sex ratio of 2,22 in favouring men. The 6–12 age group was the most affected (n: 34 cases or 60.35 %). Soft tissue wounds were present in all our patients, followed by peri-mandibular swelling (n: 37 cases or 63.79 %) and disorders of the dental articulation (n: 28 cases or 48.2 %). Condylar fractures were the most frequent (46.87 %).

Mandibular fracture lines were uni-focal in 75 % of cases. These fractures were associated with other facial lesions in 48.28 % of cases and with extra-facial lesions in 34.48 % of cases.

Conclusion: Mandibular fractures are common in maxillofacial trauma in children. Condylar fractures are the most common, almost always associated with chin injuries. Hence the importance of a systematic examination of the mandibular condyles.

1. Introduction

The face is a polymorphic region. It includes the sense organs (sensory, visual, olfactory, gustatory and auditory) and houses the essential functions of swallowing, breathing and communication. Its role is fundamental in expression and in perception [1,2]. This region, due to its prominent position, is a favorite area for trauma [3]. However, maxillofacial fractures in children are rare and account for 3.3 %–15 % of all facial fractures in the general population [4,5]. The epidemiology of mandibular fractures in children is

* Corresponding author. Faculty of Medical Sciences of Abidjan, University Félix Houphouët-Boigny, P.O. BOX 34, Abidjan, Cote d'Ivoire.
E-mail address: marckoffi@gmail.com (K.K. Marc).

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unique and is less well known in the literature [3]. In a study conducted in the USA, Haug et al. affirm that mandibular fractures are the most frequent in facial trauma in children with an incidence varying between 15 and 86.7 % [4]. Few studies have been conducted in Africa, Ba et al found a prevalence of pediatric mandibular fractures of 3.60 % compared to the general population [6]. In Côte d'Ivoire, this is the first study devoted to this segment of the population concerning these types of fractures.

The incidence of mandibular fractures in children increases with age, with a predilection in boys. They are classically consecutive to falls, road traffic accidents and recreational accidents [7,8]. As in adults, mandibular fractures in children present the same anatomo-clinical forms with a preponderance of condylar and symphyseal forms [8]. Given the lack of work on mandibular fractures in children in Côte d'Ivoire, it seemed appropriate to initiate this precept work which aims to describe the epidemiological and anatomo-clinical characteristics of these lesions.

2. Material and method

This was a retrospective descriptive cross-sectional study conducted in the maxillofacial surgery and stomatology department of the CHU de Cocody from 2000 to 2019 (20 years). The study population consisted of patients aged 0–16 years admitted to our department for a mandibular fracture. All maxillofacial trauma patients with a complete clinical examination and radiological work-up demonstrating a mandibular fracture were included in the study. Trauma patients with incomplete investigations were excluded.

The variables studied were as follows.

- Socio-demographic: sex, age, date,
- Aetiology of the trauma: road traffic accident, domestic accident, sports accident, gambling accident, brawl, other;
- Clinical and Paraclinical: clinical signs, paraclinical examination performed, type of fracture and location of the mandibular fracture line.

Sampling methods: We used a non-probability sampling method for patients admitted to the stomatology and maxillofacial surgery department during the period.

Data was entered using Excel 2016. Tables and graphs were processed using Excel version 2016. For quantitative variables, we calculated the mean and standard deviations. For some of them, we specified the median value and the extremes. For qualitative variables, we calculated proportions.

3. Results

65 patients were treated during the study period. 58 patients were included in the study.

The patients ranged in age from 1 to 16 years, with an average of 9.35 ± 2.1 years. The most common age group was between 6 and 12 years, with 24 cases (41.38 %) (Fig. 1). The majority of our patients were male, with a sex ratio of 2.22. The peak frequency of mandibular fractures in children was observed in 2003, with 8 cases (13.79 %) (Fig. 2).

We observed more mandibular fractures in March, with 10 cases (17.24 %) (Fig. 3). Road traffic accidents were the leading cause, with 35 cases (60.35 %), followed by domestic accidents (22.41 %) (Fig. 4). Of those involved in road traffic accidents, 25 were pedestrians (71 %), 23 % were passengers in 4-wheeled vehicles and 6 % were passengers in 2-wheeled vehicles. Road traffic accidents were the dominant cause between the ages of 6 and 12, domestic accidents were the most frequent aetiology between the ages of 0 and 5, and sports accidents concerned children over the age of 12 (Table 1).

The clinical signs most frequently observed were soft tissue wounds (100 %), sketchy pain (65.52 %), peri-mandibular swelling (63.79 %) and, in 48.28 % of cases, dental articulation disorders (Table 2). The chin area was the preferred site for these soft tissue wounds. Moderate trismus (mouth opening between 1 and 2 cm) was noted in 74 % of our patients.

Orthopantomograms or panoramic radiographs of the maxilla were performed in 30 of our patients (51.72 %), while CT scans were performed in 28 (48.27 %). The other standard radiographs included the right and left maxillae and the lower face. The mandibular condyle was the most frequent fracture site, accounting for 46.87 % (Fig. 5). In 44 cases (74.58 %), the fractures were unifocal, in 14

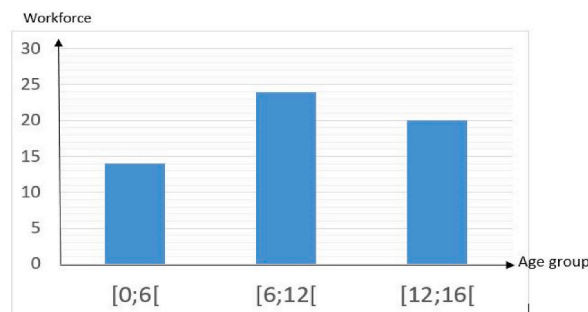


Fig. 1. Breakdown of patients by age group.

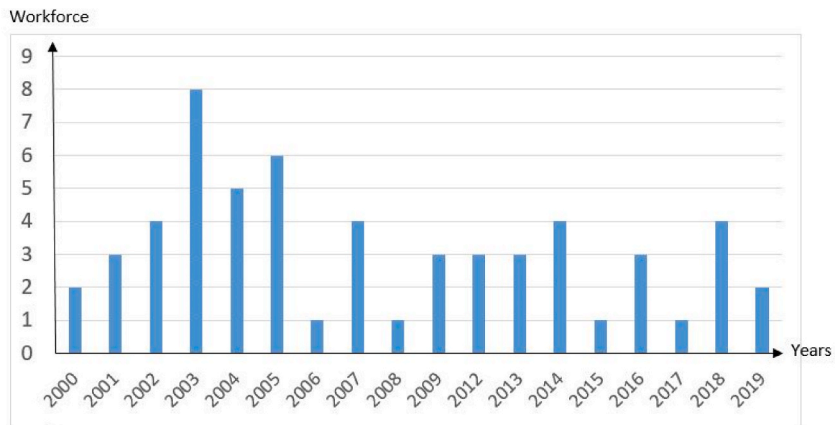


Fig. 2. Distribution of mandibular fractures according to prevalence by year.

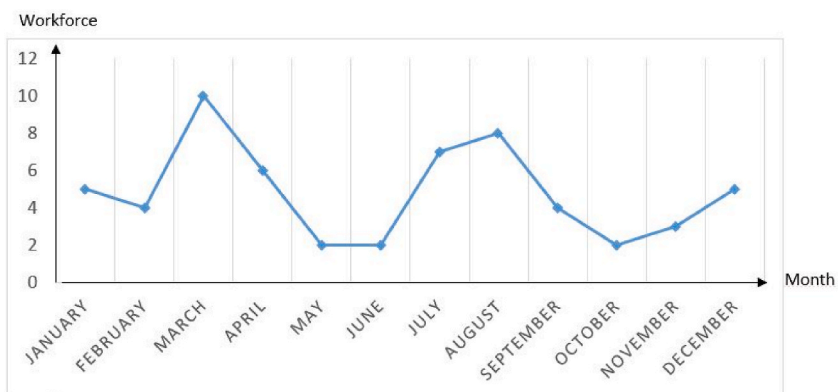


Fig. 3. Distribution of mandibular fractures according to prevalence by me.

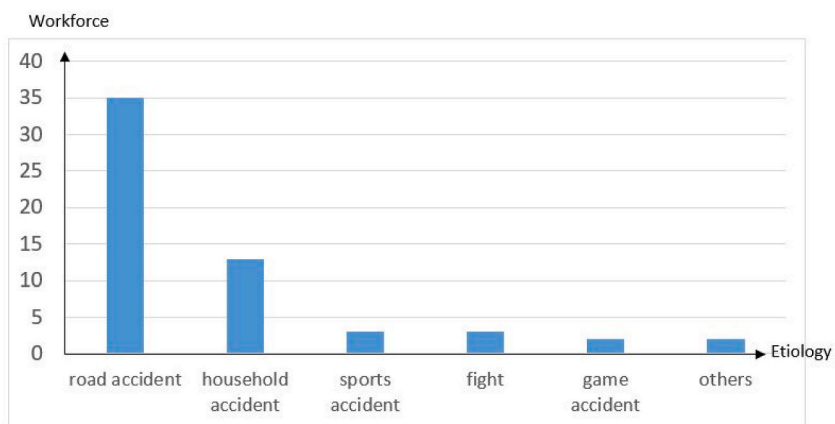


Fig. 4. Distribution according to aetiology.

cases (23.7 %) bifocal and in only 1 case (1.69 %) trifocal. Mandibular fractures were associated with other facial bone lesions in 48.28 % of cases, and in 51.85 % of cases these associated bone lesions were alveolar-dental. This association of mandibular fractures and facial bone lesions was more common in children over 6 years of age (Table 3). Mandibular fractures associated with extra-facial trauma affected 34.48 % of patients. The upper and lower limbs were the most affected, with proportions of 35 % and 25 % respectively.

Table 1
Breakdown of aetiology by age group.

Age group	road accident	household accident	sports accident	fight	game accident	others
[0; 6[	6	6	1	0	0	1
[6; 12[	17	4	0	1	1	0
[12; 16[	12	3	2	2	1	1
Total	35	13	3	3	2	2

Table 2
Breakdown by clinical signs.

Clinical signs	Workforce	Proportion %
stomatorrhoea	20	34,48
soft tissue wounds	58	100
peri-mandibular swelling	37	63,79
sensation of stepping on stairs	3	5,17
exquisite pain	38	65,52
dental articulation disorder	28	48,28
mucous membrane wound	10	17,24
trismus	27	46,55
abnormal mobility of the mandible	4	6,9
tooth mobility	5	8,62
tongue sores	4	6,9
labiomenthal hypoesthesia	4	6,9

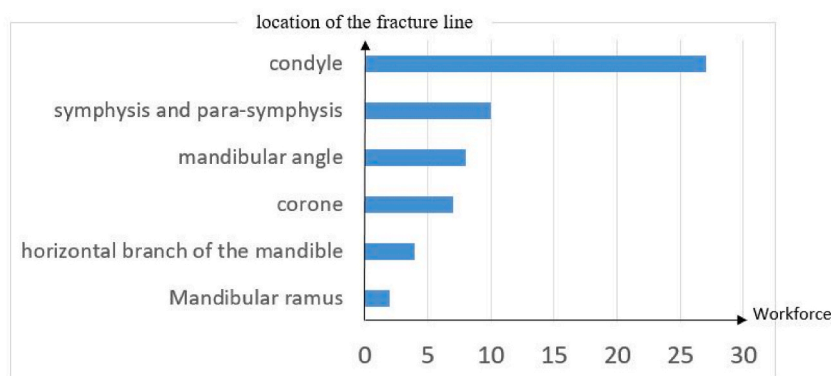


Fig. 5. Distribution according to the location of the fracture line.

Table 3
Distribution of associated facial bone lesions according to age.

Associated facial trauma	Alveolo-dental	Facial mass	NEMFOC	Total
[0–6]	2	3	0	5
[06–12]	6	6	0	12
[12–16]	6	3	1	10
Total	14	12	1	27

4. Discussions

The prevalence of pediatric mandibular fractures is low in childhood and then increases gradually with age. Only 0.8%–1% of facial fractures in children under 5 years old, it is 1%–14.7 % around 16 years old [9]. Two peaks in occurrence have been observed in the literature, the first between 6 and 8 years associated with the start of school age and the second between 12 and 14 years, a period corresponding to the practice of physical activity, participation in sport, puberty and adolescence [1]. The average age in our study, which was 9.35 years, was in accordance with the literature. The authors report average ages of 7, 9.3 and 11 years [7,8,10].

The male predominance observed in our study (69 %) has been reported by several authors [4,7–9]. This male predominance could be explained by the fact that boys are hyperactive, more turbulent than girls and more inclined to engage in dangerous activities and take many more risks. They also spend much more time outside the home. The year 2003 was the one during which we observed more

cases of mandibular fractures, a proportion of 13.79 %. This year corresponds to the period when the military-political crisis in Côte d'Ivoire intensified, marked by a massive exodus of populations to the Abidjan metropolis. In addition, the poor state of the road during this period could also explain this high frequency. This observation was made by Zegbeh et al. [11,12] in a study on maxillofacial trauma at the University Hospital of Bouaké in the general population.

Mandibular fractures were frequently observed in the month of March (17.24 %), followed by April (13.79 %) and July (12.7 %). These months correspond to the months of holidays and school holidays. The months of March and April coincide with the Easter holidays and the months of July and August correspond to the long holiday periods and the rainy season. This factor, associated with the state of the roads, would increase the risk of a road accident. Traffic and consequently the incidence of mandibular fractures. This observation was also made by Konsem et al. [13] in Burkina Faso.

In our series road traffic accidents were the leading cause of mandibular fractures in children (60.35 %). Accidents involving pedestrians were the main cause with an incidence of 71.43 %. These results can be superimposed on those found by several authors [4, 7,10,11]. Traoré et al. [9] found falls from tree tops as the main cause with a proportion of 57.4 %. For them, this could be explained by the preponderance of the rural population in their study, and by the fact that one of the main sources of income was the artisanal picking of seasonal fruits. Other authors report playful accidents as the first cause [7,14–16]. It therefore follows from these various observations that the causes of mandibular fractures in children vary according to the regions and the cultural and socio-economic characteristics of the populations. The causes of fractures also vary with age. So in our study between 0 and 5 years domestic accidents were the first cause 46.5 %, between 6 and 12 years it was road traffic accidents and beyond 12 years sports accidents.

From a clinical point of view, we noted soft tissue wounds in all our patients. The predilection site of these wounds was the chin region. A limitation of mouth opening was also noted in 74 % of our patients. The orthopantomogram has been the radiological examination of choice for the diagnosis of mandibular fractures, however it remains difficult to perform before the age of 6 years. In early childhood (before the age of 6) and in fractures that are complex or difficult to assess on the orthopantomogram, computed tomography would be indicated. This observation was also made by Sumaiya et al. [17]. The most frequent paediatric mandibular fracture site was the mandibular condyle.

Our results are in line with those of many authors, including Paul Boffano et al. who found 38.9 % mandibular condyle fractures in Europe and 63.8 % in Nigeria [4,18].

However, our results differ from those of certain authors who found the symphysis to be the preferred site, namely Konsem et al. [13] in Ouagadougou, Burkina Faso 35.29 %, Traoré et al. [9] in Bobo-Dioulasso, Burkina Faso and Kao et al. [19] in the United States.

Our results would be justified by the anatomical characteristics of the condyle of the child, indeed the pediatric condyle is very vascularized with a thin neck which constitutes the weakest region of the entire mandible, as well as the very high proportion of medullary bone per compared to compact bone [8]. Also the condylar epiphysis of the child is covered with a thick layer of cartilage which makes it a very fragile structure and very little resistant to shock [18,20].

Limitations of the study: During the literature review related to our study, we were confronted with insufficient data in the African literature on the management of mandibular fractures in children. In addition, it should be noted that a large number of medical records were unusable at the time of data collection, which reduced the sample size. Nevertheless, we were able to obtain a representative sample of the population.

5. Conclusion

The prevalence of mandibular fractures in children increases with age to reach its peak between 6 and 12 years. Road traffic accidents are the main cause. Condylar fractures were the most common, almost always associated with chin wounds. It therefore emerges in the face of any maxillofacial trauma in children with a chin wound, the attention of the practitioner must be focused on the meticulous examination of the mandibular condyles.

CRedit authorship contribution statement

Marc Koffi Konan: Conceptualization. **Ouattara Bakary:** Project administration. **Ory Opokou Alexandre De Misères:** Methodology. **Boka Koffi Laurent:** Supervision. **Brou-Zoglo Annick:** Investigation. **Yapo Aké Lucien Jonathan:** Writing – review & editing, Formal analysis, Data curation. **Koffi Affoué Linda Marie Pierre:** Software. **Chapo Ahi Morel:** Visualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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