Maxillofacial injuries and dental trauma in patients aged 19-80 years, Recife, Brazil

A. Leite Cavalcanti\textsuperscript{a}, P.K. Medeiros Bezerra\textsuperscript{b}, D. Moraes de Oliveira\textsuperscript{c} and A.F. Granville-Garcia\textsuperscript{a}

\textsuperscript{a}Professor, Department of Pediatric Dentistry, School of Dentistry, State University of Paraíba, Campina Grande, Brazil.
\textsuperscript{b}Undergraduate student, Department of Pediatric Dentistry, School of Dentistry, State University of Paraíba, Campina Grande, Brazil.
\textsuperscript{c}Post-graduate student, Bucmaxillofacial Surgery and Traumatology Program, School of Dentistry, University of Pernambuco, Camaragibe, Brazil.

\textsuperscript{*}Correspondence: E-mail: dralessandro@ibest.com.br (A. Leite Cavalcanti).

\textbf{INFORMACIÓN DEL ARTÍCULO}

\textbf{Historia del artículo:}
Recibido el 19 de marzo de 2008
Aceptado el 22 de diciembre de 2009

\textbf{Keywords:}
Epidemiology;
Surgery;
Oral;
Jaw fractures

\textbf{ABSTRACT}

\textbf{Aim:} A retrospective study was undertaken to assess causes of maxillofacial trauma in Recife, Pernambuco, Brazil.

\textbf{Method:} A review of 186 patients with maxillofacial injuries aged 19 and 83 years old seen and treated at the Hospital da Restauração between January and December 2006 was conducted and were analyzed according to age, sex, etiology, site of fracture, dentoalveolar trauma and alcohol abuse. Analysis was made in Epi Info using the Chi-square and Fisher’s Exact Tests.

\textbf{Results:} It was found that maxillofacial injuries were most frequent in males (89.2%) and in the 19-28 year age group (46.8%). Traffic accidents/motorcycle (23.7%) and physical violence (20.4%) were the most common etiological factor. Facial fractures were detected in 90.9% and a statistically significant difference between sex and facial fracture was found ($p = 0.000$). The most common facial fracture was maxilla (29.1%), followed by the mandible (27.5%). A positive association between the presence of facial fracture and alcohol consumption was observed ($p = 0.002$). Dentoalveolar trauma was present in 7.5% of patients.

\textbf{Conclusion:} The incidence of facial fractures in Brazilian population is similar than previously reported elsewhere. There were most common in male patients, mainly due to traffic accidents/motorcycle and physical violence.
Introduction

The human face constitutes the first contact point in several human interactions, thus injuries and/or mutilation of the facial structures may have a disastrous influence on the affected person\(^1\). There are numerous published reports on the incidence of maxillofacial injuries in different countries\(^2\)–\(^8\).

Road traffic accidents, assaults and fights, falls, sports injuries, industrial accidents, home accidents and domestic violence, gunshot/firearm injuries and animal bites/accidents are the commonly recognized and reported etiological factors\(^1\),\(^3\),\(^6\),\(^9\).

These etiologic factors are influenced by such factors as geography, social trends, alcohol and drug abuse, road traffic legislation, and seasons of the year\(^10\).

In the more developed countries of Europe, violence followed by road crashes are the predominant causes while in the developing world the causative factors are reversed with most being the result of road crashes\(^2\).

The age distribution of persons sustaining cranio-maxillofacial injuries differs from one country to another\(^10\). The mean age of presentation is between second and third decades of life, and with respect to sex distribution previously males were more commonly involved\(^1\),\(^4\),\(^7\).

Although few studies on maxillofacial fractures from Brazil are found in medical literature\(^11\)–\(^13\).

The aim of the present study was to analyze the etiology and pattern of maxillofacial injuries in patients aged 19 and 83 years in the Recife City, Pernambuco, Brazil.

Methods

The protocol was approved by the State University of Paraiba ethics review committee. The records of all patients with facial injuries between the ages of 19 and 83 years who were treated at the Hospital da Restauração, Recife, Brazil, between the beginning of January 2006 and the end of December 2006 were retrospectively examined. Data were analyzed according to age, sex, etiology of the injury, anatomic location of facial fractures, soft tissue injuries, dentoalveolar injury and alcohol abuse.

The etiology was classified as: traffic accidents (cars, motorcycles and pedestrian), physical violence, accidental falls, sports accidents, weapon injuries (knife and fire gun), bicycle accidents and other causes. Mandibular fractures were grouped into condylar, coronoid, ramus, angle, body, parasymphyseal, symphyseal, and dentoalveolar. Dentoalveolar injuries included: avulsion, tooth fracture, luxation and concussion.

Data analysis included descriptive statistics such as frequency distribution and cross tabulation. Comparisons of data were evaluated statistically using the Chi-square and Fisher’s Exact Tests at a significance level of 5% (\(p < 0.05\)). Odds ratio (OR) with confidence intervals to 95% were calculated (CI 95%). They were calculated using the Epi Info Software (Centers for Disease Control and Prevention, CDC, Atlanta, USA).

Results

Age and sex distribution

Over all injuries, 57% were sustained during the weekend (Friday, Saturday or Sunday). Wednesday was the day on which fewest maxillofacial injuries was sustained (7.5%).

The average age was 33.2 (standard deviation [SD] 13.1 years). There were 166 male (89.2%) and 20 female (10.8%), a
ratio of 8.3:1. Starting after the third decade of life, the overall age distribution shows a decreasing accident rate with each new decade. The most common age group involved was 19 and 28 years (46.8%) (table 1).

### Etiology

The distribution of the various etiologic factors among the sex is shown in table 2. The most frequent cause was traffic accidents/motorcycle, with 44 cases (23.7%), followed by physical violence with 38 cases (20.4%).

### Facial fractures

A total of 169 patients (90.9%) had facial fractures. This sample consisted of 159 men (94.1%) and 10 women (5.9%) and a statistically significant difference between sex and facial fracture was found ($p = 0.000$; OR 22.71 [7.13-72.32]). Eighty-five patients (50.3%) sustained single fractures, 41 patients (24.3%) had two fractures, 28 patients (16.6%) had three fractures and 15 (8.8%) had multiple (four or more) fractures. A total of 375 fractures were registered, representing 2.2 fractures per patient.

### Type and location of fractures

The most common facial fracture was maxilla (29.1%), followed by the mandible (27.5%), zygomatic-orbital complex (20.2%), nasal (9.6%), frontal (8%), and naso-orbital-ethmoid (5.6%). The most common mandibular fracture site were the symphyseal and parasympyseal regions (28.8%), the body (23.3%), the condyle (18.5%), the angle (15.8%), the ramus (6.8%), the mandibular dentoalveolar (4.1%), and the coronoid (2.7%).

The table 3 shows a positive association between the presence of facial fracture and alcohol consumption ($p = 0.002$). According to these data, patients who reported drinking alcohol have 10.5 times more chance of having facial fracture.

Maximum patients had mixed type of injury i.e. soft tissue and bone involvement (89.8%), followed by soft tissue only (9.7%) and bone only (0.5%). Those patients sustained soft tissues injuries, 32 patients (17.3%) sustained single soft tissues injuries, 70 patients (37.8%) had two injuries, 50 patients (27%) had three injuries and 33 (17.8%) had multiple (four or more) soft tissues injuries. A positive association between the presence of facial fracture and the number of soft tissues injuries was observed ($p = 0.002$). Soft tissue injuries in the form of edema (58.6%), followed by ecchymosis (24.7%) and hematoma (16.7%) were the most common types of injury.

A total of 89 patients (47.8%) had orofacial injuries and no statistically significant difference between the presence of orofacial injuries and facial fracture was found ($p = 0.064$; OR 3.28 [1.03-10.49]). Dentoalveolar trauma was present in 7.5% of the patients. The most common injury was avulsion (35.7%) and teeth fractures (35.7%), followed by subluxation (21.5%) and intrusion (7.1%).

The 186 patients admitted to the hospital had a length of stay (LOS) totaling 3,137 days (average LOS of 16.8 days per patient; one patient had a 125-day LOS).

### Table 1 – Distribution of patients by age and sex

<table>
<thead>
<tr>
<th>Age (in years)</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
<th>n %</th>
<th>n %</th>
<th>n %</th>
</tr>
</thead>
<tbody>
<tr>
<td>19 a 28</td>
<td>79</td>
<td>90.8</td>
<td>8</td>
<td>9.2</td>
<td>87</td>
<td>46.8</td>
</tr>
<tr>
<td>29 a 38</td>
<td>42</td>
<td>82.4</td>
<td>9</td>
<td>17.6</td>
<td>51</td>
<td>27.4</td>
</tr>
<tr>
<td>39 a 48</td>
<td>29</td>
<td>100.0</td>
<td>0</td>
<td>0</td>
<td>29</td>
<td>15.6</td>
</tr>
<tr>
<td>49 a 58</td>
<td>6</td>
<td>85.7</td>
<td>1</td>
<td>14.3</td>
<td>7</td>
<td>3.8</td>
</tr>
<tr>
<td>59 a 68</td>
<td>5</td>
<td>100.0</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>2.7</td>
</tr>
<tr>
<td>69 a 78</td>
<td>3</td>
<td>60.0</td>
<td>2</td>
<td>40.0</td>
<td>5</td>
<td>2.7</td>
</tr>
<tr>
<td>&gt; 79</td>
<td>2</td>
<td>100.0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1.1</td>
</tr>
<tr>
<td>Total</td>
<td>166</td>
<td>89.2</td>
<td>20</td>
<td>10.8</td>
<td>186</td>
<td>100.0</td>
</tr>
</tbody>
</table>

### Table 2 – Distribution of patients by etiology and gender

<table>
<thead>
<tr>
<th>Cause</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
<th>n %</th>
<th>n %</th>
<th>n %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Falls</td>
<td>12</td>
<td>80.0</td>
<td>3</td>
<td>20.0</td>
<td>15</td>
<td>8.1</td>
</tr>
<tr>
<td>Bicycle accidents</td>
<td>11</td>
<td>91.7</td>
<td>1</td>
<td>8.3</td>
<td>12</td>
<td>6.5</td>
</tr>
<tr>
<td>Physical violence</td>
<td>35</td>
<td>92.1</td>
<td>3</td>
<td>7.9</td>
<td>38</td>
<td>20.4</td>
</tr>
<tr>
<td>Traffic accidents/car</td>
<td>11</td>
<td>84.6</td>
<td>2</td>
<td>15.4</td>
<td>13</td>
<td>7.0</td>
</tr>
<tr>
<td>Traffic accidents/motorcycle</td>
<td>42</td>
<td>95.5</td>
<td>2</td>
<td>4.5</td>
<td>44</td>
<td>23.7</td>
</tr>
<tr>
<td>Traffic accidents/pedestrian</td>
<td>13</td>
<td>76.5</td>
<td>4</td>
<td>23.5</td>
<td>17</td>
<td>9.1</td>
</tr>
<tr>
<td>Fire gun</td>
<td>31</td>
<td>100.0</td>
<td>0</td>
<td>0</td>
<td>31</td>
<td>16.7</td>
</tr>
<tr>
<td>Knife</td>
<td>6</td>
<td>66.7</td>
<td>3</td>
<td>33.3</td>
<td>9</td>
<td>4.8</td>
</tr>
<tr>
<td>Sports accidents</td>
<td>1</td>
<td>100.0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0.5</td>
</tr>
<tr>
<td>Animal attacks</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>100</td>
<td>1</td>
<td>0.5</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
<td>80.0</td>
<td>1</td>
<td>20</td>
<td>5</td>
<td>2.7</td>
</tr>
<tr>
<td>Total</td>
<td>166</td>
<td>89.2</td>
<td>20</td>
<td>10.8</td>
<td>186</td>
<td>100</td>
</tr>
</tbody>
</table>

### Table 3 – Distribution of the patients according to the facial fracture and alcohol involvement

<table>
<thead>
<tr>
<th>Facial fracture</th>
<th>Alcohol involvement*</th>
<th>p value**</th>
<th>Odds Ratio (CI 95%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>84</td>
<td>75.0</td>
<td>28</td>
</tr>
<tr>
<td>No</td>
<td>2</td>
<td>22.2</td>
<td>7</td>
</tr>
</tbody>
</table>

*Data on alcohol involvement were unavailable for 65 of the 186 patients in the study. **Statistically significant association at 1% significance level. ***Fisher’s Exact Test. CI: confidence interval.
Discussion

Injuries to the craniomaxillofacial area affect a significant number of trauma patients, and consequences of trauma to this region can include any combination of dental, bone, or soft tissue injury. Most patients with facial injuries were seen on the weekends (Friday, Saturday or Sunday), similar to previous reports. These are days of great opportunity for outdoor and sports activities, short trips, recreation. Especially in Brazil, most soccer games occur on weekends, increasing the risk of violence among fans. Also, alcohol intake is greater on weekends. The sex distribution in the present study is consistent with that of others, with a higher frequency of craniomaxillofacial fractures in males compared with females. This study found a higher male-to-female ratio (8.3:1) than was noted in previous studies. The incidence of maxillofacial trauma is most common in the third decade, consistent with much of the international literature. The age distribution in this study showed that the most common age group involved was 19 and 28 years, in agreement with previous reports. The highest incidence in this age group is due to the fact that this age group take part in dangerous exercises and sports, drive motor vehicles carelessly, and are most likely to be involved in violence.

The etiology of maxillofacial injuries varies from one country to another and even within the same country depending on the prevailing socioeconomic, cultural and environmental factors. Traffic accidents have been the most common cause of maxillofacial injuries worldwide as reported in most previous epidemiologic studies and the present study supports the findings of these earlier studies, showing that traffic accidents (car, pedestrian and motorcycle) represents 39.8% of all etiological factors. In this study, 23.7% of cases with maxillofacial injuries were involved in motorcycle related crashes. Similar studies have shown that the incidence of motorcycle crashes in other developing countries is about 19-62%. Motorcycles have become a prominent mode of transportation in both urban and suburban cities in Brazil. The World Health Organization (WHO) has estimated that nearly 25% of all injury fatalities worldwide are a result of road traffic crashes, with 90% of the fatalities occurring in the low and middle-income countries.

Traffic accidents have a special relevance and a negative impact not only for their costs, but also for the pain, suffering and loss of life quality that are inflicted to the victims, their relatives and society as a whole. Perhaps specific measures are needed with respect to training of motorcyclists, definition of requirements for delivery services, improvement in education campaigns and inspection of proper helmet use. Physical violence was the second most common cause of maxillofacial injuries in adults. Perhaps, robbery, excessive drinking and the high index of violence in Recife can explain the number of aggression-related maxillofacial injuries. Violence prevention programs focusing on both assault and self-inflicted injury may help decrease the maxillofacial trauma resulting from intentional injuries among the population. The maxilla was the most frequently involved bone in this study, followed by the mandible. These findings were similar to other studies that reported maxilla fractures as the most frequent site of injury. Mandibular fractures were reported to be commoner than maxillary fractures. The site depends on the mechanism of injury.

In this study, the most common mandibular fracture site were the symphyseal and parasymphyseal regions, the body, the condyle and the angle. According to previous reports parasymphyseal regions and the body are the most frequently injured region of the mandible. The average number of facial fractures per patient was 2.2. Larger series of facial fractures have found lower numbers of fractures per patient, ranging from 1.2 to 1.5. The higher average number of fractures per patient could be explained by the fact that the mechanism of injury in this study population was predominantly traffic accidents, that tend to cause a greater number of fractures per patient because of a higher force of impact.

In the study reported here, alcohol was associated with about 75% of facial fractures, a proportion significantly higher. Some studies have shown a high correlation between alcohol consumption and maxillofacial injuries. Our finds showed that alcohol consumption was strongly associated with the occurrence of facial fractures. Clearly there is evidence of increased morbidity in patients who abuse alcohol and present with facial fractures. This study showed a positive association between the presence of facial fracture and the number of soft tissues injuries. Edema, ecchymosis and hematoma were the most common types of injury. Orofacial injuries were detected in 47.8% of patients, but no statistically significant difference between the presence of orofacial injuries and facial fracture was found. Dentoalveolar trauma showed a lower incidence in the adult population, similar to previous report. Avulsions and teeth fractures were the more prevalent types of dental trauma. An understanding of the cause, severity and temporal distribution of maxillofacial trauma can assist in establishing clinical and research priorities for effective treatment and prevention of these injuries. Therefore, more evaluation studies should be conducted to assess the physical, social and psychological quality of life for patients affected with maxillofacial trauma.

Conclusions

The incidence of facial fractures in Brazilian population is similar to previously reported elsewhere. There were most common in male patients, mainly due to traffic accidents/motorcycle and physical violence, and the maxilla followed by the mandible were the most frequently involved bones. It was observed a positive association between alcohol consumption and the occurrence of facial fractures.

Discussion

Injuries to the craniomaxillofacial area affect a significant number of trauma patients, and consequences of trauma to this region can include any combination of dental, bone, or soft tissue injury.

Most patients with facial injuries were seen on the weekend (Friday, Saturday or Sunday), similar to previous report. These are days of great opportunity for outdoor and sports activities, short trips, recreation. Especially in Brazil, most soccer games occur on weekends, increasing the risk of violence among fans. Also, alcohol intake is greater on weekends.

The sex distribution in the present study is consistent with that of others, with a higher frequency of craniomaxillofacial fractures in males compared with females. This study found a higher male-to-female ratio (8.3:1) than was noted in previous study in Chennai (3.7:1), in Tehran (4.5:1) and in United Arab (7:1). This male-to-female ratio is attributed to the fact that men are more involved in outdoor activities and more frequently exposed to violent interactions.

Maxillofacial trauma is most common in the third decade, consistent with much of the international literature. The age distribution in this study showed that the most common age group involved was 19 and 28 years, in agreement with previous reports. The highest incidence in this age group is due to the fact that this age group take part in dangerous exercises and sports, drive motor vehicles carelessly, and are most likely to be involved in violence.

The etiology of maxillofacial injuries varies from one country to another and even within the same country depending on the prevailing socioeconomic, cultural and environmental factors. Traffic accidents have been the most common cause of maxillofacial injuries worldwide as reported in most previous epidemiologic studies and the present study supports the findings of these earlier studies, showing that traffic accidents (car, pedestrian and motorcycle) represents 39.8% of all etiological factors. In this study, 23.7% of cases with maxillofacial injuries were involved in motorcycle related crashes. Similar studies have shown that the incidence of motorcycle crashes in other developing countries is about 19-62%. Motorcycles have become a prominent mode of transportation in both urban and suburban cities in Brazil.

The World Health Organization (WHO) has estimated that nearly 25% of all injury fatalities worldwide are a result of road traffic crashes, with 90% of the fatalities occurring in the low and middle-income countries.

Traffic accidents have a special relevance and a negative impact not only for their costs, but also for the pain, suffering and loss of life quality that are inflicted to the victims, their relatives and society as a whole. Perhaps specific measures are needed with respect to training of motorcyclists, definition of requirements for delivery services, improvement in education campaigns and inspection of proper helmet use. Physical violence was the second most common cause of maxillofacial injuries in adults. Perhaps, robbery, excessive drinking and the high index of violence in Recife can explain the number of aggression-related maxillofacial injuries. Violence prevention programs focusing on both assault and self-inflicted injury may help decrease the maxillofacial trauma resulting from intentional injuries among the population.

The maxilla was the most frequently involved bone in this study, followed by the mandible. These findings were similar to other studies that reported maxilla fractures as the most frequent site of injury. Mandibular fractures were reported to be commoner than maxillary fractures. The site depends on the mechanism of injury.

In this study, the most common mandibular fracture site were the symphyseal and parasymphyseal regions, the body, the condyle and the angle. According to previous reports parasymphyseal regions and the body are the most frequently injured region of the mandible. The average number of facial fractures per patient was 2.2. Larger series of facial fractures have found lower numbers of fractures per patient, ranging from 1.2 to 1.5. The higher average number of fractures per patient could be explained by the fact that the mechanism of injury in this study population was predominantly traffic accidents, that tend to cause a greater number of fractures per patient because of a higher force of impact.

In the study reported here, alcohol was associated with about 75% of facial fractures, a proportion significantly higher. Some studies have shown a high correlation between alcohol consumption and maxillofacial injuries. Our finds showed that alcohol consumption was strongly associated with the occurrence of facial fractures. Clearly there is evidence of increased morbidity in patients who abuse alcohol and present with facial fractures. This study showed a positive association between the presence of facial fracture and the number of soft tissues injuries. Edema, ecchymosis and hematoma were the most common types of injury. Orofacial injuries were detected in 47.8% of patients, but no statistically significant difference between the presence of orofacial injuries and facial fracture was found. Dentoalveolar trauma showed a lower incidence in the adult population, similar to previous report. Avulsions and teeth fractures were the more prevalent types of dental trauma. An understanding of the cause, severity and temporal distribution of maxillofacial trauma can assist in establishing clinical and research priorities for effective treatment and prevention of these injuries. Therefore, more evaluation studies should be conducted to assess the physical, social and psychological quality of life for patients affected with maxillofacial trauma.

Conclusions

The incidence of facial fractures in Brazilian population is similar to previously reported elsewhere. There were most common in male patients, mainly due to traffic accidents/motorcycle and physical violence, and the maxilla followed by the mandible were the most frequently involved bones. It was observed a positive association between alcohol consumption and the occurrence of facial fractures.
Referencias


Discusión

A. Valiente Álvarez (Jefe de Servicio de Cirugía Oral y Maxilofacial, Hospital Universitario Carlos Haya, Málaga, España)

He leído con interés este artículo en el que se hace un estudio epidemiológico sobre traumatología facial en una zona geográfica determinada como es Recife, capital de Pernambuco, al nordeste de Brasil, y llama la atención cómo no se relaciona la muestra con la población general ni las características especiales de la zona, como son su influencia turística por sus playas y carnavales y por su población, de aproximadamente un millón y medio de habitantes (la población del estado de Pernambuco es de ocho millones).

En primer lugar debemos considerar que no es fácil actualmente encontrar estudios sobre traumatología facial en países desarrollados y sí en aquellos que están en vías de desarrollo, quizás por la disminución de la casuística debido en gran parte al cumplimiento de las normas de tráfico, el aumento de la seguridad vial y la tecnología de los medios de locomoción. Las series se estudian en países tales como Nigeria o India, y les puedo asegurar que después de patearme de norte a sur este último país, creo que es un auténtico milagro que la traumatología facial no se una epidemia como la gripe. De todas maneras, en países desarrollados tal como el nuestro, hasta hace unos meses en una preciosa ciudad del sur se llegó a regalar el casco a los motoristas, y ni por ellas.

La muestra puede ser significativa (169 pacientes en un año) y es tratada teniendo en cuenta unos factores que pueden considerarse universales, tales como su relación estacional con clara referencia al alcohol en fines de semana y el uso de la motocicleta.

Se echa de menos la casuística precisamente en el grupo, desde mi punto de vista, más interesante, el de los niños, ya que aunque se ve que el grupo más relevante es entre 19 y 28 años, el estudio del grupo infantil revelaría el enorme cambio que aunque se ve que el grupo más relevante es entre 19 y 28 años, el estudio del grupo infantil revelaría el enorme cambio que aunque se ve que el grupo más relevante es entre 19 y 28 años, el estudio del grupo infantil revelaría el enorme cambio que aunque se ve que el grupo más relevante es entre 19 y 28 años, el estudio del grupo infantil revelaría el enorme cambio que aunque se ve que el grupo más relevante es entre 19 y 28 años, el estudio del grupo infantil revelaría el enorme cambio
la correlación con la estancia preoperatoria, la cual no está
citada en el estudio.

En referencia a la discusión, es una enumeración de los datos
obtenidos y prácticamente se elabora un perfil del paciente trau-
matizado facial, el cual independientemente de las variables
socioeconómicas y culturales, podría ser universal tal como
varón joven que en fin de semana, con medio de automoción
mecánico, sale a divertirse durante horas y consume alcohol u
otro tipo de drogas. Creo que con esto está dicho todo.