

Original Article

## A Retrospective Study of Oral and Maxillofacial Injuries in an Emergency Hospital in Southern Brazil

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### Abstract

**Objective:** To identify and analyze cases of OMF treated in an emergency hospital in southern Brazil. **Material and Methods:** The investigators conducted a retrospective, cross-sectional study. The sample was composed of 1,533 patient medical records. Demographic, seasonal, and clinical variables were collected. Additionally, the medical records also included data on etiological factors, injury site, and tissues involved. A descriptive analysis was conducted based on 1,179 (76.9%) records of OMF injuries. **Results:** Most patients were male children and adolescents. Accidents (59.7%), such as falls, and interpersonal violence (18.7%), such as physical aggression, were the main etiological factors. Most injuries involved soft tissue (66.4%), especially in the lip region; whereas fractures affected the nasal bones. Transfers and hospitalizations accounted for 8.1% of clinical outcomes and dentists participated in the treatment of 85% of cases. **Conclusion:** The results of this study suggest a higher prevalence of OMF injuries in men, affecting young people more frequently and showing falls as the main etiological factor. Dentists participated in the majority of the medical care. Future studies will focus on determining risk groups, developing preventive programs, and improving health care services, with the participation of dentists in the multidisciplinary team.

**Keywords:** Facial Injuries, Emergency Medical Services, Descriptive Epidemiology.

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## **Introduction**

Oral and maxillofacial (OMF) injuries are a public health problem in developed and developing countries [1,2]. Costly treatment, long length of hospital stay, and considerable decreased productivity are significant factors related to this health issue. In addition, OMF injuries are associated with loss of function, face disfigurement, psychological problems, and significant decrease in quality of life [1,3]. Oral and maxillofacial injuries may account for 50% of all deaths from trauma-related causes [4]. The prevalence and factors associated with this health problem are influenced by cultural differences, lifestyle, population density, and socioeconomic status [1-3,5,6].

Traffic accidents are one of the leading causes of facial injuries that may lead to disability and death. International statistics have shown that 300,000 people die each year as a result of traffic accidents. Also, there is an estimate that this rate can increase by about 5% every year [7]. Data indicate that Brazil is among the countries with the highest rates of traffic accidents, affecting mainly young people between 15 and 29 years old [8]. Interpersonal and domestic violence, contact sports, alcohol and drug use, and falls are also strongly associated with facial injuries [9-12]. Furthermore, studies have demonstrated a strong association of facial injury with males, aged between 20-30 years and weekends [1,5,6,9,13,14].

Epidemiological research seeks to understand the multifactorial aspects related to OMF injuries with the purpose of determining types of injury, risk groups, more frequent causes, needs of health care facilities, specific training of human resources, and development of prevention programs. Therefore, the objective of the present study was to analyze the cases of OMF injuries treated in an emergency hospital in southern Brazil, considering demographic, seasonal, and clinical variables. Based on a database search, we also intended to identify published articles on OMF injuries and their variables.

## **Material and Methods**

### **Ethical Considerations**

This study was approved by the Research Ethics Committee (Protocol No 170,173). All procedures were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

### **Participants and Study Design**

This is a retrospective, cross-sectional study conducted in an emergency hospital. Our sample consisted of patients seen between January 1 and December 31, 2011. We only included medical records reporting on OMF injuries. The lesions were isolated or combined with other types of body injuries.

## Study Setting

Our study was conducted in an emergency hospital in southern Brazil. The city has a population of approximately 324,000 inhabitants. Primary health care is provided at 24 health care units and four hospitals. This hospital is mainly focused on emergency cases and its procedures are based on a risk classification system with the most severe cases being given priority. In addition, the Advanced Trauma Life Support (ATLS) is used as a framework for managing trauma patients at the hospital. The ATLS is a training program for the management of cases of acute physical trauma developed by the American College of Surgeons [15].

## Data Collection

Data were collected from the medical records of the patients treated in the emergency hospital. Data were entered into a collection form completed for each individual medical record. Data collection was performed by a single examiner trained by an experienced researcher. We collected demographic variables (sex and age); seasonal variables (month, day of week, and time of arrival at the health care facility), and clinical variables (health professional who provided emergency care, type of injury, injury outcome, and clinical outcome). Additionally, the following aspects were also described: etiological factors, soft and bone tissues affected, and types of traumatic dental injury.

## Data Analysis

Data were tabulated and analyzed using the Statistical Package for the Social Sciences (SPSS for Windows, version 13.0, SPSS Inc, Chicago). Based on these data, a descriptive analysis was performed showing the absolute and relative frequencies of the variables under consideration.

## Literature Search Strategy

To allow comparisons between the present findings and the results from other populations, the MEDLINE database (PubMed) was searched for the identification of relevant publications using the following descriptors in various combinations of the MeSH terms and entry terms: ("epidemiology"[Subheading] OR "epidemiology"[All Fields] OR "epidemiology"[MeSH Terms]) AND maxillofacial[All Fields] AND ("injuries"[Subheading] OR "injuries"[All Fields] OR "trauma"[All Fields] OR "wounds and injuries"[MeSH Terms] OR ("wounds"[All Fields] AND "injuries"[All Fields]) OR "wounds and injuries"[All Fields]) AND (("2010/01/01"[PDAT]: "2015/12/31"[PDAT]) AND "humans"[MeSH Terms]). The inclusion criteria were: sample size equal to or larger than 500 cases and studies published between 2010-2015. The exclusion criteria involved studies with specific population or age group (e.g.: elderly population, military) with evaluation of only one type or specific site of injury (e.g.: jaw fractures), and with only one etiological factor (e.g.: traffic accidents).

## Results

Based on the database search strategy, we selected 330 articles after reading their titles and abstracts. Of these, 92 articles that had the same objective of the present study were selected. These articles were read in full and 27 studies were included (Table 1).

**Table 1. Characteristics of the studies and factors associated with oral and maxillofacial injuries.**

Author (country)	Study design/ period	N	Age (years)	Tissues	Sex	Age group (years)	Etiological factor	Seasonality	Outcome	Results	
										TA (%)	TA (%)
Leles <sup>5</sup> (Brazil)	Retrospective 2003-2004	530	0-92	S, B, D	M: 75.8%	21-30 (32.3%)	TA (45.7%)	Day (11-12 a.m.)	STI		
Levin <sup>13</sup> (Israel)	Retrospective 2003-2005	3.972	NI	B, D	M: 75.0%	>18 (71.0%)	TA (33.2%)	NA	NI		
Ramli <sup>6</sup> (Malaysia)	Retrospective 1998-2002	2.986	1-90	S, B, D	M: 79.2%	23*	OA (27.0%)	NA	STI		
Allaredy <sup>9</sup> (USA)	Retrospective 2007	407.167	NI	S, B	M: 68.1%	38*	IV (37.0%)	Monday to Friday	Nasal fracture		
Ravindran <sup>14</sup> (India)	Retrospective 2006-2007	1.950	1-89	S, B, D	M: 81.8%	20-30 (34.2%)	TA (66.4%)	April/May (Sunday)	Jaw Fracture		
Zandi <sup>1</sup> (Iran)	Prospective 2007-2009	2.450	1-88	S, B	M: 77.0%	20-29 (27.6%)	TA (35.0%)	NA	STI		
Gandhi <sup>16</sup> (India)	Retrospective 2006-2009	718	1-85	B	M: 60.6%	21-30 (36.9%)	TA (72.0%)	NA	Jaw Fracture		
Batista <sup>17</sup> (Brazil)	Retrospective 2005-2007	790	<13 / >30**	S, B, D	M: 68.0%	20-29 (40.1%)	TA (27.6%)	NA	Jaw Fracture		
Kar <sup>18</sup> (India)	Retrospective 2004-2009	503	10-70	B, D	M: 87.8%	21-30 (41.7%)	TA (80.3%)	NA	Jaw Fracture		
Kostakis <sup>19</sup> (Greece)	Retrospective 2005-2009	727	10-97	B	M: 85.0%	34*	TA (50.8%)	NA	Jaw Fracture		
Shanmukar <sup>20</sup> (India)	Retrospective 2000-2005	2.027	0 / >60**	S, B	M: 87.6%	21-30 (38.7%)	TA (72.7%)	NA	Jaw Fracture		
Van Den Bergh <sup>21</sup> (Netherlands)	Retrospective 2000-2010	579	2-88	B	M: 70.5%	20-29 (29.0%)	TA (36.3%)	NA	Jaw Fracture		
Eid <sup>22</sup> (Brazil)	Retrospective 1991-2010	1.385	0-89	S, B, D	M: 82.6%	20-29 (28.6%)	TA (25.8%)	NA	Jaw Fracture		
Kyrgidis <sup>23</sup> (Greece)	Retrospective 1998-2008	1.239	2-95	B, D	NR	29*	TA (68.8%)	NA	Jaw Fracture		

**Table 1. Characteristics of the studies and factors associated with oral and maxillofacial injuries.**

Author (country)	Study design/ period	N	Age (years)	Tissues	Sex	Age group (years)		Etiological factor	Seasonality	Outcome
						IG	CG			
Zandi <sup>24</sup> (Iran)	Case-Control 2007-2010	2.692	1-88	B	IG-M: 88.7% CG-M: 6.7%	IG-F1 CG-23	IG-TA (43.7%) CG-A (25.3%)	NA	Nasal fracture	
Zhou <sup>25</sup> (China)	Retrospective 2000-2009	1.131	<3/>70**	B, D	M: 77.9%	19-29 (30.7%)	TA (30.9%)	NA	Jaw Fracture	
Bali <sup>26</sup> (India)	Retrospective 2003-2010	740	0/>61**	B	M: 81.0%	21-30 (38.3%)	TA (71.8%)	Night	Jaw Fracture	
Béogo <sup>27</sup> (Africa)	Retrospective 2001-2010	604	1-75	B	M: 88.9%	20-39 (57.8%)	TA (80.0%)	NA	Jaw Fracture	
Lafiti <sup>10</sup> (Iran)	Retrospective 2011	637	NI	B	M: 72.0%	14*	A (35.1%)	April/June	Nasal fracture	
Martinez <sup>11</sup> (USA)	Cohort									
	1984-1990/ 2004-2010	458	0/>66**	NI	NI	21-40 (61.7%)	IV (48.8%)	NA	Jaw Fracture	
	Retrospective 2006-2010	1.731	0-91	NI	NI	41-65 (35.4%)	TA (27.3%)	NA	Jaw Fracture	
Mijiti <sup>28</sup> (China)	Retrospective 2006-2010	1.350	0-91	B	M: 85.0%	32*	TA (42.2%)	NA	NI	
Cabalag <sup>29</sup> (Australia)	Prospective 2009-2011	980	18-99	B	M: 80.1%	15-24 (55.2%)	IV (29.9%)	NA	Jaw Fracture	
Goulart <sup>12</sup> (Brazil)	Retrospective 1999-2012	3.724	NI	S, B	M: 75.0%	29*	A (22.1%)	NA	STI	
Motamedri <sup>30</sup> (Iran)	Retrospective 2007-2010	8.818	NI	B	M: 83.6%	21-30 (39.5%)	TA (63.8%)	NA	NI	
Zhou <sup>31</sup> (China)	Retrospective 2000-2009	1.131	0/>51**	B, D	M: 77.8%	21-40 (53.2%)	TA: (30.9%)	Autumn/Summer	NI	
Pandey <sup>32</sup> (India)	Retrospective 2010-2011	1.108	2-85	B	M: 89.6%	21-30 (39.9%)	TA: (49.0%)	NI	Jaw Fracture	

\*Median Age; B, Bone Tissue; CG, Control Group; D, Dental Tissue; IG, Intervention Group; IV, Interpersonal Violence; M, Male; NA, Not Assessed; NI, Not Informed; OA, Occupational Accident; A, Accidents (falls); S, Soft Tissue; STI, Soft Tissue Injury; TA, Traffic Accident; Age (years); \*\* Minimum and maximum age not specified.

Our sample included 1,533 medical records of patients seen in an emergency hospital in southern Brazil. We excluded 354 medical records because the cases did not involve OMF injuries. Overall, we investigated 1,179 medical records. Incomplete records determined the differences in the variables analyzed.

According to Table 2, 65.2% of patients were male, 25.1% were between 0-5 years old, and 23.7% were between 20-35 years old. The months of June (12.7%) and July (11.1%), afternoon shifts (34.5%), evening shifts (34.8%), and weekends (35.6%) had the largest number of patients. Dentists participated in the treatment of 85.6% of cases. Isolated facial injuries accounted for 76.4% of cases and the most frequent injury outcome was soft tissue injury (66.4%), followed by combined trauma (19.8%). Transfers and hospitalizations accounted for only 8.1% of clinical outcomes.

**Table 2. Simple frequency and percentage of demographic, seasonal, and clinical variables associated with patients with oral and maxillofacial injuries seen in an emergency hospital in southern Brazil/2011.**

Variables	N (patients)*	N (%)
<b>Demographic Variables</b>		
Sex	1.179	
Male		769 (65.2)
Female		410 (34.8)
Age (Years)	1.147	
0-5		288 (25.1)
6-12		161 (14.0)
13-19		117 (10.2)
20-35		272 (23.7)
36-50		134 (11.7)
51-60		72 (6.3)
>60		103 (9.0)
<b>Seasonal Variables</b>		
Cases/Month	1.179	
January		72 (6.1)
February		118 (10.0)
March		108 (9.2)
April		106 (9.0)
May		112 (9.5)
June		150 (12.7)
July		131 (11.1)
August		110 (9.3)
September		86 (7.3)
October		77 (6.5)
November		25 (2.1)
December		84 (7.1)
Cases/Week	1.177	
Sunday		216 (18.4)
Monday		138 (11.7)
Tuesday		156 (13.3)
Wednesday		147 (12.5)
Thursday		177 (15.0)
Friday		140 (11.9)
Saturday		203 (17.2)
Cases/Time	1.102	
0-6 A.M. (Morning)		126 (11.4)
7-12 A.M. (Morning)		213 (19.3)
1-6 P.M. (Afternoon)		380 (34.5)
7-12 P.M. (Evening/Night)		383 (34.8)
<b>Clinical Variables</b>		
First Medical Care	839	
Dentist		392 (46.7)
Both		326 (38.9)
Physician		121 (14.4)
Type of Injury	1.179	

Variables	N (patients)*	N (%)
Isolated Face Injury		901 (76.4)
Face and Head Injuries		160 (13.6)
Multiple Trauma		118 (10.0)
Injury Outcome	1.144	
Soft Tissue Injury		760 (66.4)
Combined Trauma		227 (19.8)
Bone Fracture		118 (10.3)
Traumatic Dental Injury		39 (3.4)
Clinical Outcome	855	
Discharge		786 (91.9)
Transfer and Hospitalization		69 (8.1)

\* Different numbers resulted from incomplete records of the variables analyzed.

Table 3 describes the etiological factors associated with OMF injuries. According to our results, 435 (59.7%) cases of trauma were caused by accidents; 136 (18.7%) resulted from interpersonal violence; 136 (18.7%) were caused by traffic accidents; 17 (2.3%) resulted from accidents while practicing sports, and five (0.7%) cases were occupational accidents. Falls accounted for 83.2% of the causes of accidents, whereas physical aggression accounted for 97.1% of cases of interpersonal violence. Considering traffic accidents, the most frequent types were those involving motor vehicles (48.5%) and bicycles (35.3%).

**Table 3. Simple frequency and percentage of etiological factors associated with patients with oral and maxillofacial injuries seen in an emergency hospital in southern Brazil/2011.**

Etiological Factors	N (%)	N (%)
Accidents	435 (59.7)	
Fall		362 (83.2)
Other		55 (12.6)
Animal Bite		14 (3.2)
Human Bite		4 (0.9)
Interpersonal Violence	136 (18.7)	
Physical Aggression		132 (97.1)
Fire Guns		2 (1.5)
Knives		2 (1.5)
Traffic Accidents	136 (18.7)	
Motor Vehicle		66 (48.5)
Bicycle		48 (35.3)
Being Run Over		18 (13.2)
Roller Skate/Skateboard		4 (2.9)
Sports Accident	17 (2.3)	
Contact Sports		16 (94.1)
Other		1 (5.9)
Workplace Accident	5 (0.7)	
Occupational Accidents		5 (100.0)

Table 4 describes the sites affected in soft tissues and bone fractures. In terms of soft tissues, the lip (27.9%) and nasal regions (22.2%) were the most often affected areas. The nasal region accounted for 70.9% of bone fractures.

**Table 4. Simple frequency and percentage of the sites affected in soft tissues and bone fractures in patients seen in an emergency hospital in southern Brazil/2011.**

Region	N	N (%)
Soft Tissue Injuries		
Site – Region	877	
Lip		245 (27.9)
Nasal		195 (22.2)
Combined Injuries		170 (19.4)
Periorbital		88 (10.0)
Chin		70 (8.0)
Frontal		56 (6.4)
Intraoral		53 (6.0)
Bone Fractures		
Site – Region	206	
Nasal		146 (70.9)
Lower Jaw		21 (10.8)
Periorbital		11 (5.3)
Zygomatic Complex		10 (4.9)
Alveolar		9 (4.4)
Upper Jaw		7 (3.4)
Frontal		1 (0.5)
Combined Injuries		1 (0.5)

The most frequent traumatic dental injury consisted of dental dislocation (41.5% -54/130), including lateral dislocation, intrusion, and extrusion, followed by coronal fracture (26.9%-35/130), avulsion (16.2% -21/130), and combined dental trauma (15.4%-20/130).

## Discussion

Our results showed a high prevalence of isolated OMF injuries, especially in male children and young adults affecting soft tissues of the lip and nasal regions. In addition, we found that accidents, such as falls, were the main etiological factor and dentists participated in the treatment of 85% of cases. The studies on OMF injuries are described in Table 1, showing high prevalence of nasal and mandibular bone fractures caused by traffic accidents affecting mainly young adult males. Our findings confirm and expand these data.

According to the literature, men tend to have OMF injuries more often than women, with a prevalence between 60 and 90% [1,11,12,24,30]. This high prevalence may be caused by the fact that they are more exposed to risk factors, making them more vulnerable to accidents [33]. Men are also more prone to physical aggression, practicing contact sports, using alcohol, and getting involved in traffic accidents [5,9,14,18,27].

Unlike other studies, our results showed high prevalence of OMF injuries in children and adolescents. Approximately 50% of patients were between 0 and 19 years. The inclusion of soft tissue and traumatic dental injury as an outcome can explain the findings in this population. In addition, the finding that falls was the main etiological factor is in agreement with the high prevalence of OMF injury found in children under five years of age.

Young adults between 20 and 35 years old also showed a high prevalence of OMF injuries, which is in agreement with similar studies describing prevalence between 27% and 58% [1, 10, 18,

26, 27, 29]. Young adults have a higher exposure to risk factors, such as alcohol and drug use, and involvement with physical aggression [34].

The higher frequency of OMF injury was recorded in June and July, although the differences were not significant. Studies conducted in other countries have found that the winter is the period with the largest number of cases; however, they did not provide an explanation for this causality [10,33]. Previous authors [34] found a higher prevalence of trauma in Brazil during the summer, which is explained by the greater exposure to risk situations, including physical activities, social gatherings with alcohol consumption and outdoor activities.

The higher prevalence of cases in the afternoon and night shifts can be explained by increased active nightlife with gathering in clubs and bars, and the consequent increase in traffic, in addition to the fact that people are sleepier and prone to accidents [26]. Also in this sense, weekends are associated with higher consumption of alcohol and increased traffic due to family outings and sports practice [14].

According to our results, accidents accounted for 60% of the etiological factors of OMF injuries; and falls were the most common type of accidents (83.0%). In the studies included in our analysis, falls had lower percentages, ranging from 22% to 35% [10,12,24]. Our hypothesis is that falls are associated with the age group of 0-5 years, which had the highest percentage of injuries in our study. Most studies have reported a higher percentage of injuries among young adults, and the most common etiological factor was traffic accidents, ranging from 30% to 80% [1,14,20,27].

The results of this study showed a prevalence of 19% for traffic accidents. This may be attributed, at least in part, to the Federal traffic education campaign, which resulted in a specific law (Law no. 11,705 dated of 2008) that forbids drinking and driving. In addition, educational campaigns have been enhanced, and there is increased monitoring of the use of personal protective equipment [36]. Studies have shown that the enforcement of a specific legislation, safer roads, public transport policies, and education campaigns can significantly contribute to the reduction of traffic accidents [37].

Interpersonal violence, in turn, accounted for 19% of the etiological factors. This is in disagreement with other studies, where the percentage was higher (29%-48%) [9,11,29]. However, the percentages associated with interpersonal violence are influenced by underreporting of violent events. Physical aggression is associated with urban violence and emotional and socioeconomic conflicts, especially among the young population. The lack of investment in education and public safety can further exacerbate this situation [22].

Soft tissue injuries have been the most prevalent (66.4%), specifically affecting the lip and nasal regions. Although these injuries have also been described in other studies [1,5,6,38], soft tissue injuries are less frequent than bone fractures. Bone fractures affected mainly the nasal region and can be explained by the more prominent anatomical position and frailty of the nasal bones. Such data are in disagreement with previous studies that found upper and lower jaw fractures as the most

prevalent [21,26,29,33,39]. Nasal fractures and soft tissue injuries are strongly associated with falls and physical violence [4].

Traumatic dental injuries accounted for 3.4% of the outcomes found in the study. Dental dislocation, followed by crown fractures and avulsions were the most frequent types of traumatic dental injury. Among the studies included in our analysis, there were few reports of traumatic dental injury as an outcome of OMF injuries [5,6,14,22,23]. Also, these studies did not suggest the possible causes of injuries. This makes it more difficult to discuss the results. The fact that the Brazilian Unified Health System provides the information that there are dentists working at the hospital makes it reference health center, which may explain the record of this type of case.

According to our results, 90% of clinical outcomes were discharge and that the most frequent type of injury was isolated face injury. In addition, dentists participated in the treatment of 85% of cases. These results indicate that OMF injuries were treated at the emergency department, not requiring transfers or hospitalizations, which may indicate less severe injuries. Our findings also demonstrate the importance of the presence of dentists at the emergency departments of hospitals.

The limitations of this study are related to retrospective and cross-sectional design because we cannot determine causalities. Therefore, caution should be taken when interpreting our results. In addition, we believe that longitudinal studies should be performed and patients should be monitored so that sequelae can be reported. Our findings increase the knowledge on trauma and contribute to the preparation of policies for treatment and prevention of OMF injuries.

## Conclusion

Mother's sense of coherence was not associated with dental caries and was associated with nocturnal oral hygiene of infants and monthly family income, and lower income and lack of nocturnal oral hygiene of infants were associated with weaker SOC.

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