

PEDIATRIC MANDIBULAR FRACTURES : INSIGHTS INTO EPIDEMIOLOGY AND TREATMENT AT OWENDO TEACHING HOSPITAL

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Article

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ABSTRACT

Introduction : Managing mandibular fractures in children is challenging due to their developing mandible and evolving dentition. This study aims to investigate the epidemiological and therapeutic dimensions of pediatric mandibular fractures.

Materials and methods : This retrospective and descriptive study, from 2016 to 2022. It encompasses cases of isolated or concomitant mandibular fractures, cases involving pathological bone, and those with incomplete records. Parameters examined include frequency, age, gender, place of residence, etiology, time of presentation, fracture location, intervention timing, treatment modality, surgical technique, patient outcomes, complications, and sequelae.

Results : A total of 57 cases were included in the study, representing a frequency of 47.1%. The average age of the patients was 9.2 years. Boys was found in 82.5%, resulting in a sex ratio of 4.7. Motor vehicle accidents were responsible for 53% of the fractures. The para-symphiseal region was 35.4% fractured. Bloody treatment was utilized in 65% of cases, while 7.0% of patients received a combination of functional treatment and osteosynthesis. Complications were observed in 12.3% of patients, and 10.6% experienced sequelae.

Conclusion : Mandibular fractures are prevalent among older, male children, with public road accidents being the leading cause and the osteosynthesis emerges as the preferred treatment modality.

Key Words: Pediatric Mandibular Fracture, Childhood, Epidemiology, Treatment, Gabon

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INTRODUCTION

A mandibular fracture is characterized by the disruption of the normal integrity of the lower facial bone structure, resulting from external forces and potentially impacting the masticatory system. According to Glazer et al. [1], pediatric facial fractures account for 15% of all cases, whereas Nezam et al. reported a higher prevalence of 56% among pediatric facial fractures in India [2]. These fractures stand out as a distinct category due to their occurrence within a developing mandible and evolving dentition (including both primary and permanent teeth). Notably, these fractures are more commonly observed in male children, comprising 72% of cases [3]. They typically result from various causes such as motor vehicle accidents, falls from heights, household incidents, and altercations, with a frequent involvement of the symphysis (both median and para) and the condyle [4].

Diagnosis relies on clinical evaluation, which includes assessing for deformity, pain, fracture-related signs (such as hematoma, wounds, or bruising), and is further confirmed through orthopantomography. In recent times, CT scans have gained significance as they can reveal previously unnoticed fractures and are particularly recommended

for children under 6 years of age. While diagnosing these fractures generally presents few challenges, their treatment is a complex issue due to the presence of dental germs and the ongoing facial growth process [5].

Regardless of the chosen therapeutic approach, the primary objective is to restore both the anatomical integrity of the affected structures, the dental occlusion, and, most importantly, the masticatory function. Therefore, these fractures demand meticulous treatment, as neglecting them can lead to significant morphological, functional, and aesthetic consequences, particularly in cases where the fractures may go unnoticed in children. The face plays a pivotal role in interpersonal interactions, and untreated mandibular fractures can potentially result in psychological and social repercussions.

Three main treatment options are available: surgical intervention, functional therapy, and orthopedic management. Each of these approaches carries its own set of potential complications and sequelae, which has led to a lack of consensus within the medical community. This study aims to investigate the epidemiological and therapeutic dimensions of these fractures.

PATIENTS AND METHODS

This study employed a retrospective, observational, descriptive, and single-center analytical approach, conducted within the Department of Stomatology and Maxillofacial Surgery at CHUO, spanning from June 2016 to June 2022. A total of 57 eligible patient records, ranging from ages 0 to 16, were collected. Inclusion criteria encompassed all patients, irrespective of gender, who were admitted and treated for either isolated mandibular fractures or those concomitant with other facial or distant injuries, confirmed through clinical and radiological assessments. Exclusions comprised dentoalveolar fractures, fractures involving pathological bone conditions, and incomplete medical records. The parameters under investigation encompassed key epidemiological characteristics, including prevalence, age distribution, gender distribution, place of residence, etiology, time of initial consultation, and fracture location.

The treatment-related parameters included intervention timing, treatment modality, surgical techniques employed, the primary approach chosen, patient progress, complications, and sequelae. The assessment of patient progress was conducted by the attending practitioner and categorized as 'very favorable' if no complications or sequelae were noted, 'favorable' in the presence of complications, 'unfavorable' in cases with minor sequelae (such as mouth opening deviation), and 'unfavorable' when severe sequelae, such as temporomandibular ankylosis, were observed.

Data entry was performed using Microsoft Word 2016 and Excel 2016 software, and subsequent analysis was carried out using SPHINX software. Qualitative variables were presented as counts and percentages, while quantitative variables were summarized using means and ranges. Multivariate analysis was conducted using the student's t-test, with p-values less than 0.05 deemed statistically significant (with a significance threshold set at <0.05).

RESULTS

Our study encompassed a cohort of 57 patients, focusing on mandibular fractures in children, which constituted 47.1% of pediatric maxillofacial traumas. The age range of the patients spanned from 2 to 16 years, with an average age of 9.2 years. Among these patients, 47 were male (comprising 82.5% of the cohort), while 10 were female (17.5% of the cohort), resulting in a sex ratio of 4.7. Furthermore, 88% of the patients hailed from urban areas, with the remaining 12% residing in rural locales. The causative factors behind these fractures included public road accidents in 53.0% of cases, domestic accidents in 17.5% of cases, and fights in 14.0% of cases (as illustrated in Figure 1).

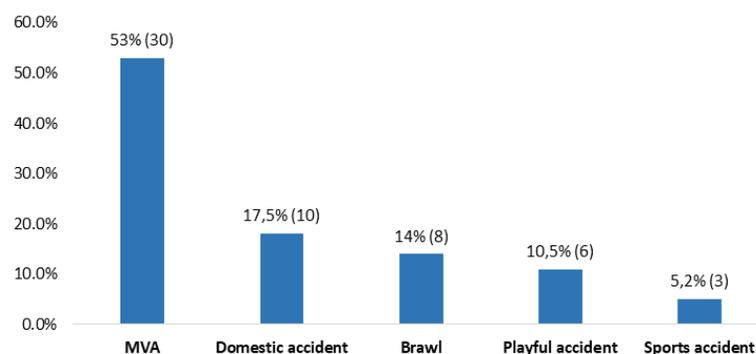


Figure 1 : Distribution of etiological factors by workforce

The median time interval between the traumatic event and the initial medical consultation was 24 hours in 58.0% of cases, as detailed in Table 1. Regarding the location of the fractures, the parasymphyseal region was involved in 35.4% of patients, the symphysis in 26.6% of patients, the condyle in 21.5% of patients, and the mandibular angle in 10.1% of patients (refer to Figure 2). Unilateral fractures were observed in 58% of cases, while bilateral fractures accounted for 37%, and trifocal fractures represented 5.2% of the cases.

Table 1 : Distribution of Consultation Time by Workforce

Consultation period	n	(%)
< or = 24h	33	57,9%
Between 2 - 5 days	13	22,8%
> 5 Days	11	19,3%
Total	57	100%

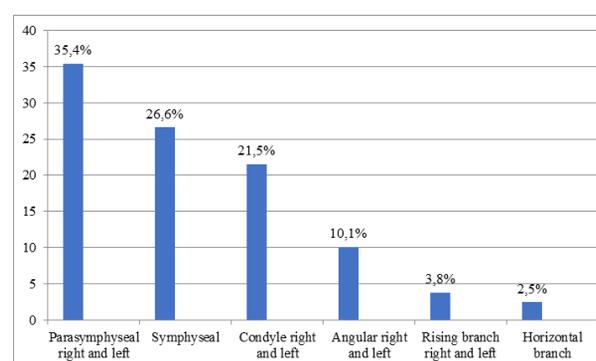


Figure 2 : Frequency Distribution of Fracture Sites

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The intervention took place within 2–6 days for 34 patients, accounting for 59.6% of cases (as shown in Table 2). Out of the total, 37 patients (65.0% of cases) underwent exclusive hemostatic treatment (refer to Figure 3).

Table 2 : Distribution of Time to Initiate Treatment by Healthcare Providers

Pick-up delay	n	(%)
< or = 24h	9	15,7%
Between 2 - 6 days	34	59,6%
> 6 days	14	24,5%
Total	57	100%

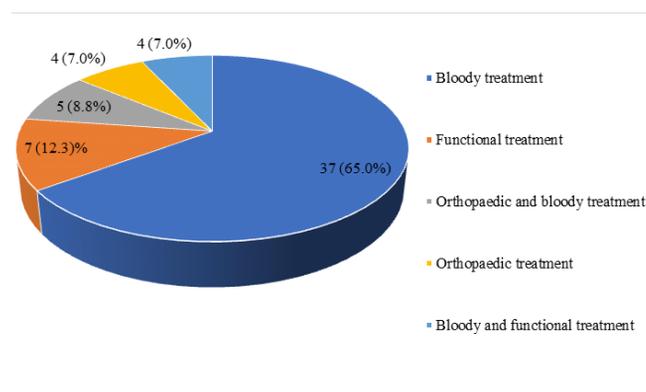


Figure 3: Distribution of therapeutic methods by workforce

This bloody treatment predominantly entailed the application of targeted miniaturized plaque osteosynthesis (as depicted in Figure 4), which was employed in 46 patients, constituting 80.7% of cases. Among these cases, 37 patients (65.0%) exclusively received targeted miniaturized plaque osteosynthesis. Additionally, the maxillo-mandibular block technique was utilized in 3 patients (5.3% of cases), while a mono-mandibular restraint was applied in 1 patient (1.7%) as part of an exclusive orthopedic approach. Functional treatment alone was administered to 7 patients, encompassing 12.3% of cases.

Combined treatment approaches incorporating both maxillo-mandibular blockage and osteosynthesis was undertaken in 5 patients, representing 8.8% of cases. Furthermore, a combination of functional and osteosynthesis treatments was implemented in 4 patients, constituting 7.0% of cases. For unifocal fractures, treatment strategies included functional treatment in 5 patients (8.8% of cases),

orthopedic treatment in 3 patients (5.2% of cases), and bloody treatment in 25 patients (43.8% of cases). Among bifocal fractures, 2 patients (3.5% of cases) received functional treatment, 1 patient (1.7% of cases) was managed with orthopedic treatment, 10 patients (17.5% of cases) underwent bloody treatment, and 8 patients (14.0% of cases) received mixed treatment. In trifocal fractures, 2 patients (3.5% of cases) underwent bloody treatment, while 1 patient (1.7% of cases) received mixed treatment.

The progression of mandibular fractures exhibited varying outcomes within our study cohort. Specifically, the evolution was classified as very favorable in 38 patients, accounting for 66.7% of cases, while it was deemed favorable in 13 patients (22.6% of cases). Conversely, unfavorable outcomes were observed in 2 patients (3.5% of cases), with 4 patients (7% of cases) experiencing an even more adverse progression.

Out of the 13 patients with favorable outcomes, complications emerged as a notable concern. Bloody treatment led to complications in 1 patient (1.7% of cases), resulting in perifracture abscess, while osteoarthritis was observed in 1 patient (1.7% of cases). Additionally, consolidation delay affected 2 patients (3.5% of cases), pseudarthrosis was observed in 2 patients (3.5% of cases), and 6 patients (10.5% of cases) developed a condition characterized by a vicious callus due to bloody treatment. In cases where a combination treatment was administered, 1 patient (1.7% of cases) experienced consolidation delay as a complication. Among the patients with unfavorable outcomes, 2 individuals exhibited sequelae, affecting a total of 6 patients (10.5% of cases) who had undergone functional treatment. Temporomandibular ankylosis was detected in 4 patients (7% of cases), while 2 patients (3.5%) exhibited a deviation in oral opening.

DISCUSSION

EPIDEMIOLOGICAL INSIGHTS

Our study revolves around an infant population, encompassing cases where 47.1% sought treatment for maxillofacial trauma. This observation highlights the occurrence of mandibular fractures in children affected by facial trauma. However, our recorded figures, while significant, are notably lower when compared to the findings of Mukhopadhyay et al. [6], who reported a 72% incidence of mandibular fractures compared to 28% of other facial trauma cases. Our results closely align with those of Ghosh et al. [7], whose decade-long study identified 2137 mandibular fractures, constituting 45.4% of the total 4711 maxillofacial trauma cases.

The observed frequency of mandibular fractures aligns with expectations, given the exposed anatomical position of the mandible.

Furthermore, in children, the relative absence or limited pneumatization of the facial mass enhances its resistance to trauma, rendering mandibular fractures less common. In our study, the majority of patients fell within the age brackets of 5 to 7 years and 14 to 16 years, each group accounting for 30% of cases, with an average age of 9.2 years. Moreover, these age groups were predominantly male, a pattern consistent across both groups. These findings closely resemble the data reported by some authors, such as Andrade et al. [8], who observed an average age of 9.5 years, with 40.5% of cases occurring in the 11 to 15-year age group, and the Traore study [2], which noted an average age of 9.3 years, with a majority of cases between 6 and 11 years, accounting for 40.7%. In contrast, Ghosh et al. [7] reported a lower average age of 8.0 years, which may be attributed to the heightened involvement of these age groups in school-related activities. A noteworthy observation in our study is the significant male predominance, reflected in a sex ratio of 4.7. This trend aligns with existing literature, as seen in the study by Andrade et al. [8], which reported a sex ratio of 4.1. However, it stands in contrast to the findings of other studies, such as Glazer et al. [1] with a sex ratio of 2.05 and Ghosh et al. [7] with a sex ratio of 2.9. The higher vulnerability of males to mandibular fractures may stem from their increased engagement in potentially hazardous physical activities or less safe behaviors on the roadways.

A significant portion of the fractures in our study were localized in the para-symphiseal region, accounting for 34.5% of cases and affecting both sexes. These fractures were most prevalent in two age groups, specifically 5 to 7 years and 14 to 16 years. It's important to note that our findings are relatively lower in comparison to other studies, such as Mukhopadhyay [6] with 80.7% and Hofmann et al. [9] with 39.6% of cases focusing on this region. Symphyseal fractures represented 26.6% of cases, a prevalence rate below that reported by Konsem et al. [10] (35.29%) and Aldelaimi et al. [11] (57.1%). Condylar fractures were noted in 21.5% of cases, which is lower than the findings of Glazer et al. [1] (54%) and Andrade et al. [8] (68%). Fractures affecting the mandibular angle accounted for 10.1% of cases, a rate below that reported by Hofmann et al. [9] (40.6%). Ramus fractures comprised 3.8% of cases, which is lower than the rate identified by Owusu et al. [12] (9.5%). Body fractures represented 2.5% of cases, a lower rate compared to Hofmann et al. [9] (14.3%). Mandibular fractures typically involve areas of reduced bone density, such as the symphysis (both median and para), the condyle, and the additional angle in children. The high proportion of bone marrow in the condyles, coupled with a thin cortical layer, contributes to the heightened vulnerability of this region.

The study identified 57.8% of unifocal fractures, 37.0% of bifocal fractures, and 5.2% of trifocal fractures. These findings closely resemble the data reported by Mukhopadhyay et al. [6] and Glazer et al. [1], but deviate from the observations of Andrade et al. [8].

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Functional treatment was administered in 12.3% of cases in our study. These findings differ from those reported by Kao et al. [3], who observed a 25% incidence, and Smith et al. [13], who noted 28.33% of cases. Notably, Andrade et al. [8] recommend functional treatment for children under 10 years of age, aligning with our observations.

Orthopedic treatment was prescribed for 7% of our patients, which contrasts with the results from studies by Glazer et al. [1] and Traore et al. [4], where orthopedic treatment had a much higher frequency of 54% and 70.4%, respectively. In the study by Bansal et al. [14], orthopedic treatment accounted for as much as 77% of cases.

Maxillo-mandibular block treatment represented 5% of cases in our study, although this rate contradicts the findings of Glazer et al. [1] (100% of cases) and Traore et al. [4] (50% of cases).

Bloody treatment was administered to 37 patients, comprising 65.0% of cases in our study. This rate is in close alignment with the findings of Hofmann et al. [9], who reported a similar incidence of 61.5%. However, our observations differ from those of Smith et al. [13], where only 20% of cases received bloody treatment, and Lee et al. [15], which reported a rate of 21.4%. Osteosynthesis via mini-screwed plates was the primary approach in 80% of cases in our study. This rate exceeds the figures reported by El mansouri [4] (64% of cases) and Pontell et al. [15] (69.5% of cases).

It's worth noting that our rates are elevated due to the inclusion of osteosynthesis in mixed treatment approaches, either in conjunction with functional treatment in 4 patients or orthopedic treatment in 5 patients. Consequently, the combined treatment of maxillo-mandibular blockage and osteosynthesis represented 8.8% of cases in our study, a figure that contrasts with the findings of Hofmann et al. [9], who reported a higher incidence of 23.1%.

The progression of treated mandibular fractures in children exhibits a spectrum of outcomes, ranging from very favorable to unfavorable. A very favorable evolution was observed in 38 patients, comprising 66.7% of cases. This positive trajectory may be attributed to the remarkable remodeling capacity of growing bones in children. However, it's important to note that this frequency is lower compared to the rates reported by several authors, which range between 88% and 100% [16,17].

A favorable evolution was identified in 13 patients, accounting for 22.3% of cases, characterized by infectious and late secondary complications related to bone consolidation. These complications, categorized as peri-fracture abscess, osteitis, pseudarthrosis, and vicious callus, exhibited rates ranging from 1.7% to 10.5%, figures that align with the existing literature [3-5]. In contrast, an unfavorable evolution, marked by sequelae such as temporomandibular ankylosis, was observed in 7% of cases.

This condition primarily affected children with bifocal fractures (involving the condyle and symphysis) who initially underwent functional treatment before transitioning to surgical intervention. Notably, this rate is higher than that reported in the Traore study [4], which documented a rate of 1.8% of cases, but lower than the rate observed in the study by Quang et al. [19], where 25% of cases exhibited such sequelae.

CONCLUSION

Mandibular fractures are prevalent, with a notable predominance among male individuals. Primary causes of these fractures include road accidents and domestic mishaps. The average time between trauma and initial consultation typically amounts to 24 hours, and parasymphyseal fractures are the most frequently observed. Among the various types of fractures, unifocal fractures are the most common. Surgical intervention, particularly osteosynthesis, emerges as the preferred treatment approach, consistently yielding favorable outcomes. On the contrary, opting for functional treatment places the child at risk of severe sequelae, such as temporomandibular ankylosis.

CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest.

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