

# Epidemiological study of facial fractures at the Oral and Maxillofacial Surgery Service, Santa Casa de Misericórdia Hospital Complex, Porto Alegre – RS – Brazil

## *Levantamento epidemiológico das fraturas de face do Serviço de Cirurgia e Traumatologia Bucomaxilofacial da Santa Casa de Misericórdia de Porto Alegre – RS*

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### ABSTRACT

**Objectives:** to investigate the incidence and etiology of face trauma with diagnosis of facial fracture treated at the Buccomaxillofacial Surgery and Traumatology Service of the Santa Casa de Misericórdia Hospital Complex in Porto Alegre. **Methods:** we conducted a cross-sectional, retrospective epidemiological study of 134 trauma victims with 153 facial fractures. **Results:** the male gender was the most affected (86.6%) and the incidence was higher in the age group from 21 to 30 years. The main etiology was assault (38.8%), followed by motor vehicle accidents (14.2%), motorcycle accidents (13.4%), falls (9%), road accidents (6.7%), sports accidents (5.2%), work accidents (5.2%), firearm injuries (4.5%) and cycling accidents (3%). The most frequent fractures were those of the zygomatic complex (44.5%), followed by fractures of the mandible (42.5%), maxillary bone (5.2%), nasal bones (4.5%) and zygomatic arch (3.3%). **Conclusion:** the fractures of the zygomatic complex and the mandible were the ones with the highest incidence in the facial traumas, having physical assaults as their main cause.

**Keywords:** Epidemiology. Facial Injuries. Oral and Maxillofacial Surgeons.

### INTRODUCTION

Trauma is the public health problem with the greatest potential to be prevented and treated. Thus, understanding the cause and severity of maxillofacial lesions may contribute to the establishment of clinical and research priorities for the effective treatment and prevention of these injuries<sup>1</sup>. Trauma is among the leading causes of death and morbidity in the world, accounting for 7.4% to 8.7% of emergency care<sup>2</sup>. The increase in the level of life expectancy, urban growth and its forms of locomotion, unemployment crises and the consumption of alcohol and drugs in the different regions, alter the age, gender, etiology and frequency of facial lesions<sup>3</sup>.

Studies aimed at investigating the treatments and complications of facial trauma allow quantification and qualification of such lesions' sequelae<sup>4</sup>. The main causes of facial fractures include auto accidents and assaults. Other causes are falls, sports accidents and accidents at work<sup>5-7</sup>. In some countries, the reduction of

motor vehicle accidents by the introduction of safety measures and legislation to punish vehicle-driving irregularities has increased physical assaults and sports accidents to the condition of main agents causing traumatic buccomaxillofacial injuries<sup>8</sup>. Thus, it is evident the need for campaigns to prevent the main etiological agents of facial trauma, to contribute to the reduction of this type of occurrence.

The objective of this study is to determine the incidence and etiology of facial traumas with diagnosis of facial fractures seen at the Buccomaxillofacial Surgery and Traumatology Service (CTBMF) of the Holy Home of Mercy Hospital Complex of Porto Alegre, RS, Brazil.

### METHODS

This work was accomplished after approval by the Ethics in Research Committee of the Holy Home of Mercy of Porto Alegre, under the protocol n° 460/09.

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This is a retrospective, cross-sectional, epidemiological study of 134 patients with 153 facial fractures treated from January 2004 to December 2008. The data evaluated considered the etiological agent of the lesion, age and gender, as well as the fractures' locations.

We divided the etiological agents into nine groups: aggression, fall, automobile accidents, cycling accidents, motorcycle accidents, sports accidents, work accidents, firearm injuries and run-overs.

We classified fractures of the facial skeleton into mandibular bone, zygomatic complex, maxillary bones, nasal bones and zygomatic arches<sup>9,10</sup>. We included orbital fractures in the subgroup of fractures of the zygomatic complex, as it participates in the orbit floor, as well as in its lateral wall<sup>11</sup>. We included dento-alveolar fractures in the group of fractures of the bone corresponding to the fractured arch, and we excluded the exclusively dental fractures from the statistics.

We analyzed the data collected in the medical charts and transposed them to specific records, being one record for each chart. We extracted the following data: patient identification, age group, gender, etiological agent of facial fracture and facial fracture classification. We performed a descriptive analysis of the data, calculating frequency and percentage for categorical variables, and mean and standard deviation for quantitative variables. To identify the factors associated with the trauma site, we used the ANOVA test with Tukey's multiple comparisons for the quantitative variables and the chi-square or Fisher's exact test for categorical variables. We analyzed data in the SPSS 12.0 software and the minimum level of significance was 5%.

## RESULTS

Regarding the profile of the patients treated, the male gender was the most affected, representing 86.6% of face fractures, when compared with the female one (13.4%), establishing a ratio of approximately 6:1. Regarding the distribution of frequencies and percentages referring to the age groups, we verified that the most affected age group was from 21 to 30 years old, with 41 cases (30.6%), followed by the age

group from 31 to 40 years, with 38 patients (28.4%).

Regarding the etiological agents, we recorded 52 cases (38.8%) of assault, 19 cases of auto accident (14.2%), 18 motorcycle accidents (13.4%), 12 cases of fall (9%), nine run-overs (6.7%), seven sports accidents (5.2%), seven work accidents (5.2%), six cases of firearm injury (4.5%) and four cases of cycling accident (3%) (Table 1).

**Table 1.** Frequency and percentage of facial fractures according to etiological agent.

Etiologic Agent	Frequency	%
Automobile accident	19	14.2
Bicycle accident	4	3.0
Sports accident	7	5.2
Motorcycle accident	18	13.4
Work accident	7	5.2
Assault	52	38.8
Run-over	9	6.7
Firearm	6	4.5
Fall	12	9.0
Total	134	100

Fonte: dados obtidos nos prontuários do Serviço de CTBMF Santa Casa - POA, 2009.

In the distribution of patients with facial fractures according to the etiological agent and in relation to the mean age, we verified, through the Analysis of Variance complemented by the Tukey's Multiple Comparison Test, that patients with face fractures due to sports accidents were younger (24.86 years) than patients who had face fractures due to work accidents (47 years) or fall. The other etiologies did not differ as for the age (Table 2). We grouped automobile accidents, motorcycle accidents, cycling accidents and run-overs in the item traffic accidents.

Of the 153 facial fractures, 68 (44.5%) occurred in the zygomatic complex, 65 (42.5%) in the mandible, eight (5.2%) in the maxillary bone, seven (4.5%) in the nasal bones and in the zygomatic arch we recorded five fractures (3.3%) (Table 3). Regarding the number of facial fractures in both males and females, the mandibular

bone was the most affected. None of the types of facial fractures assessed in this study showed gender preference, according to the chi-square and Fisher's exact tests.

**Table 2.** Distribution of patients with facial fractures according to etiological agents and mean age.

Etiologic Agent	Age group (years)		
	N	Average	Standard Deviation
Traffic accident	50	32.08	14.042
Sports accident	7	24.86	5.872
Work accident	7	47.00	11.240
Assault	52	34.56	11.823
Firearm	6	29.00	5.831
Fall	12	42.33	13.547
Total	134	34.22	13.119

Fonte: dados obtidos nos prontuários do Serviço de CTBMF Santa Casa - POA, 2009.

Table 4 shows the distribution of facial fractures according to age group. We found no significant difference in this assessment.

**Table 3.** Distribution of frequencies and percentages of facial fractures.

Type of fracture	Frequency	%
Zygomatic Complex	68	44.5
Mandible	65	42.5
Maxilla	8	5.2
Nasal Bones	7	4.5
Zygomatic Arch	5	3.3

Fonte: dados obtidos nos prontuários do Serviço de CTBMF Santa Casa - POA, 2009.

**Table 4.** Distribution of facial fractures according to age group.

Type of fracture	Age (in years)						Total
	11-20	21-30	31-40	41-50	51-60	61-70	
Zygomatic Complex	9	16	19	11	9	4	68
Mandible	8	23	21	8	2	3	65
Maxilla	0	1	3	1	2	1	8
Nasal Bones	3	2	1	1	0	0	7
Zygomatic Arch	0	1	3	0	1	0	5

Fonte: dados obtidos nos prontuários do Serviço de CTBMF Santa Casa - POA, 2009.

With respect to the frequency and percentage of the etiological agent related to the facial fracture region, the Fisher's exact test showed no significant difference in fracture type according to etiology. Regarding gender and etiological agent, we observed that men presented more fractures due to assaults (42.2%), while women had more fractures due to run-overs (22.2%) and falls (27.8%).

## DISCUSSION

The results of an epidemiological survey of face traumas of a population should be evaluated accor-

ding to a series of variables related to individuals and the region studied. Ellis *et al.*<sup>12</sup> point out that the cause of the lesion and the geographical area where it occurred, the socioeconomic level of the population, the study period and the population mobility can alter results and show the most varied trauma presentations. Data obtained in this study revealed that the two main etiological factors of facial fractures are assaults and traffic accidents. Three decades ago, the studies pointed to motor vehicle accidents as the main cause of facial trauma<sup>9,10</sup>. However, current research in Brazil shows an increasing participation of physical assault as an etiological factor of facial trauma due to the increase in urban violence,

which, among other problems, is associated with the socioeconomic and emotional conflicts to which many individuals are subjected, especially the youngest<sup>6,11</sup>.

Public actions such as speeding control and severe punishment for drunk drivers, as well as the introduction of safety devices such as seat belts and helmets, air bags, side protection bars and the evolution of the automobile industry as a whole are responsible for decreasing the number of facial traumas due to motor vehicle accidents<sup>10,13</sup>. Our results are in agreement with other evidence in the literature reporting that assaults were the main cause of facial fractures<sup>3,11,14-19</sup>. In the present study, assaults resulted in 38.8% of the cases, excluding gunshot wounds.

The second most involved etiological agent was automobile accidents, accounting for 14.2% of facial fractures, being in accordance with the literature. When studied in conjunction with run-overs, motorcycle accidents and cycling accidents, that percentage rises to 37.3%. These data show a worrying reality, since even when all types of traffic accidents were present, the facial trauma index was still lower than that of assaults<sup>16</sup>. Other studies, however, still point car accidents as the most frequent etiological agent<sup>3,20-23</sup>. This may be due to the inclusion of patients who were victims of facial trauma in the eighties and nineties, when the use of protective equipment in vehicles was not mandatory, especially in Brazil<sup>10,13</sup>.

According to Adebayo *et al.*<sup>5</sup>, the etiologies of face traumas vary with the socioeconomic conditions of each region. Studies carried out in different regions report divergences regarding the main etiological factor. Thus, Thomson *et al.*<sup>23</sup> verified that most facial fractures were caused by falls and Subhashraj, Ramkumar and Ravindran<sup>24</sup> concluded that the motorcycle accident was the main etiological factor. In our study, these agents represented the fourth and third causes of facial fracture, respectively.

Accidents at work were the etiological agent with the highest mean age (47 years), while sports accidents had the lowest one (24.86 years). Fall is the main mechanism of trauma in the age group over 40 years, and is usually related to the presence of multiple diseases<sup>9,19,25</sup>. However, Macedo *et al.*<sup>11</sup> stated that the fall proved to be an important trauma mechanism

at the extremes of age. Karyouti<sup>26</sup> reported that children are constantly engaged in sports activities and risky exercise, without the use of appropriate protective equipment and away from the supervision of those responsible, contributing to the increase in the number of facial fractures. Since the care for children in the facility where we conducted this study is restricted, we could not confront these data<sup>6,27</sup>.

Regarding age, the studied sample revealed that the highest prevalence of facial fractures occurs in the age group of 21 to 30 years and from 31 to 40 years, unlike other studies in which the predominant age group was from 61 to 70 years old<sup>5,9,15,17,20-23,28-34</sup>. For Reis *et al.*<sup>14</sup>, the most affected age group was 11 to 30 years. This is due to the fact that in this age group individuals are more exposed to the risk factors, since they are in full physical and professional activity<sup>7</sup>. Evidence in the literature reveals a high number of fractures and facial trauma caused by sports, among them soccer, hockey, rugby and wrestling, which brings into question the incentive to use personal protective equipment<sup>7</sup>.

Fractures of the zygomatic complex were responsible for 44.5% of the total fractures in this study, followed by mandible fractures, with 42.5%, both in agreement with the reviewed literature<sup>5,20,21-23,26,28,30,31,34</sup>. However, there is great disagreement with the researched authors, the nose bone fractures being more prevalent in several studies<sup>17,29,32</sup>. As for Alvi, Doherty and Lewen<sup>16</sup>, orbital fractures were the most prevalent.

The relationship between the type of fracture and the etiology of trauma showed no difference in this study. Some works have found that most mandible fractures are the result of physical assault, traffic accidents, gunshot wounds, accidents with industrial workers and sports accidents<sup>7,19</sup>. According to Greenberg and Haug<sup>25</sup>, assaults cause more fractures of the mandible, zygomatic complex and nose bones, whereas motor vehicle accidents promote more fractures in the maxillary bones.

As in most studies, our work showed a predominance of facial fractures in men<sup>5,9,11,15,20,34</sup>. Thomson *et al.*<sup>23</sup>, however, identified the female gender as more prevalent. We observed a difference in etiology according to gender, in which men have more fractu-

res due to assaults (42.2%), while women have more fractures due to run-overs (22.2%) and falls (27.8%).

Silva<sup>34</sup> emphasizes that trauma should not be seen only as a medical problem, but also a social and economic one. Costs incurred in providing care to victims by health workers, damage to property involved at the time of trauma, loss of wages and permanent or transient disabilities often lead to difficulties in the social reintegration of victims and their return to the job market. All these factors, added to the familiar incon-

veniences and psychological wear and tear on patient care reveal a much greater repercussion of this disease, which deserves constant attention by health institutions that provide assistance to traumatized patients.

This research provides data for a better understanding of the facial fractures' main etiological agents and the most affected bones in the studied population, being of fundamental importance for the planning, organization and improvement of care of such patients.

## R E S U M O

**Objetivos:** pesquisar a incidência e etiologia dos traumas de face com diagnóstico de fratura facial atendidos no Serviço de Cirurgia e Traumatologia Bucomaxilofacial do Complexo Hospitalar Santa Casa de Misericórdia de Porto Alegre. **Métodos:** estudo epidemiológico, transversal, retrospectivo de 134 pacientes vítimas de trauma com 153 fraturas faciais. **Resultados:** o gênero mais acometido foi o masculino (86,6%) e sua incidência foi maior na faixa etária dos 21 aos 30 anos. A principal etiologia foi a agressão (38,8%), seguida de acidentes automobilísticos (14,2%), acidentes motociclísticos (13,4%), quedas (9%), atropelamentos (6,7%), acidentes esportivos (5,2%), acidentes de trabalho (5,2%), ferimentos por arma de fogo (4,5%) e acidentes ciclisticos (3%). As fraturas mais frequentes foram as do complexo zigomático (44,5%), seguidas das fraturas da mandíbula (42,5%), osso maxilar (5,2%), ossos próprios nasais (4,5%) e arco zigomático (3,3%). **Conclusões:** as fraturas do complexo zigomático e da mandíbula foram as de maior incidência nos traumas de face, e tiveram como principal causa as agressões físicas.

**Descritores:** Epidemiologia. Traumatismos Faciais. Cirurgias Bucomaxilofaciais.

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