

Original article

Epidemiology of facial fractures: an analysis of 349 patients

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Abstract – Introduction: Facial fractures epidemiology varies with geographic region. **Patients and methods:** This study reports the frequency, demographic characteristics and aetiologies of facial fractures in a 5-year retrospective survey, in Burkina Faso. **Results:** In 349 patients, the fracture involved the mandible (44.5%), the zygomatic complex (38.9%), the maxilla (13.8%) or the naso-fronto-orbito-ethmoidal complex (2.8%). The peak of frequency (58.2%) was recorded between 20 and 39 years and the male to female ratio was 7.1:1. The aetiologies of the fractures were road traffic crashes (80.5%), assaults (9.7%), falls (8.3%), and sport accidents (1.5%). In 80% of the road traffic accidents, a two-wheeled vehicle was involved and 75.9% of falls were from a tree height. There was a significant association between multiple facial fractures and road traffic accidents. **Discussion:** Epidemiology of facial fractures in this study is similar to that generally reported in developing countries. Frequency of falls from trees height constitutes however a particularity. These findings illustrate the necessity of enforcement of road traffic security, as well as a development of program of prevention of falls from trees, in Burkina Faso.

Mots clés :
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Résumé – Épidémiologie des fractures faciales : l'analyse de 349 patients. Introduction : L'épidémiologie des fractures a une variation géographique. **Patients et méthodes :** Une étude rétrospective sur 5 ans rapporte la fréquence, les caractéristiques démographiques et les étiologies des fractures faciales au Burkina Faso. **Résultats :** Chez 349 patients, la fracture intéressait la mandibule (44,5 %), le complexe zygomatique (38,9 %), le maxillaire (13,8 %) ou le complexe ethmoïdo-naso-fronto-orbitaire (2,8 %). Le pic de fréquence (58,2 %) était observé entre 20 et 39 ans et le rapport homme/femme était de 7.1:1. Les étiologies des fractures étaient les accidents de la circulation routière (80,5 %), les agressions (9,7 %), les chutes (8,3 %) et les accidents de sport (1,5 %). Dans 80 % des accidents de trafic, un véhicule à 2 roues était impliqué et 75,9 % des accidents par chute étaient des chutes du haut d'un arbre. Les fractures faciales multiples étaient significativement associées aux accidents de la route. **Discussion :** L'épidémiologie des fractures faciales dans cette étude est similaire à celle généralement rapportée dans les pays en développement. La fréquence des accidents par chute du haut d'un arbre constitue cependant une particularité. Ces résultats illustrent la nécessité d'un renforcement de la sécurité routière ainsi que d'un développement de programmes de prévention des accidents par chute du haut d'un arbres, au Burkina Faso.

Introduction

Trauma is a worldwide problem of public health importance, being one of the main causes of morbidity and mortality [1]. Among the numerous injuries, facial fractures are common given the anatomically exposed position of the face and the fragility of its bones [2]. Facial fractures may result in functional and aesthetic impairments. Furthermore, facial fractures patients may experience a variety of concomitant injuries with some of them being life threatening such as head injury (Fig. 1). Epidemiology of facial fractures varies with era and

geographic, socioeconomic, and cultural factors [3-6]. Classically, interpersonal violence is reported as their leading cause in the industrialized world [4, 6] while road traffic accidents are predominant in developing countries [3, 7]. An understanding of the frequency and case distribution of facial fractures can assist in establishing research priorities for effective treatment and prevention of these injuries. However, published studies from Burkina Faso are scarce. This study aims to report the frequency, aetiologies and demographic characteristics distribution of facial fractures, in a 5-year retrospective survey at a university teaching hospital in Burkina Faso.

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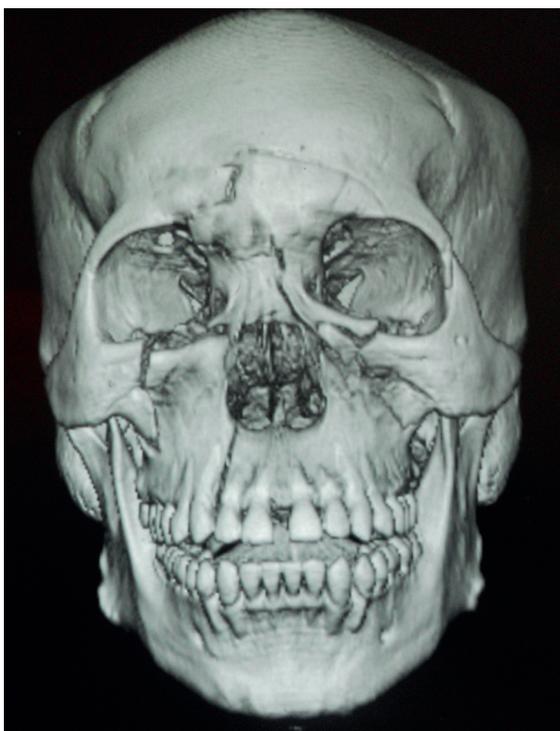


Fig. 1. Le Fort 2 fracture, sagittal maxilla fracture, naso-fronto-orbito-ethmoidal fracture, in an unconscious patient.

Fig. 1. Fracture de Le Fort 2, fracture sagittale du maxillaire, fracture du complexe ethmoïdo-naso-fronto-orbitaire, chez un patient comateux.

Patients and methods

This is a retrospective descriptive study carried out between 2005 and 2009 at the Department of Stomatology and Maxillofacial Surgery of CHU Sanou Souro, a university teaching hospital in Burkina Faso. All patients seen during this period who had facial fracture and complete records were included. The diagnosis of fracture was based on clinical and radiological criteria.

The data collected included the patient’s age and gender, the aetiology and the site of the facial fracture, the existence and type of other corporeal injuries. The Chi Square test was used for comparing proportions; the difference was significant when *p* value < 0.05.

Results

Frequency of the facial fractures

In the 5-year period, a total of 349 patients were seen, giving a yearly incidence of 70 patients. They suffered from 596 facial fractures. The mandible and the zygomatic complex were the most commonly involved bones (Tab. 1). The

Table I. Frequency of the facial fractures.
Tableau I. Fréquence des fractures faciales.

Facial Fracture	<i>n</i>	%
Mandible	203	44.5
Symphysis	105	
Body	90	
Angle	42	
Ramus	10	
Condyle	30	
Alveolar process	38	
Maxilla	63	13.8
Lefort I	9	
Lefort II	24	
Lefort III	28	
Sagittal	14	
Alveolar process	15	
Zygomatic complex	178	38.9
Zygoma body	153	
Zygomatic arch	25	
Naso-fronto-orbital-ethmoid-complex	13	2.8

fractures involved one facial bone in 73.3% (256/349) of the patients: the mandible (132 patients), the zygoma (79 patients), the zygomatic arch (25), and the maxilla (20 patients). In 26.3% (93/349) of the patients, the fractures involved more than one facial bone: mandible and zygoma (45 patients); maxilla and zygoma (14 patients); maxilla and mandible (13 patients); maxilla, mandible and zygoma (8 patients); maxilla, naso-fronto-orbital-ethmoid complex (NFOEC) and zygoma (4 patients); maxilla and NFOEC (2 patients); mandible and NFOEC (2 patients); zygoma and NFOEC (2 patients); maxilla, mandible and NFOEC (2 patients); mandible, zygoma and NFOEC (1 patient).

A total of 248 other injuries were associated with the facial fractures in 206 patients. Soft tissues injuries accounted for 69.75% (173/248) of these injuries and comprised facial wounds (129 patients), oral mucosa wounds (30 patients), scalp wound (9 patients), and tongue wounds (5 patients). The major injuries were represented by limbs fractures (33 patients), brain injuries (19 patients), skull fracture (18 patients), chest trauma (3 patients), rupture of the eye globe (1 patient), and spinal injuries (1 patient).

Age and gender distribution

There were 306 male patients (87.7%) and 43 females (12.3%), giving a sex ratio of 7.1:1. Patients’ ages ranged from

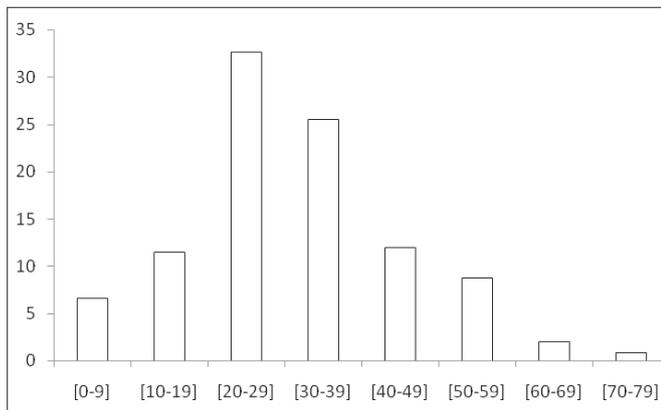


Fig. 2. Age distribution of the patients.

Fig. 2. Distribution des patients selon l'âge.

1 to 71 years (mean 30.5) and 48 patients (14.2%) were 15 years or below. More than half of the patients (58.2%) were aged between 20 and 39 years (Fig. 2).

Aetiologies of the facial fractures

Road traffic crashes represented 80.5% (281/349) of the aetiologies. Other aetiologies were assaults, falls and sport accidents which represented 9.7% (34/349), 8.3% (29/349) and 1.5% (5/349) respectively. Fall from tree was recorded in 22 patients among the 29 and assaults involved 3 cases of gun shot.

In road traffic crashes, 30.2% (85/281) of the fractures were multiple while in the other aetiologies, 11.5% (7/61) of the fractures were multiple. The difference was statistically significant ($p = 0.008$). In 167 out of the 281 road traffic accidents, the causal vehicles were motorcycles in 144 (86.2%), cars in 24 (14.3%), bicycles in 15 (9%), and animal carts 5 (3%). Pedestrians were hit in 11 (6.6%) of these 167 road traffic crashes.

Discussion

The incidence of facial fractures is variable, depending on the population studied. Subhashraj *et al.* report 2748 patients in a 7-year survey in India and Brasileiro *et al.* report 1024 patients within 5 years in Brazil [8, 9]. Deogratus *et al.* report 314 patients in a 5-year period in Tanzania and Adebayo *et al.*, 443 patients in 10-year period in Nigeria [10, 11]. There could be an under-reporting of the facial fractures frequency in our study conducted in a region covering a population of about 5 million inhabitants predominantly young and including both urban and rural areas. In our hospital, due to lack of resources, all the trauma patients do not have full clinical and

radiological screening. Thus, some patients who present with limbs, skull, spinal, chest, pelvis or brain trauma may have associated facial fractures misdiagnosed. Furthermore, in a setting of mass poverty, some trauma patients attend traditional practitioners. The predominance of involvement of the mandible in this study is reported in several studies [8, 10, 12]. The vulnerability of this bone can be explained by its anatomically prominent position in the facial skeleton. The peak incidence of facial fractures recorded in young adults and their male predilection is classically reported. This can be explained by the greater mobility and consequently more susceptibility to traffic accidents and urban violence in young males, due to their social and economic activities. It's also generally known that this group of population has risky behavior such as irresponsible driving or riding and is more involved in brawls. Although the male predilection of the facial fractures is a worldwide observation, the male to female ratio varies extremely, according to the cultural and socio-economic characteristics of the studied population and era. We reported a ratio of 7.1:1 in our series, in a setting where women are involved in domestic activities rather than outdoor tasks and motorbicycle riding. Gassner *et al.* report a ratio of 2.1:1 in Austria that they explain by a greater involvement of women in economic activities outside the home [13]. On the other hand, Al Ahmed *et al.* report a male: female ratio of 11:1 in the United Arab Emirates that they attribute to the cultural setting in where men usually do outdoor work and few women drive [5]. Illustrations of variation in the gender ratio of the facial fractures along the era are brought in Africa by Nigerian authors. Fasola *et al.* report a reduction by a factor of 2.0 between 1978 and 1999 in Ibadan [3]. Adeyemo *et al.* report a reduction from 16.9:1 to 3:1 in Kaduna and from 6.4:1 to 3.3:1 in Ibadan [14]. The lower frequency of facial fractures in children than in adults is generally reported. This is due to the elasticity of bones in children and the presence of tooth buds [15, 16]. However, Erol *et al.* report a peak incidence of 26.7% between 0 and 10 years in Turkey, attributed to falls from housetops [17]. The frequency of 14.2% of paediatric population in our series is close to that reported by Ogunlewe *et al.* (16.4%) in Lagos, Nigeria [16]. The frequency of facial wounds associated with the facial fractures (129 patients) can be due to the frequency of the road crashes in which the two-wheeled vehicles were involved (motorcycles in 144 and bicycles in 15) and the non-use of helmets by riders in Burkina Faso. The associated injuries such as limbs fractures, skull fracture, brain injuries, eye rupture or spinal injuries highlight the necessity of a quick primary examination of facial fractures patients, as some associated lesions may require emergency management. The reported major causes of facial fractures vary according to the status of development. Developed countries experience a decrease of road traffic accidents thanks to traffic laws enforcement and motor vehicles safety devices while there is an increase of assaults related to

alcohol consumption [4, 6, 18]. In the studies from developing countries, road traffic accidents are classically reported to be the main aetiology [3, 7, 9, 10, 12, 14]. This is corroborated by the findings of the present study. Burkina Faso is similar to the majority of African developing countries, with an increasing urban population, an insufficiency of public transport, an increasing number of second hand four-wheeled vehicles and a non-compliance with speed limits and seat belt laws. Moreover, Burkina Faso is a country of bicycles and motorcycles whose riders refuse to use helmets. To our knowledge, the prevalence of falls from trees as a cause of facial fracture recorded in this series is unpublished. This aetiology results from the search for tropical fruits such as mango, and wood for domestic use as it is easy to climb trees in the savannah zone. The significant association between multiple facial fractures and road traffic accidents may be explained by the high velocity of trauma and its distribution to a large body region in motor vehicles accidents [19].

Conclusion

Epidemiological characteristics of facial fractures in this study are similar to that generally reported in developing countries. Frequency of falls from trees height constitutes however a particularity. These findings illustrate the necessity of development of public transport and enforcement of road traffic laws, as well as a development of program of prevention of falls from trees, in Burkina Faso.

Competing interests: none

References

1. Krug EG, Sharma GK, Lozano R. The global burden of injuries. *Am J Public Health* 2000;90:523-6.
2. Carvalho TBO, Cancian LR, Marques CG, Piatto VB, Maniglia JV, Molina FD. Six years of facial trauma care: an epidemiological analysis of 355 cases. *Braz J Otorhinolaryngol* 2010;76:565-74.
3. Fasola AO, Nyako EA, Obiechina AE, Arotiba JT. Trends in the characteristics of maxillofacial fractures in Nigeria. *J Oral Maxillofac Surg* 2003;61:1140-3.
4. Alvi A, Doherty T, Lewen G. Facial fractures and concomitant injuries in trauma patients. *Laryngoscope* 2003;113:102-6.
5. Al Ahmed HE, Jaber MA, Abu Fanas SH, Karas M. The pattern of maxillofacial fractures in Sharjah, United Arab Emirates: a review of 230 cases. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2004;98:166-170.
6. Erdmann D, Follmar KE, Debruijn M, Bruno AD, Jung SH, Edelman D, et al. A retrospective analysis of facial fracture etiologies. *Ann Plast Surg* 2008;60:398-403.
7. Bancolé Pognon SA, Biotchane I, Akpovi GD. Prise en charge des fractures mandibulaires à l'hôpital Saint Luc de Cotonou (Bénin). A propos de 83 cas. *Med Buccale Chir Buccale* 2013;19:85-9.
8. Subhashraj K, Nandakumar N, Ravindran C. Review of maxillofacial injuries in Chennai, India: a study of 2748 cases. *Br J Oral Maxillofac Surg* 2007;45:637-9.
9. Brasileiro BF, Passeri LA. Epidemiological analysis of maxillofacial fractures in Brazil: a 5-year prospective study. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2006;102:28-34.
10. Adebayo ET, Ajike OS, Adekeye EO. Analysis of the pattern of maxillofacial fractures in Kaduna, Nigeria. *Br J Oral Maxillofac Surg* 2003;41:396-400.
11. Deogratus BK, Isaac MM, Farris S. Epidemiology and management of maxillofacial fractures treated at Muhimbili National Hospital in Dar es Salaam, Tanzania, 1998-2003. *Int Dent J* 2006;56:131-4.
12. Motamedi MH. An assessment of maxillofacial fractures: a 5-year study of 237 patients. *J Oral Maxillofac Surg* 2003;61:61-4.
13. Gassner R, Tuli T, Hachl O, Rudisch A, Ulmer H. Cranio-maxillofacial trauma: a 10 year review of 9,543 cases with 21,067 injuries. *J Cranio Maxillofac Surg* 2003;31:51-61.
14. Adeyemo WL, Ladeinde AL, Ogunlewe MO, James O. Trends and characteristics of oral and maxillofacial injuries in Nigeria: a review of the literature. *Head Face Med* 2005;1:7.
15. Haug RH, Foss J. Maxillofacial injuries in the pediatric patients. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2000;90:126-34.
16. Ogunlewe MO, James O, Ladeinde AL, Adeyemo WL. Pattern of paediatric maxillofacial fractures in Lagos, Nigeria. *Int J Paediatr Dent* 2006;16:358-62.
17. Erol B, Tanrikulu R, Görgün B. Maxillofacial fractures: analysis of demographic distribution and treatment in 2901 patients (25-year experience). *J Cranio Maxillofac Surg* 2004;32:308-13.
18. Lee KH, Snape L, Steenberg LJ, Worthington J. Comparison between interpersonal violence and motor vehicle accidents in the aetiology of maxillofacial fractures. *ANZ J Surg* 2007;77:695-8.
19. Follmar KE, DeBruijn M, Baccarani A, Bruno AD, Mukundan S, Erdmann D, et al. Concomitant injuries in patients with panfacial fractures. *J Trauma*. 2007;63:831-5.