

Epidemiological, Clinical and Radiological Aspects of Maxillofacial Trauma at the Sylvanus Olympio University Teaching Hospital in Lomé, Togo

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Abstract

Introduction: Maxillofacial trauma includes injuries affecting the facial bones, mandible, and their surrounding soft tissues. These injuries are very common, related to the increase in the vehicle fleet in recent decades and non-compliance with traffic regulations. We conducted this study to better understand the etiological profile and the different clinical and radiological forms of maxillofacial trauma in Togo. **Patients and Methods:** This was a descriptive retrospective study conducted from January 1st, 2015, to December 31th, 2023 (9 years), focusing on the records of patients with facial trauma. Data were collected using a pre-established survey form based on patient medical records, consultation and surgical report records from the Stomatology and Maxillofacial Surgery Department. **Results:** Five hundred and twenty-three patient records were retained, representing a hospital frequency of 58.11 cases/year. The average patient age was 33.13 years, with the most common age group being 20 to 40 years (69.90%). The predominance was male, with a sex ratio of 7.57. The primary etiology identified was road traffic accidents (RTAs), with 86.20% of cases (motorcyclists were involved in 88.40% of cases), followed by assaults, with 5.90%. Craniofacial computed tomography was the most commonly performed radiological examination (90.60%). The mandible was the most affected bone by fractures (49.90%), followed by orbitozygomatic frac-

tures (45.70%) and Lefort fractures (41.68%). Craniocerebral trauma was the most common associated injury (43.8%). **Conclusion:** Facial trauma is common and primarily affects young adults. RTAs were the largest contributor. Hence, the need to focus on prevention, focusing on compliance with road safety measures, including the use of full-face helmets by motorcyclists, seat belts by drivers, and compliance with the highway code.

Keywords

Trauma, Fractures, Maxillofacial, Road Traffic Accidents

1. Introduction

Maxillofacial trauma is defined as all injuries related to shock or physical aggression affecting the anterior part of the cephalic extremity. These injuries include both disruptions in the continuity of the facial bone skeleton, but also damage to the covering soft tissues, even the deep spaces of the face and the teeth [1]. They are the third leading cause of general mortality and represent a global public health issue. They constitute one of the main causes of morbidity and mortality, both in developed and developing countries [2]. According to Lebeau *et al.*, these facial injuries represent 30% of the activities of the maxillofacial surgery department at Grenoble University Hospital [3]. In 2020, their prevalence at the Central Hospital and the Emergency Center of Yaoundé was estimated at around 23.2% [4].

Indeed, these injuries can jeopardize functional, aesthetic, and sometimes life-threatening prognosis. Due to the strong involvement of the face in relationship life, their morphological, functional, psychological and social consequences are sometimes considerable in the absence of appropriate treatment [5]. In Togo, a study conducted by Bissa *et al.* [6] revealed that 80% of these injuries were linked to accidents involving two-wheeled vehicles. Ten years later, the Togolese vehicle fleet has increased considerably, accompanied by changes in road planning and urban mobility habits. These developments raise the need for a new inventory of these maxillofacial injuries, in order to update the epidemiological, anatomical and clinical data. This justifies the present study.

2. Patients and Methods

Study Type and Period. We conducted a descriptive study with retrospective data collection over a 9-year period, from January 1st, 2015, to December 31st, 2023. It took place in the Stomatology and Maxillofacial Surgery Department of the Sylvanus Olympio University Teaching Hospital (CHU-SO).

Inclusion Criteria. This study included all patients treated in the department for maxillofacial trauma during the defined period, and whose medical records included epidemiological, diagnostic, and therapeutic data.

Exclusion Criteria. Incomplete and unusable records due to a lack of key information, as well as records of patients treated for pathologies other than trauma, were excluded. This exclusion of files was significant, linked to the poor storage conditions of physical files, such as humidity (lack of computerization of the department), and also to the absence of some key elements required for the study.

Data Collection. Data collection was conducted using a pre-established, anonymous individual data collection form. The data collected came from patient medical records, hospitalization and surgical report records, from the Stomatology and Maxillofacial Surgery Department.

Variables Studied. The variables studied included sociodemographic (age, sex, occupation, place of residence, etc.), etiological, clinical, and radiological data.

Data Analysis. Data were entered using Microsoft Excel and analyzed using R 4.0.4 software. Quantitative variables were expressed as means with standard deviations, and qualitative data as percentages and 95% confidence intervals.

Ethical Considerations. Approval was obtained from the CHU-SO Bioethics Committee (Memorandum No. 0219/2024/MSHP/CHUSO/DIR/DRH/SERV. PERS dated February 22nd, 2024), and patient anonymity was maintained.

3. Results

Epidemiological Data. During our study period, 28,770 patients consulted the department, including 5129 cases of maxillofacial trauma. Of these, 4606 observations were excluded due to incomplete records, and 523 cases of maxillofacial trauma were retained, representing 58.11 cases per year (Figure 1). This significant exclusion of files was linked to the poor storage conditions of physical files, such as humidity (lack of computerization of the department), and also to the absence of some key elements required for the study (see exclusion criteria). The mean age of patients was 33.13 years, with a range of 2 to 80 years.

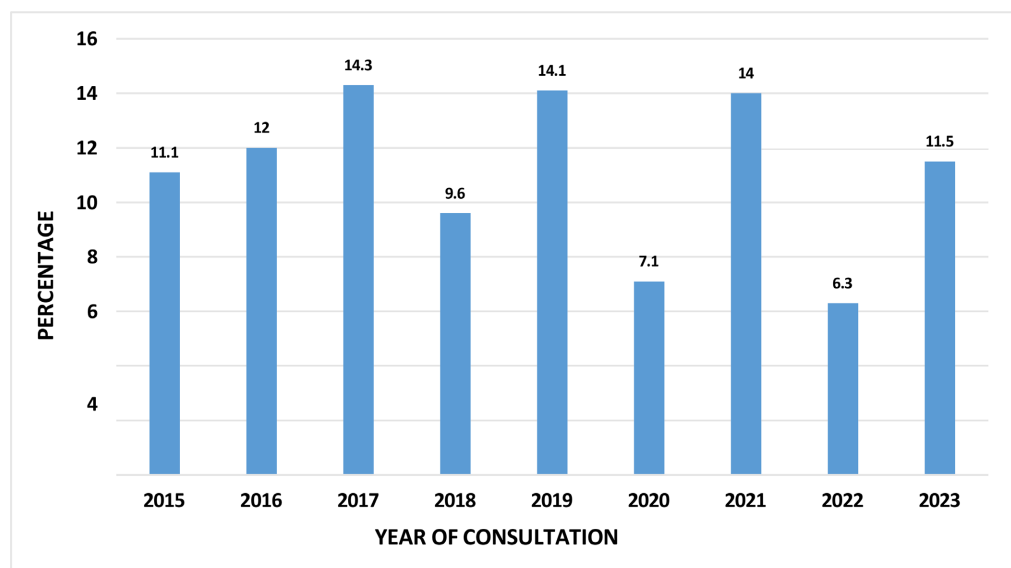


Figure 1. Distribution of patients according to year of consultation.

The [20 - 40] year age group represented 65.90% (**Figure 2**). Four hundred and sixty-two patients were male (88%) and 61 were female (12%), so the sex ratio was 7.57. Fifty-nine percent of patients came from Lomé and its surrounding areas, 32.88% came from other regions of the country, and 17.03% of patients did not provide their place of origin or residence. Road traffic accidents (RTAs) accounted for the occurrence of maxillofacial injuries in 86.20% of cases (**Table 1**). Among these, accidents involving a collision between two motorcycles accounted for 36.40%. Motorcyclists were involved in 88.40% of RTAs (**Table 2**).

Clinical Data. Maxillofacial pain was the reason for consultation in 98.10% of cases; chewing discomfort was present in 32.90% of cases, speech disorders in 15.5% of cases, decreased visual acuity in 10.13% of cases and the notion of cracking in 0.6% of cases. On physical examination, the exo-oral signs were represented by exquisite pain (91.60% of cases), cheekbone fading (42.06% of cases), the sensation of walking stairs (36.33% of cases) and periorbital ecchymosis

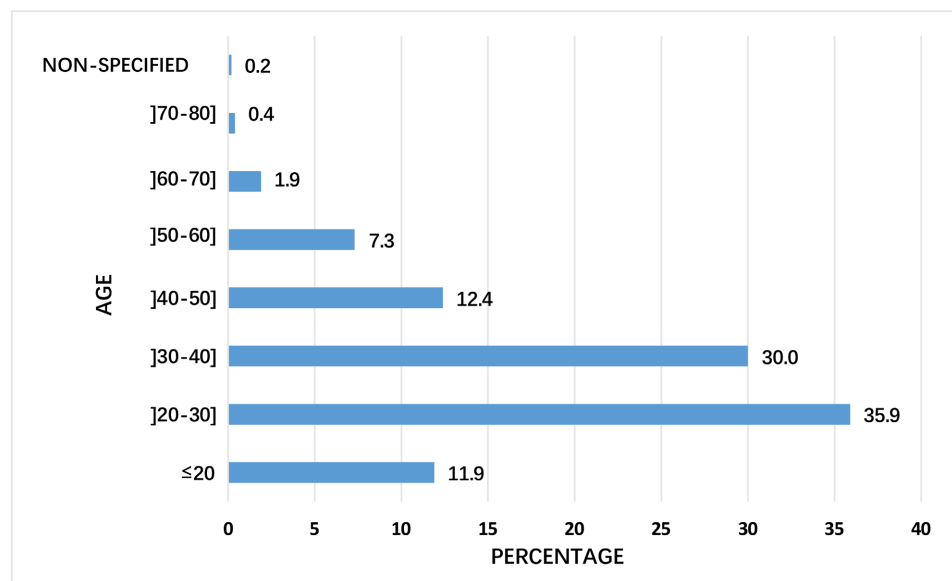


Figure 2. Distribution of patients according to age group.

Table 1. Distribution of patients according to the circumstances of occurrence.

	Number (n)	Percentage (%)
Road traffic accidents	451	86.20
Assault and battery	31	5.90
Work accident	18	3.40
Domestic accident	9	1.70
Sports accident	5	1.00
Ballistic trauma	1	0.20
Other	8	1.60
Total	523	100

Table 2. Distribution of road traffic accidents according to the vehicles involved.

Motorcycle-motorcycle	164	36.40
Car-motorcycle	94	20.80
Motorcycle-obstacle	84	18.60
Motorcycle-pedestrian	54	11.90
Car-obstacle	17	3.80
Car-pedestrian	12	2.70
Not specified	12	2.70
Car-car	11	2.40
Motorcycle-bicycle	3	0.70
Total	451	100

(24.09% of cases). **Table 3** summarizes the distribution of patients according to the exo-oral physical signs. The endo-oral signs found were the limitation of mouth opening (**Figure 3**) (53.50% of cases) and dental articulation disorders (46.50% of cases). **Table 4** summarizes the distribution of patients according to intraoral physical findings. Skin lesions were dominated by bruises (**Figure 4**) and facial hematomas, found in 47.80% of cases, and facial wounds (**Figure 5**) in 41.07%. **Table 5** summarizes the distribution of patients according to facial cutaneous findings.

Radiological Data. The radiological explorations requested for the radiological diagnosis of maxillofacial fractures were essentially the orthopantomogram for fractures of the dentate portion of the mandible, and the CT scan for fractures of

Table 3. Distribution of patients according to exo-oral physical signs

	Number (n)	Percentage (%)
Exquisite pain	479	91.60
Cheekbone effacement	220	42.06
Stair-stepping sensation	190	36.33
Periorbital bruise	126	24.09
Rhinorrhagia	110	21
Sensitivity disorder	37	7.10
Oculomotor disorder	30	5.74
Ear-ache	29	5,50
Enophthalmos	15	2.90
Diplopia	11	2.10
Rhinoliquorrhea	5	0.95
Exophthalmos	3	0.60

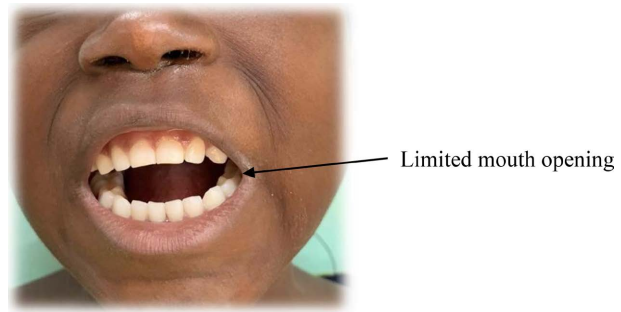


Figure 3. Photograph of a patient with limited mouth opening (source: photo library, stomatology and maxillofacial surgery department, CHU-SO).

Table 4. Distribution of patients according to intraoral physical signs.

	Number (n)	Percentage (%)
Limited mouth opening	280	53.50
Dental articulation disorder	243	46.50
Gingival fibromucosal wound	100	19.12
Tooth avulsion	96	18.40
Coronoradicular fracture	56	10.70
Tooth luxation	50	9.60
Upper vestibular horseshoe bruise	50	9.60
Palatinal fibromucosal wound	06	1.14
Oronasal communication	05	0.95



Figure 4. Photograph of a patient with a periorbital bruise while wearing glasses (source: photo library, stomatology and maxillofacial surgery department, CHU-SO).

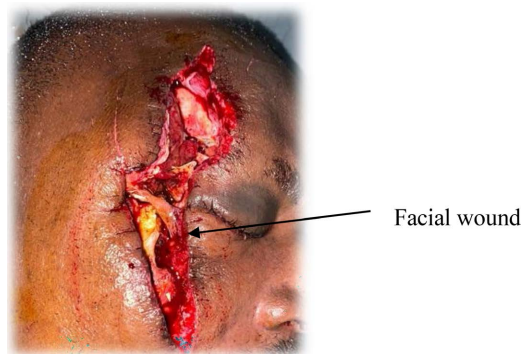


Figure 5. Photograph of a patient with a facial wound (source: photo library, stomatology and maxillofacial surgery department, CHU-SO).

the non-dentate portion of the mandible, in particular condylar fractures, but also fractures of other facial bones and complex cranioencephalic lesions (orbito-zygomatic fractures, fractures of the naso-ethmoido-maxillo-fronto-orbital complex (NEMFOC), oclusofacial fractures, in particular Lefort fractures, and inter-maxillary dislocations). For the CT scan, axial sections with coronal, sagittal and 3D reconstructions were required for a better analysis of the lesions. Radiologically, facial fractures were found in 352 patients (67.30%). They were dominated by orbitozygomatic fractures (**Figure 6**) and Lefort fractures (**Figure 7**) in 45.70%

Table 5. Distribution of patients according to skin lesions.

	Number (n)	Percentage (%)
Facial hematoma	250	47.80
Lower labial wound	39	7.45
Upper labial wound	6	1.15
Auricular pinna wound	34	6.50
Subtotal/total amputation	7	1.34
Laceration	27	5.16
Eyeball wound	18	3.44
Jugal wound	8	1.52
Nerve section	7	1.34
Inferior alveolar nerve (V3)	3	0.58
Infraorbital nerve (V2)	2	0.38
Buccal branch of nerve VII	2	0.38

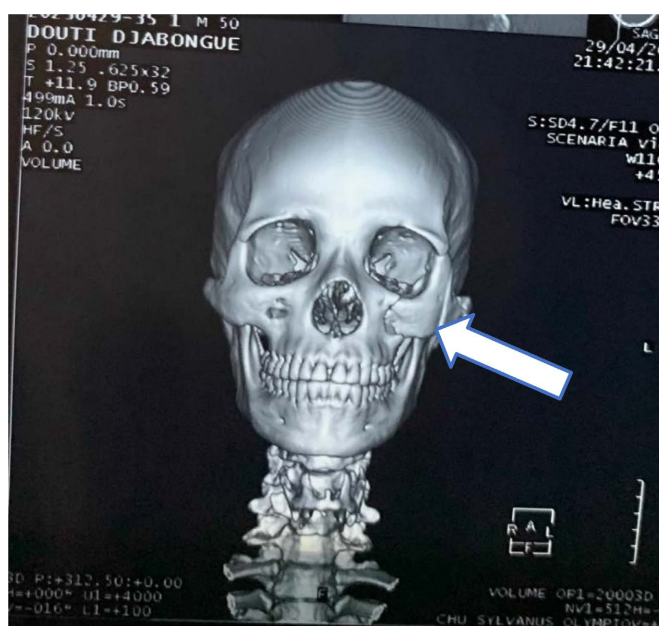


Figure 6. 3D reconstruction craniofacial CT image of an orbito-zygomatic fracture (source: photo library, stomatology and maxillofacial surgery department, CHU-SO).

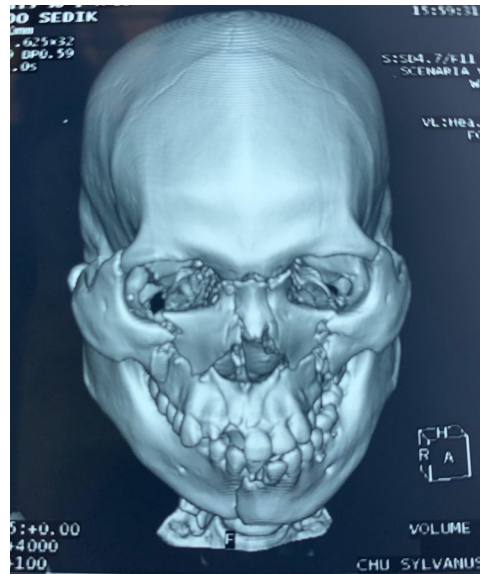


Figure 7. 3D reconstruction craniofacial CT image showing a panfacial fracture associating Lefort I, II, III fractures and a fracture of the mandibular symphysis (source: photo library, stomatology and maxillofacial surgery department, CHU-SO).

and 41.68% of cases, respectively. Lefort fractures, also called horizontal occluso-facial fractures, are fractures that detach the maxillary dental arch from the base of the skull. They are subdivided into 3 types. Lefort 1 fractures detach the maxillary dental arch from the rest of the other bones of the face. Lefort 2 fractures detach the nasomaxillary block with the maxillary dental arch, from the rest of the other bones of the face. Lefort 3 fractures are also called true craniofacial disjunction fractures, and detach the maxillary dental arch and all the rest of the other bones of the face as a block, from the base of the skull. Mandibular fractures (**Figure 8**) were found in 261 patients (49.90% of cases), with involvement of the dentate portion in 27.53% of cases. The association of dentate and non-dentate lesions was found in 14.34% of cases. **Table 6** summarizes the detailed distribution

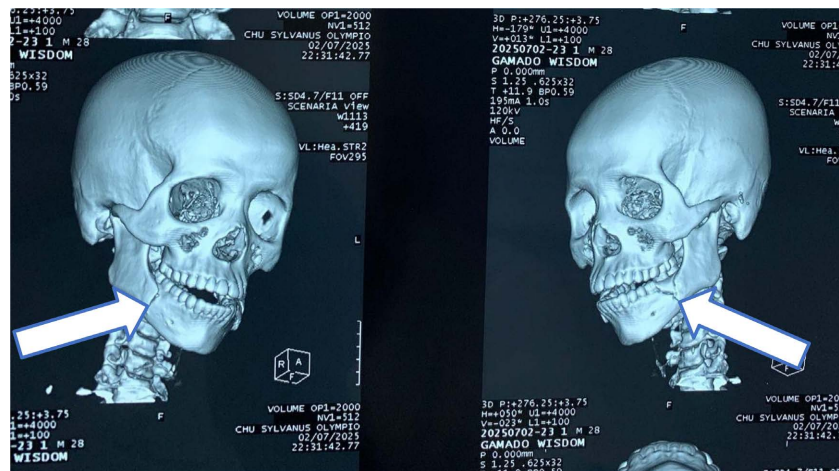


Figure 8. 3D reconstruction of the craniofacial CT image showing a mandibular fracture (source: photo library, stomatology and maxillofacial surgery department, CHU-SO).

Table 6. Distribution of bone lesions according to their anatomical location.

	Number (n)	Percentage (%)
<i>Mandibular fractures</i>	261	49.90
Dentate portion	144	27.53
Dentate portion + non-dentate portion	75	14.34
Mandibular condyle	42	8.03
<i>Facial fractures</i>	486	92.92
Orbito-zygomatic fractures	239	45.70
Lefort fractures	218	41.68
Naso-ethmoido-maxillo-fronto-orbital complex (NEMFOC)	15	2.88
Intermaxillary Dislocations	7	1.33
Isolated Orbital Floor Fractures	7	1.33
<i>Lefort fractures</i>	218	41.68
Lefort 1	92	42.20
Lefort 2	75	34.40
Lefort 3	51	23.39
<i>Alveolar-Dental Injuries</i>	214	40.92
Mandibular	60	11.47
Maxillary	47	8.98
Tooth Dislocation	47	8.98
Coronal Fractures	40	7.65
Root fractures	20	3.84

of bone lesions according to their anatomical location. Associated lesions were represented by cranioencephalic trauma (CET) in 43.8% of cases, limb trauma in 9.90% of cases, spinal trauma (0.8%) and thoracic contusions (0.6%).

4. Discussion

Maxillofacial trauma is increasingly common and constitutes a real public health problem [2] [7]. It represents 30% of the activities of the maxillofacial surgery department at Grenoble University Hospital [3] and ranks second among pathologies encountered in Côte d'Ivoire after infectious diseases [8]. In Togo, previous studies conducted by Boko *et al.* [9] and Bissa *et al.* [6] found respective overall rates of 6.82% in 2005 and 10.29% in 2017, with an annual frequency of 30.2 cases. Our annual frequency of 58.11 cases per year is relatively higher and reflects the increase in maxillofacial trauma compared to previous studies. This increase in maxillofacial trauma could be attributable to a set of contributing factors, including the increase in the vehicle fleet in recent decades, non-compliance with safety

measures and the road traffic code, and the state of road infrastructure. In our series, the average age of patients was 33.13 years \pm 11.30 years with extremes of 02 years and 80 years. The age group of [20 - 40] years represented 65.90%. This result is similar to data from the world literature [10] [11] and African literature [6] [7] [12] reporting a peak in the third decade. These results could be explained by the extreme youth of the African population in general and that of the Togolese population in particular [6] [9] [13]. These are young adults belonging to the most active social class, predominantly male, and therefore the most mobile [7]. This male predominance (88% in our series) in maxillofacial trauma has been reported by many authors [6] [12] [13]. This increased vulnerability of male subjects could be explained by their susceptibility to engage in violent and high-risk behavior, to participate in contact sports and to the reckless driving of motorized vehicles [13] [14]. These injuries are therefore the consequence of direct trauma such as road traffic accidents in our series (86.20%) involving a large number of motorcyclists (88.40%). In African literature, road traffic accidents are the leading cause of facial bone fractures [6] [7] [14]. However, in developed countries, sports accidents and assaults/fights are the most common causes despite a highly developed vehicle fleet. Lebeau *et al.* [3] in France reported 25.8% of facial injuries related to sports accidents, followed by RTAs (23.1%). These results could be explained by the presence of several factors contributing to road traffic accidents in our communities: precarious transport conditions (vehicles in poor condition, overloaded passengers), non-compliance with road regulations, the development of the motorcycle taxi phenomenon, to which are added often lax enforcement of road regulations and a lack of quality road infrastructure [13] [14].

From an anatomico-clinical perspective, maxillofacial injuries have revealed cases of serious injuries including simple and isolated forms (fracture of the nasal bones, mandible fracture, etc.) and complex multi-lesion forms such as craniofacial dislocations and fractures of the nasoethmoidomaxillofrontoorbital complex (NEMFOC). Mandibular fractures were found in 49.90% of patients in our series, followed by orbitozygomatic fractures and Lefort fractures, respectively in 45.70% and 41.68% of cases. These results are in agreement with numerous studies carried out by other authors, including Bouguila *et al.* in Tunisia [15] who had found a proportion of mandibular and zygomatic fractures respectively in 62% and 32% of cases. This predominance of mandibular fractures and orbitozygomatic fractures could be explained by the anatomical structure and the prominent position of these bones, making them real natural bumpers of the face [8] [16]. These lesions can be complex affecting several bone structures of the facial mass. This is the case of Lefort fractures found in 41.68% of patients. Traoré *et al.* in Burkina Faso reported 31.9% of cases of Lefort fractures [17]. This high frequency of Lefort fractures could be explained by the anatomical fragility of the facial mass at the level of the Lefort lines of weakness and the violent context of trauma. In addition, lesion associations are not rare. This is the case of skin lesions found in 90.25% of patients in our series. At the forefront of these skin lesions were facial hematomas

(47.80%) followed by facial wounds in (41.07%). These results are consistent with those of Gruss JS et al and Millogo M. et al who respectively found hematomas in 45.30% of cases and facial wounds in 39.80% of cases [18] [19]. Traoré et al in Burkina Faso reported a proportion of facial hematomas in 50.10% of cases and facial wounds in 42.50% of cases [17]. The formation of hematomas is due to the vascular richness of the face, the proximity of subcutaneous bone structures and the absence of significant muscular protection. As for the wounds, they are often caused by sharp objects or direct impacts against hard surfaces. In addition, the skull, due to its proximity to the facial mass, is the most affected by these maxillofacial traumas, i.e. 43.80% of cases in our series. For Gruss et al., head trauma (even minor) is sometimes associated with severe maxillofacial trauma; this led him to conclude that a maxillofacial bone trauma patient is also a head trauma patient, the face acting as a bumper for the brain [18].

Our study had limitations due to the retrospective nature of any study, including the incompleteness of medical records, which reduced the sample size.

It should also be noted that helmet use was not recorded in the files. The absence of helmet or seat-belt data was also study limitation. The absence of helmet or seat belt use is a variable that was not systematically found in patient records, due to the fact that injured people often arrive at the hospital unconscious, brought by relatives or friends who did not directly witness the accident. The absence of this variable complicates the interpretation of the possible real impact on the severity of injuries.

5. Conclusion

Traumas are the prerogative of young male subjects. They are often caused by road traffic accidents, mostly involving two-wheeled vehicles, followed by assaults. These injuries can affect all anatomical structures of the maxillofacial sphere. They can be serious, with associated injuries falling within the scope of polytrauma patients. Hence the importance of emphasizing the prevention of these facial traumas, particularly through awareness-raising on compliance with the highway code, the mandatory wearing of full-face helmets by all motorcyclists, and the wearing of seat belts by all motorists.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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