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ORIGINAL ARTICLE

FACIAL TRAUMA EPIDEMIOLOGY: ETIOLOGIC FACTOR RELEVANCE ON LESIONS GRAVITY

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Abstract:

The aims of this study were to describe the epidemiological characteristics of patients treated at a Maxillofacial Surgery service, to know the etiological factors involved in the trauma mechanism of patients under hospital treatment and to relate the importance of these factors in the severity of the injuries. A retrospective study was carried out of 1510 medical records of all patients who were hospitalized with facial trauma in a Midwest region of Brazil trauma referral hospital. Descriptive and comparative statistical analysis were performed using SPSS 18.0 software. Data were compared using the chi-square test, results were considered statistically significant for values of $p < 0.05$. The mean age of the patients was 32.61 (SD = 17.08) and the extremes of age ranged from 7 months of life to 94 years. Men were more affected by facial trauma than women, with a male:female ratio of 4.3:1 and means of transport were the most prevalent etiological factor (53.3%). Motorcycle's accidents being associated with a higher prevalence of combined fractures ($P < 0.01$), while sports accidents had a higher incidence of single injuries. Based on the results, it is possible notice that some activities still have a difference in prevalence between men and women and that this affects the exposure to etiological factors of facial trauma. Etiological factors may be associated with the extent and severity of injuries resulting from facial trauma.

Keywords: Maxillofacial Injuries; Trauma Centers; Epidemiology.

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INTRODUCTION

Trauma is an injury caused by a violent action, usually from physical nature external to the organism. As more than half of the injuries and deaths caused by trauma are preventable, it should be considered a disease and not an accident. [1]

Each year 5.8 million people die because of traumatic causes, 32% more than deaths from AIDS, malaria and tuberculosis combined. These numbers make trauma a public health problem and are among top 10 causes of death worldwide. In Brazil, at some regions, trauma is the main cause of death [2,3].

Facial trauma corresponds to 7.4% - 8.7% of emergency care and stands out among the others because of the direct repercussions on the patient's quality of life through its emotional, aesthetic and functional aspects and the possibility of permanent deformities. In this context, the economic impact of both the patient and the health system is highlighted, with expenses ranging from hospitalization to rehabilitation [4,5].

The epidemiological profile of studies on facial injuries is influenced by geographic location, socio--economic-cultural aspects, environmental factors, age, gender and the investigation period. Road traffic accidents, physical assaults, gun-related, domestic accidents, work accidents and sports injuries are the most common causes of traumatic injuries [6-9].

Data knowledge related to facial injuries is indispensable for assistance in emergency care, in order to enable timely and effective conducts and treatments or to support the creation of preventive, educational, technical and public policy measures aiming to reduce impacts of the trauma consequences [4,5,10]. Thus, the present study aims to characterize the epidemiological profile of patients assisted by the Maxillofacial team at an emergency hospital in the city of Goiânia, Brazil.

MATERIALS AND METHODS

A retrospective study was carried out collecting data from electronic medical records of patients from July 2015 to July 2018 in a referral hospital for highly complex injuries treatments in the Midwest region of Brazil (Governador Otávio Lage de Siqueira State Emergency Hospital of the Northwest Region of Goiânia - HUGOL). Medical records of patients assisted by the Oral and Maxillofacial Surgery (OMFS) team that generated authorization for hospitalization were included and those which included patients diagnosed with odontogenic and non-odontogenic infectious processes were excluded.

Data were collected regarding sex, age, reason for care, etiological factors, diagnosis, types of facial fractures (isolated or combined). Data were tabulated and grouped by categories. Etiological factors were identified and grouped into 7 main categories: traffic accidents, physical aggression, falls, gun-related, sports accidents and others. Traffic accident category was further divided into motorcycle accidents, automobile accidents, cycling accidents, run over and others. Lesions were classified into zygomatic bone fractures, mandible fractures, nasal bones fractures and others. In addition, fractures were also classified in single, when the patient had only one injury or combined, when a single patient presented more than one injury.

Descriptive and comparative statistical analysis were performed using SPSS 18.0 software. Data were compared using the chi-square test, results were considered statistically significant for values of $p < 0.05$. This study was approved by Leide das Neves Ferreira Research Ethics Committee (nº 2,488,563/17).

RESULTS

A total of 1.510 patients with facial trauma were hospitalized and evaluated by the OMFS team during the period from July 2015 to July 2018, totaling 1.640 face fractures (since a single patient can present single or combined fractures). The average age of the participants in years was 32.61 (± 17.08) and the extremes of age ranged from 7 months of life to 94 years. Table 1 presents sociodemographic and trauma etiology data.

Table 1. Sociodemographic data of 1510 facial trauma patients treated at HUGOL from July 2015 to July 2018.

Variable	n (%)	
Age	Average	32,61 years
	Standard Deviation	17,08 years
	Minimum	7 months
	Maximum	94 years
Sex	Male	1225 (81,1)
	Female	285 (18,8)
Etiological Factors	Traffic Accident	805 (53,3)
	Physical aggression	231(15,3)
	Fall	192(12,7)
	Gun-related accidentes	99 (6,6)
	Animal-related accidents	51 (3,4)
	Sports acidentes	43 (2,3)
	Others	89 (5,9)

Men were more affected by facial trauma than women, with a male:female ratio of 4.3:1, with the third decade of life being the most affected, reaching a male:female ratio of 6.3:1 in this age group (20-29 years) (Table 2).

Table 2. Distribution of 1510 patients with facial trauma treated from July 2015 to July 2018 according to sex and age group.

Age	Sex Distribution		
	Men	Women	Men:Women Ratio
0 – 9	79	43	1.8
10 – 19	132	42	3.1
20 – 29	366	55	6.6
30 – 39	267	68	3.9
40 – 49	176	37	4.7
50 – 59	112	17	6.5
60 – 69	60	12	5
70 – 79	22	5	4.4
80 – 89	8	6	1.3
90 – 94	3	0	3
Total	1225	285	4.3

Among the etiological factors, the most prevalent was related to means of transport, comprising 53.3% of the studied population (n = 805), followed by physical aggression with 15.2% (n = 231) and falls 12.7% (n = 192). In relation to means of transport, 61.6% (n = 496) of accidents were caused by motorcycles, followed by cars 21.6% (n = 174) and by cycling accidents 9% (n = 73). Table 3 shows the sample distribution according to the etiological factors.

Table 3. Classification of patients with facial trauma victims of traffic accidents treated at HUGOL from July 2015 to July 2018.

Type of Traffic Accident	(%)
Motorcycle accident	496 (61,6)
Car accident	174 (21,6)
Cycling accident	73 (9)
Run Over	58 (7,2)
Others	4 (0,6)
Total	805 (100)

Table 4 shows the sample distribution regarding diagnosis, 1.640 facial fractures were identified, in which the zygomatic bone fracture was the most frequent (n = 542, 33.04%).

Table 4. Distribution of 1510 facial trauma patients treated from July 2015 to July 2018 according to the diagnosis.

Diagnosis	n	%
Zigomatic Fracture	542	33,1%
Mandible Fracture	519	31,6%
Nose Fracture	320	19,5%
Others	259	15,8%
Total	1640	100%

The data on the etiological factors were related to gender (Table 5) and a higher frequency of men affected was identified, with a statistically significant difference in the following factors: animal-related accidents, motorcycle accidents, sports accidents and occupational accidents. Women were more frequent, with a statistically significant difference, in car accidents, falls and domestic accidents.

Table 5. Distribution of 1510 facial trauma patients according to gender and etiological factors

Etiological Factors		**Men (n)**	**Women**	**X^2**	**p**
Animal-related accident	Yes	47	4	4,19	0,04
	No	1178	281		
Motorcycle accident	Yes	420	76	6,08	0,01
	No	805	209		
Car accident	Yes	116	58	26,85	<0,01
	No	1109	227		
Physical aggression	Yes	195	36	1,92	0,165
	No	1030	249		
Run Over	Yes	46	12	0,13	0,719
	No	1179	273		
Fall	Yes	144	48	5,391	0,02
	No	1081	237		
Gun-related accident	Yes	83	16	0,509	0,476
	No	1142	269		
Domestic Accident	Yes	7	5	4,104	0,043
	No	1218	280		
Sports Accident	Yes	43	0	10,297	<0,01
	No	1182	285		
Occupational Accident	Yes	16	0	3,762	0,052
	No	1209	285		

In this study, patients with single fracture in one of the facial bones were compared with patients with combined fractures, in relation to gender, no statistically significant difference was observed ($X^2 = 1.126$; $p = 0.289$). Table 6 presents data on single or combined fractures related to the etiological factor. We observed a higher prevalence of combined fractures with a statistically significant difference only for motorcycle accidents. For sports accidents, single fracture has a higher prevalence with statistically significant differences.

Table 6. Classification of 1510 patients with facial trauma victims of traffic accidents according to single or combined fractures and factors.

Etiological Factors		Single Fracture	Combined Fractures	X^2	p
Animal-related accident	Yes	38	13	0,001	0,749
	No	1254	374		
Motorcycle accident	Yes	337	159	16,008	<0,01
	No	786	228		
Car accident	Yes	123	51	1,398	0,237
	No	1000	336		
Physical aggression	Yes	178	53	1,032	0,310
	No	945	334		
Run Over	Yes	44	14	0,070	0,791
	No	1079	373		
Fall	Yes	150	42	1,626	0,202
	No	793	345		
Gun-related accident	Yes	80	19	2,303	0,129
	No	1043	368		
Domestic Accident	Yes	8	4	0,377	0,539
	No	1115	383		
Sports Accident	Yes	42	1	12,610	<0,01
	No	1081	386		
Occupational Accident	Yes	12	4	0,003	0,954
	No	111	383		

DISCUSSION

Epidemiological studies are essential for establishing guidelines to prevent facial trauma. In this study, traffic-related accidents stand out, which represent more than 50% of the sample. In addition, there are factors that modify the severity of the trauma, in this study it was observed that motorcycle accidents had a higher incidence of combined fractures - multiple fractures of the face -, which is directly related to the type and intensity of the impact.

Motorcycles are widely used alternatives to escape congestion in large urban centers. Although the use of helmets is mandatory as protective equipment, many motorcyclists use it inappropriately due to the lack of inspection [11]. In many studies, among accidents caused by means of transport, motorcycles occupy a higher prevalence of facial fractures [4,11-13].

There are numerous variables that interfere in the epidemiology of trauma, such as socioeconomic, geographic and cultural factors, means of transport, legislation and public policies that can expose specific populations to the most diverse types of trauma [11]. The present study was carried out in a single trauma center, however, HUGOL is a reference hospital for the treatment of trauma in the entire central-west region of Brazil. Our research showed a strong prevalence of men involvement in maxillofacial trauma. This result is probably since men participate more actively in social activities and are consequently more susceptible to traffic accidents, interpersonal violence, accidents at work and during the practice of sports. These results are also noted in several other regions of the world [12,14-17].

This study results show a high prevalence of young adults affected by facial trauma among all other age groups. These findings reflect the fact that young adults, because they are more fearless, are more likely to being involved in risky situations by alcohol abuse, dangerous driving and interpersonal violence [14,17-19].

The main etiological agent of facial fractures corresponded to accidents with means of transport (47.5%), followed by physical aggressions (13.5%). There is a tendency to reduce traffic accidents in many countries due to the application of stricter laws regarding the use of helmets and implementation of driving under the influence laws [12]. In metropolitan areas, many studies show that physical aggression is the main cause of facial fractures [5,6,9,10], however some studies have still shown that accidents with means of transport are still the most common causes [7, 11,20]. Studies with specific populations, such as children and the elderly, showed falls as the main etiological factors [18,21,22] as well as sports accidents [15].

The fracture sites with the highest frequency of involvement vary according to the survey period, geographic location and trauma mechanism. In the present study, fractures of the zygomatic bone were the most frequent and similar results can be found in the literature [14,16]. In contrast, other researchers report mandibular [5,6,8,12,20,23] and nasal bones fractures [7,15,18,24,25] as the main site affected.

These results emphasize the need for public policies looking to make population aware of traffic laws and the use of personal protective equipment. The study and dissemination of data related to the epidemiology of facial trauma is extremely important for the development of new guidelines in order to prevent new injuries, education and systematization of care.

The results presented lead us to conclude that accidents involving means of transport were the most common cause associated to facial fractures of patients seen at the Governador Otávio Lage de Siqueira State Emergency Hospital of the Northwest Region of Goiânia (HUGOL), motorcycle accidents have an increased likelihood of resulting in combined injuries. Sex and etiological factors have an important relation to the role and activities of men and women in society, as well as the characteristics of facial trauma. Men were more affected than women, especially young adults (20-29 years), with the most fractured bones being the zygomatic bone followed by the mandible and later by the bones of the nose.

REFERENCES

1. Galvagno Junior SM, Nahmias JT, Young DA. Advanced trauma life support® update 2019: management and applications for adults and special populations. Anesthesiol Clin. 2019 Mar;37(1):13-32.
2. Shakur H, Roberts I, Piot P, Horton R, Krug E, Mersch J. A promise to save 100,000 trauma patients. Lancet. 2012 Dec;380(9859):2062-3.
3. Santos AMB, Meurer E. Trauma de face: eventos agudos na atenção básica. Florianópolis (SC): Universidade Federal de Santa Catarina (UFSC); 2013.
4. Vasconcelos BG, Carvalho e Silva LA, Silva Júnior AF, Mohn Neto CR, Pereira CM. Epidemiological profile of patients with facial fractures treated at one hospital in Goiania, Goiás. J Heal Sci Inst. 2014 Jul/Set;32(3):241-6.
5. Massuia PDS, Silveira FGL, Assunção LF, Garcia ERBR, Sanches VM. Epidemiology of facial trauma at the plastic surgery and burns service of the Santa Casa de Misericórdia de São José do Rio Preto. Braz J Plast Sug. 2015;29(2):221-6.
6. Carvalho TBO, Cancian LRL, Marques CG, Piatto VB, Maniglia JV, Molina FD. Six years of facial trauma care: an epidemiological analysis of 355 cases. Braz J Otorhinolaryngol. 2010 Sep/Oct;76(5):565-74.
7. Faverani LP, Jardim ECG, Gulinelli JL, Queiroz TP, Panzarini SR, Garcia Junior IR, et al. Traumas faciais: estudo retrospectivo de 1190 casos na região de Araçatuba. Rev Bras Cir Cabeça Pescoço. 2009 Jan/Mar;38(1):22-5.
8. Scannavino FLF, Santos FS, Novo Neto JP, Novo LP. Epidemiological analysis of maxillofacial trauma of an emergency service. Rev Cir Traumatol Buco-Maxilo-Fac. 2013 Oct/Dec;13(4):95-100.
9. Krause RGS, Silva Junior ANS, Schneider LE, Aguiar RC, Smidt R. Etiologia e incidência das fraturas faciais: estudo prospectivo de 108 pacientes. Rev Cir Med Biol. 2004;3(2):188-93.
10. Filho Neto AVR, Macedo JLS, Silva RV, Dantas CCB, Santos CP, Vieira PB, et al. Epidemiology of patients with facial fractures treated by the plastic surgery team in an emergency room in the Federal District of Brazil. Rev Bras Cir Plást. 2014;29(2):227-31.
11. Ribeiro ALR, Gillet LCS, Vasconcelos HG, Rodrigues LC, Pinheiro JJV, Alves Junior SM. Epidemiology of patients with facial fractures treated by the plastic surgery team in an emergency room in the Federal District of Brazil. Braz J Plast Surg. 2015;29(2):227-31.
12. Kostakis G, Stathopoulos P, Dais P, Gkinis G, Igoumenakis D, Mezitis M, et al. An epidemiologic analysis of 1,142 maxillofacial fractures and concomitant injuries. Oral Surg Oral Med Oral Pathol Oral Radiol. 2012 Nov;114(5 Suppl):S69-S73.
13. Bellamy JL, Mundinger GS, Reddy SK, Flores JM, Rodriguez ED, Dorafshar AH. Le Fort II fractures are associated with death: a comparison of simple and complex midface fractures. J Oral Maxillofac Surg. 2013 Sep;71(9):1556-62.
14. Arangio P, Vellone V, Torre U, Calafati V, Capriotti M, Cascone P. Maxillofacial fractures in the province of Latina, Lazio, Italy: review of 400 injuries and 83 cases. J Craniomaxillofac Surg. 2014 Jul;42(5):583-7.
15. Povolotskiy R, Youssef P, Kaye R, Paskhover B. Facial fractures in young adults: a national retrospective study. Ann Otol Rhinol Laryngol. 2019 Jun;128(6):516-23.
16. Al-Bokhamseen M, Salma R, Al-Bodbaij M. Patterns of maxillofacial fractures in Hofuf, Saudi Arabia: a 10-year retrospective case series. Saudi Dent J. 2019 Jan;31(1):129-36.
17. Cavalcante GMS, Bernardino ÍM, Nóbrega LMD, Ferreira RC, Ferreira E, Ferreira E, et al. Facial injuries and the gender issue: expressions of violence in a metropolitan region of Northeastern Brazil. Braz Dent J. 2020 Sep/Oct;31(5):548-56.
18. Motta MM. Análise epidemiológica das fraturas faciais em um hospital secundário. Rev Bras Cir Plást. 2009;24(2):162-9.
19. Eggensperger NM, Danz J, Heinz Z, Iizuka T. Occupational maxillofacial fractures: a 3-year survey in central Switzerland. J Oral Maxillofac Surg. 2006 Feb;64(2):270-6.
20. Freitas DA, Caldeira LV, Silva ADM, Freitas VA. Estudo epidemiológico das fraturas faciais ocorridas na cidade de Montes Claros/MG. Rev Bras Cir Cabeça Pescoço. 2009;38:113-5.
21. Soller ICS, Poletti NAA, Beccaria LM, Squizatto RH, Almeida DB, Matta PRA. Epidemiological profile of patients with facial injuries treated in an emergency hospital. Rev Min Enferm. 2016;20:e935.
22. Gassner R, Tuli T, Hächl O, Rudisch A, Ulmer H. Cranio-maxillofacial trauma: a 10 year review of 9,543 cases with 21,067 injuries. J Craniomaxillofac Surg. 2003 Feb;31(1):51-61.
23. Bresaola MD, Assis DSFR, Ribeiro Júnior PD. Avaliação epidemiológica de pacientes portadores de traumatismo facial em um serviço de pronto-atendimento da Região Centro-Oeste do Estado de São Paulo. Rev Odontol. 2005;7(3):50-7.

24. Macedo JLS, Camargo LM, Almeida PF, Rosa SC. Changing in the aetiology of facial trauma of patients attended to emergency department in Distrito Federal. Rev Bras Cir Plást. 2007;22(4):209-12.

25. Fama F, Cicciu M, Sindoni A, Nastro-Siniscalchi E, Falzea R, Cervino G, et al. Maxillofacial and concomitant serious injuries: an eight-year single center experience. Chin J Traumatol. 2017 Feb;20(1):4-8.