

EPIDEMIOLOGY OF MAXILLOFACIAL TRAUMA IN A BRAZILIAN EMERGENCY HOSPITAL: A RETROSPECTIVE STUDY

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ABSTRACT

Injuries due to external causes are a major challenge for public health services, as they result in high individual and collective costs. The aim of this study was to retrospectively analyze the epidemiology of facial fractures in a tertiary referral center in the Brazilian Midwest from 20th October 2014 to 20th October 2015. Variables considered included age, sex, the periods between injuries and surgeries, trauma etiology, the topography of the fractures, and complications. Descriptive and bivariate tests were performed. A total of 561 facial fractures from 430 patients were included. A higher prevalence of fractures was observed among men (n=355, 82.6%) and patients in the 18-59-year age group (n=380, 88.4%). When comparing gender to anatomic trauma sites and trauma etiology, no significant correlations were found. There was a significant association between the age groups and the most common fracture sites: the mandible (n=194, 34.6%, p=0.011) and the zygomatic complex (n=150, 26.7%, p=0.002). Road traffic accidents, the most frequent etiology observed (n=271, 63%), were significantly associated with trauma involving the soft tissues (p≤0.001), nasal bone (p=0.030), zygomatic complex (p=0.001), and mandible (p≤0.001). The postoperative complication rate was 2.6%.

KEYWORDS: Epidemiology, Facial injuries, Maxillofacial injuries, Jaw fractures, Risk factors.

1. INTRODUCTION

Maxillofacial fractures are a major public health problem worldwide. This condition contributes greatly to morbidity and mortality rates, with different degrees of physical, functional, and aesthetic impacts, resulting in high individual and collective costs to repair these impacts¹⁻⁴.

Studies have shown different types of etiologies associated with these injuries. The most frequently seen are road traffic injuries, interpersonal violence, falls, occupational accidents, animal attacks, sports accidents, iatrogenic factors, and other etiologies⁴⁻⁹.

According to the World Health Organization¹⁰,

between 20 and 50 million non-fatal injuries from road accidents are estimated to occur annually around the world, causing numerous disabilities. The entity also estimated that road traffic injuries would rise to become the fifth leading cause of death by 2030, considering the inefficiency of our current preventive measures.

Road traffic accidents have been the main etiological agents of facial trauma in developing countries^{6-8,11,12}. At the same time, other studies present interpersonal violence with a higher incidence of maxillofacial fractures compared to traffic accidents⁵⁻¹³.

The occurrence and etiology of facial trauma may vary according to the geographic area where the sample was collected, the distribution and socioeconomic trends presented in the universe of the sample, as well as cultural aspects and climatic variations⁴⁻⁶. Therefore, there is a need for continuous regional epidemiological studies to provide greater knowledge on each trauma care center situation.

This study aimed to retrospectively assess the epidemiology of facial fractures in an emergency-based hospital setting in Brazil.

2. MATERIAL AND METHODS

This study was approved by the local Ethics Research Committee. (Presentation Certificate of Ethical Appreciation: 51298715.6.0000.0033). Informed consent forms were signed for the study. The study was conducted as per the Helsinki Declaration.

An observational retrospective study with a descriptive and analytical stage was performed through the analysis of electronic medical records (Welfare do Brasil, Campinas-São Paulo). The study population consisted of the electronic medical records of 430 patients aged 1 to 81 years, who underwent surgery to treat facial fractures at the Hospital de Urgências de Goiânia (HUGO-SES/GO), from 20th October 2014 to 20th October 2015. Patients who underwent

conservative treatment or expired before the scheduled surgery were excluded. According to data from the Brazilian Institute of Geography and Statistics (IBGE), the hospital is a reference trauma center responsible for providing care to 1,302,001 inhabitants¹⁴.

The collected information was transcribed to a specific form consisting of the following variables: age, sex, times between injury and surgery, trauma etiology, topography of the fractures, and complications. The data collected were organized in a spreadsheet according to age, forming groups with ages from 0-17, 18-59, and greater than 60 years. Statistical analyses were performed using SPSS Statistics for Windows version 25.0 (Armonk, NY, IBM Corp.). A descriptive analysis of the data was performed, with the values presented in absolute frequencies and percentages. Bivariate tests (Pearson's Chi-square and Fisher's exact tests) were used to determine variables' associations. The significance level was set at 5%.

3. RESULTS

A total of 430 clinical records and 561 facial fractures were included. Trauma occurred more frequently in men (82.6%) than in women, with a ratio of 5:1. A higher frequency was observed among participants in the 18-59 age group, corresponding to 88.4% (380 cases) of all reported cases. In 63% of the cases, facial trauma occurred due to road traffic accidents (n=271), mostly due to motorcycle accidents (n=184, 67.8%) and car accidents (n=52, 19.02%).

The periods between patients' injuries and their surgical interventions ranged from 0 to 141 days, with an average of 8.8 days. Most of the patients (n=270, 62.8%) underwent surgery within 7 days after their trauma.

Regarding topography, the mandible (n=194, 34.6%) was the most common fracture treated surgically, followed by the zygomatic complex (n=150, 26.7%), as shown in Table 1.

Table 1. Demographic characteristics, etiologies of trauma, and times between injury and surgery.

Variables	n	%
Sex		
Male	355	82,6
Female	75	17,4
Age group		
0 to 17 years	45	10,5
18 to 59 years	380	88,4
More than 60 years	5	1,2
Etiology of trauma		
Cold weapons	3	0,7
Others	6	1,4
Accidents with animals	11	2,6
Occupational accidents	16	3,7
Sports accidents	17	4
Gunshot wounds	18	4,2
Falls	34	7,9
Aggression, interpersonal violence	54	12,6
Road traffic accidents	271	63
Time between injury and surgery		
0 to 1 day	53	12,3
2 to 7 days	217	50,5
8 to 14 days	95	22,1

15 to 30 days	51	11,9
More than 30 days	14	3,3
Anatomic site		
Glenoid fossa	1	0,2
Le Fort III	4	0,7
Naso-Orbito-Etmoidal	10	1,8
Orbital	13	2,3
Le Fort II	15	2,7
Frontal	18	3,2
Maxilla	21	3,7
Le Fort I	22	3,9
Soft tissue injuries	25	4,5
Nasal bone	88	15,7
Zygomatic complex	150	26,7
Mandible	194	34,6

The bivariate analysis comparing sex and the anatomic trauma sites showed no significant correlations. A similar result was observed for the distribution of the trauma etiologies between men and women ($P=0.472$) (Table 2).

There was a significant association between the age groups and trauma in mandibular regions ($P=0.011$), in the zygomatic complex ($P=0.002$), orbital regions ($P=0.031$), and soft tissue injuries ($P\leq 0.001$). A higher frequency of facial fractures was observed among participants aged 18 to 59 years, compared to those aged 0-17 and aged 60+ (Table 3).

Table 2. Distribution of trauma according to sites affected and etiologies between men and women.

Anatomic site	Patients (n=430)		P Value
	Men n (%)	Women n (%)	
Glenoid fossa			
Yes	1 (100.0)	0 (0.0)	1.0 ^a
No	354 (82.5)	75 (17.5)	
Le Fort III			
Yes	4 (100.0)	0 (0.0)	1.0 ^a
No	351 (82.4)	75 (17.6)	
Naso-Orbito-Etmoidal			
Yes	9 (90.0)	1 (10.0)	1.0 ^a
No	346 (82.4)	74 (17.6)	
Orbital			
Yes	11 (84.6)	2 (15.4)	1.0 ^a
No	344 (82.5)	73 (17.5)	
Le Fort II			
Yes	13 (86.7)	2 (13.3)	1.0 ^a
No	342 (82.4)	73 (17.6)	
Frontal			
Yes	16 (88.9)	2 (11.1)	0.751 ^a
No	339 (82.3)	73 (17.7)	
Maxilla			
Yes	17 (81.0)	4 (19.0)	0.772 ^a
No	338 (82.6)	71 (17.4)	
Le Fort I			
Yes	21 (95.5)	1 (4.5)	0.147 ^a
No	334 (81.9)	74 (18.1)	
Soft tissue injuries			
Yes	18 (72.0)	7 (28.0)	0.172 ^a
No	337 (83.2)	68 (16.8)	
Nasal bone			
Yes	73 (83.0)	15 (17.0)	1.0 ^a
No	282 (82.5)	60 (17.5)	
Zygomatic complex			
Yes	126 (84.0)	24 (16.0)	0.596 ^b
No	229 (81.8)	51 (18.2)	
Mandible			

	Yes	159 (82.0)	35 (18.0)	0.779 ^b
	No	196 (83.1)	40 (16.9)	
Etiology of trauma				
Cold weapons	3 (100.0)	0 (0.0)	0.472 ^a	
Others	5 (83.3)	1 (16.7)		
Accidents with animals	10 (90.9)	1 (9.1)		
Occupational accidents	16 (100.0)	0 (0.0)		
Sports accidents	16 (94.1)	1 (5.9)		
Gunshot wounds	14 (77.8)	4 (22.2)		
Falls	26 (76.5)	8 (23.5)		
Interpersonal violence	45 (83.3)	9 (16.7)		
Road traffic accidents	220 (81.2)	51 (18.8)		
Total	355 (82,6)	75 (17,4)		

^a Exact Fischer's test, ^b Pearson's Chi-square test

Table 3. Distribution of trauma according to the anatomical sites affected and age groups.

Anatomic site	Age group (n=430)			P Value
	0-17 y n (%)	18-59 y n (%)	Over 60 y n (%)	
Glenoid fossa				
Yes	0 (0.0)	1 (100.0)	0 (0.0)	1.0 ^a
No	45 (10.5)	379 (88.3)	5 (1.2)	
Le Fort III				
Yes	0 (0.0)	4 (100.0)	0 (0.0)	1.0 ^a
No	45 (10.6)	376 (88.3)	5 (1.2)	
Naso-Orbito-Etmoidal				
Yes	2 (20.0)	8 (80.0)	0 (0.0)	0.366 ^a
No	43 (10.2)	372 (88.6)	5 (1.2)	
Orbital				
Yes	3 (23.1)	9 (69.2)	1 (7.7)	0.031 ^a
No	42 (10.1)	371 (89.0)	4 (1.0)	
Le Fort II				
Yes	0 (0.0)	15 (100.0)	0 (0.0)	0.486 ^a
No	45 (10.8)	365 (88.0)	5 (1.2)	
Frontal				
Yes	3 (16.7)	15 (83.3)	0 (0.0)	0.534 ^a
No	42 (10.2)	365 (88.6)	5 (1.2)	
Maxilla				
Yes	1 (4.8)	20 (95.2)	0 (0.0)	0.777 ^a
No	44 (10.8)	360 (88.0)	5 (1.2)	
Le Fort I				
Yes	0 (0.0)	21 (95.5)	1 (4.5)	0.070 ^a
No	45 (11.0)	359 (88.0)	4 (1.0)	
Soft tissue injuries				
Yes	10 (40.0)	15 (60.0)	0 (0.0)	≤0.001 ^a
No	35 (8.6)	365 (90.1)	5 (1.2)	
Nasal bone				
Yes	12 (13.6)	76 (86.4)	0 (0.0)	0.428 ^a
No	33 (9.6)	304 (88.9)	5 (1.5)	

Zygomatic complex				
Yes	6 (4.0)	142 (94.7)	2 (1.3)	0.002 ^a
No	39 (13.9)	238 (85.0)	3 (1.1)	
Mandible				
Yes	12 (6.2)	181 (93.3)	1 (0.5)	0.011 ^a
No	33 (14.0)	199 (84.3)	4 (1.7)	

^a Exact Fischer's test; significance $p < 0.05$.

Trauma involving the soft tissues ($P \leq 0.001$), nasal bone ($P=0.030$), zygomatic complex ($P =0.001$), and mandible ($P \leq 0.001$) were significantly associated with traffic accidents (Table 4 – next page). The postoperative complication rate was 2.6%, and the reasons for these are detailed in Table 5 (next page).

4. DISCUSSION

This study showed that most trauma patients treated at a referral hospital in the Midwest region of Brazil were men and were involved in traffic accidents. Additionally, it was found that traumas occurred mainly in the age group between and 18-59 years and affected the zygomatic complex and the mandible most frequently.

According to the statistical yearbook of the Ministry of Transport and the Ministry of Justice of Brazil, in 2010, 8,006 road traffic accidents were reported in the state of Goiás, corresponding to 4.4% of traffic accidents in the entire country¹⁵. These statistics support the current study findings, in which road traffic accidents (63% of cases) were the most prevalent above all etiologies, and consistent with previously published studies in Brazil^{6-8,11,12}. Regarding sex distribution, facial fractures were proportionally higher among males, with a ratio of 5:1, supporting previous studies^{5,6,12,13}. This result is explained by the fact that men tend to get involved in risky behaviors more often than women¹⁶. Women tend to be more cautious and remain more attentive during activities,⁵ such as driving vehicles.

Although studies have demonstrated a high prevalence of car accidents^{17,18}, the results of this research show a higher rate of motorcycle accidents (67.8%) compared to cars (19.2%). In this regard, it is possible to assume that law enforcement and control have been more effective in reducing car accidents. While reducing car accidents overall, the amount of motorcycle crashes is still a concern for public health in Goiânia city.

These findings are compatible with those of a previous study carried out in the same city by Leles *et al*⁶, in which they had already highlighted an increasing rate of motorcycle accidents. Compared to cars, two-wheeled vehicles are more affordable and have lower maintenance costs.

For this reason, they are the most common type of transportation in Goiânia.

Table 4. Distribution of trauma according to the anatomical sites affected and etiologies.

	Etiology n (%)									P Value
	1	2	3	4	5	6	7	8	9	
Yes	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)	0 (0.0)	0.630 ^a
No	6 (1.4)	34 (7.9)	3 (0.7)	54 (12.6)	16 (3.7)	11 (2.6)	17 (4.0)	270 (62.9)	18 (4.2)	
Le Fort III										
Yes	0 (0.0)	0 (0.0)	0 (0.0)	2 (50.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (50.0)	0 (0.0)	0.471 ^a
No	6 (1.4)	34 (8.0)	3 (0.7)	52 (12.2)	16 (3.8)	11 (2.6)	17 (4.0)	269 (63.1)	18 (4.2)	
Naso-Orbito- Etmoidal										
Yes	1 (10.0)	0 (0.0)	0 (0.0)	1 (10.0)	0 (0.0)	0 (0.0)	1 (10.0)	6 (60.0)	1 (10.0)	0.279 ^a
No	5 (1.2)	34 (8.1)	3 (0.7)	53 (12.6)	16 (3.8)	11 (2.6)	16 (3.8)	265 (63.1)	17 (4.0)	
Orbital										
Yes	0 (0.0)	0 (0.0)	0 (0.0)	1 (7.7)	0 (0.0)	1 (7.7)	1 (7.7)	9 (69.2)	1 (7.7)	0.577 ^a
No	6 (1.4)	34 (8.2)	3 (0.7)	53 (12.7)	16 (3.8)	10 (2.4)	16 (3.8)	262 (62.8)	17 (4.1)	
Le Fort II										
Yes	0 (0.0)	0 (0.0)	0 (0.0)	1 (6.7)	0 (0.0)	1 (6.7)	0 (0.0)	13 (86.7)	0 (0.0)	0.733 ^a
No	6 (1.4)	34 (8.2)	3 (0.7)	53 (12.8)	16 (3.9)	10 (2.4)	17 (4.1)	258 (62.2)	18 (4.3)	
Frontal										
Yes	1 (5.6)	0 (0.0)	0 (0.0)	3 (16.7)	0 (0.0)	1 (5.6)	2 (11.1)	11 (61.1)	0 (0.0)	0.248 ^a
No	5 (1.2)	34 (8.3)	3 (0.7)	51 (12.4)	16 (3.9)	10 (2.4)	15 (3.6)	260 (63.1)	18 (4.4)	
Maxilla										
Yes	0 (0.0)	0 (0.0)	0 (0.0)	1 (4.8)	2 (9.5)	0 (0.0)	0 (0.0)	18 (85.7)	0 (0.0)	0.443 ^a
No	6 (1.5)	34 (8.3)	3 (0.7)	53 (13.0)	14 (3.4)	11 (2.7)	17 (4.2)	253 (61.9)	18 (4.4)	
Le Fort I										
Yes	0 (0.0)	1 (4.5)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	20 (90.9)	1 (4.5)	0.448 ^a
No	6 (1.5)	33 (8.1)	3 (0.7)	54 (13.2)	16 (3.9)	11 (2.7)	17 (4.2)	251 (61.5)	17 (4.2)	
Soft tissue injuries										
Yes	4 (16.0)	6 (24.0)	2 (8.0)	0 (0.0)	14 (3.5)	0 (0.0)	0 (0.0)	10 (40.0)	1 (4.0)	≤0.001^a
No	2 (0.5)	28 (6.9)	1 (0.2)	54 (13.3)	14 (3.5)	11 (2.7)	17 (4.2)	271 (63.0)	18 (4.2)	
Nasal bone										
Yes	0 (0.0)	8 (9.1)	1 (1.1)	17 (19.3)	6 (6.8)	3 (3.4)	4 (4.5)	49 (55.7)	0 (0.0)	0.030^a
No	6 (1.8)	26 (7.6)	2 (0.6)	37 (10.8)	10 (2.9)	8 (2.3)	13 (3.8)	222 (64.9)	18 (5.3)	
Zygomatic complex										
Yes	1 (0.7)	8 (5.3)	0 (0.0)	8 (5.3)	8 (5.3)	2 (1.3)	6 (4.0)	113 (75.3)	4 (2.7)	0.001^b
No	5 (1.8)	26 (9.3)	3 (1.1)	46 (16.4)	8 (2.9)	9 (3.2)	11 (3.9)	158 (56.4)	14 (5.0)	
Mandible										
Yes	0 (0.0)	13 (6.7)	0 (0.0)	29 (14.9)	3 (1.5)	4 (2.1)	4 (2.1)	126 (64.9)	15 (7.7)	≤0.001^b
No	6 (2.5)	21 (8.9)	3 (1.3)	25 (10.6)	13 (5.5)	7 (3.0)	13 (5.5)	145 (61.4)	3 (1.3)	

Table 5. Reasons for postoperative complications.

Complications	Complications	
	n	%
Infection	5	45.6
Technical failure	3	27.4
Ectropion	1	9.0
Diplopia	1	9.0
Enophthalmos	1	9.0

However, they are also more unstable, offering little protection to its riders, thereby increasing the severity of traumas that can occur. These are the possible reasons for the increase in motorcycle accident rates. In Goiânia city, most motorcycle riders ride their motorcycles to work during the day. Therefore, in order to reduce the incidence of maxillofacial fractures resulting from motorcycle accidents, there is a clear need to implement continuous public policies including preventive measures, as well as amplify the application of the aforementioned strict traffic laws during the day.

Facial fractures were more frequent among patients aged 18 to 59 years, comprising the active economic population, which is consistent with previously published literature^{4-6,12,13,19}.

This data is alarming given the possible decline in quality of life due to those injuries and the financial impact caused.

The mandibular fractures (34.6%) were the most frequent lesion sites in the current study. This result is like that found in previous studies^{4, 7, 12} and is possibly related to the high frequency of traffic accidents. In this type of accident, fractures of the lower third of the face are common due to the limited protection offered to this region by personal protective equipment, such as open helmets²⁰.

A limitation of this study was the methodological difficulty in assembling the data that were collected from the medical records in order to be used as appropriate variables. In particular, this dilemma was encountered for the anatomic site of fractures, etiologies, and complications. Owing to the diversity of the complications encountered and the limited number of cases, statistical analysis was not possible for this variable.

This research provides relevant epidemiological data on the prevalence of maxillofacial trauma in the Brazilian Midwest region, especially for traffic accidents. These data can help improve preventive measures, develop public health policies, human

resource training, and allow for optimization of health service resources.

5. CONCLUSION

Most of the accident victims who attended the emergency service were men, aged between 18 and 59 years, who suffered a jaw fracture due to a traffic accident. These data can help improve public health policies and allow for optimization of health service resources.

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