

The epidemiology of facial trauma in a city in Northern Brazil

A epidemiologia do trauma facial em uma cidade do Norte do Brasil

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Abstract

The aim of the present work is to carry out an epidemiological study with patients with facial fractures who were operated on in the city of Belém do Pará. In the Years 2015 to 2020, in addition to a literature search on the topic, data was collected on the system of a health insurance company in the city of Belém. It was approved by the Research Ethics Committee of the Dental Research Center and São Leopoldo Mandic Dental School. Facial fractures in Belém do Pará had a 3.5 times higher incidence in men than women. One of the explanations lies in the increased number of men involved in interpersonal aggression, violent sports and traffic accidents. Mostly there were fractures in the zygomatic area and in the nose. The vast majority were treated with open reduction. Facial fractures are multifactorial, but traffic awareness campaigns and alcohol abuse should be incorporated into government projects in each national area.

Keywords: Epidemiology; Fractures, Bone; Mandible; Open fracture reduction.

Resumo

O objetivo do presente trabalho é realizar um levantamento epidemiológico com os pacientes vítimas de traumas de face e submetidos a cirurgia na cidade de Belém do Pará. Foi realizado um levantamento epidemiológico dos pacientes clientes de uma operadora de saúde. O levantamento foi realizado na cidade de Belém do Pará entre os anos de 2015 e 2020. O estudo foi aprovado pelo Comitê de Ética da Faculdade São Leopoldo Mandic. As fraturas faciais em Belém do Pará tiveram uma incidência 3,5 vezes maior em homens do que em mulheres. Uma das explicações reside no maior número de homens envolvidos em agressão interpessoal, esportes violentos e em acidentes de trânsito. Houve predominância das fraturas na região zigomática e nariz. A grande maioria foi tratada com redução aberta. As fraturas faciais tem origem multifatorial, mas campanhas de consciência no trânsito e o abuso de álcool devem ser incorporadas nos projetos governamentais em todas as regiões.

Palavras-chave: Epidemiologia; Fraturas ósseas; Mandíbula; Redução aberta de fraturas.

Resumen

El objetivo de este estudio es realizar una encuesta epidemiológica con pacientes que han sufrido traumatismo facial y han sido intervenidos en la ciudad de Belém do Pará. En los años 2015 a 2020, además de la búsqueda de literatura sobre el tema, se recolectaron datos sobre el sistema de una compañía de seguros de salud en la ciudad de Belém. Facultad de Odontología São Leopoldo Mandic. Las fracturas faciales en Belém do Pará tuvieron una incidencia 3,5 veces mayor en hombres que en mujeres. Una de las explicaciones radica en el mayor número de hombres involucrados en agresiones interpersonales, deportes violentos y accidentes de tránsito. Predominó las fracturas en la región cigomática y en la nariz. La gran mayoría fue tratada con reducción abierta. Las fracturas faciales tienen un origen multifactorial, pero las campañas de concientización sobre el tráfico y el abuso del alcohol deben incorporarse a los proyectos gubernamentales en todas las regiones.

Palabras clave: Epidemiología; Fracturas de hueso; Mandíbula; Reducción de fracturas abiertas.

1. Introduction

Knowing and studying the ethiology of maxillofacial fractures is fundamental to determining useful strategies for first aid logistics and preventing future interactions. The predominant etiological cause of facial fractures are car and bicycle

accidentes (Macedo et al. 2008). Nowadays these means of transport achieve higher performance and speed due to the weight reduction of the vehicles or a more powerful engine. Associating these characteristics with carelessness, the number of motorcycle accidents increases more and more (Del Valle and Franzi 2005).

The leading cause of mandibular fractures in São Paulo state is related to road traffic accidents (Silva and Lebrão 2003). In patients over third age, the main incidence of facial fractures is fall from the ground (Scariot et al. 2009). Mandible fractures are due to the presence of teeth and predispose to bone exposure. Driving under the influence of alcohol is a factor that increases the frequency of vehicles accident, especially if the vehicle is a bicycle (Moshy et al. 2020).

The aim of this study was to quantify and qualify facial trauma through various events attended at the Unimed General Hospital - HGU, in the city of Belém do Pará, from July 2015 to July 2020 and to compare the data obtained with other studies in order to check whether there is a connection between them.

2. Methodology

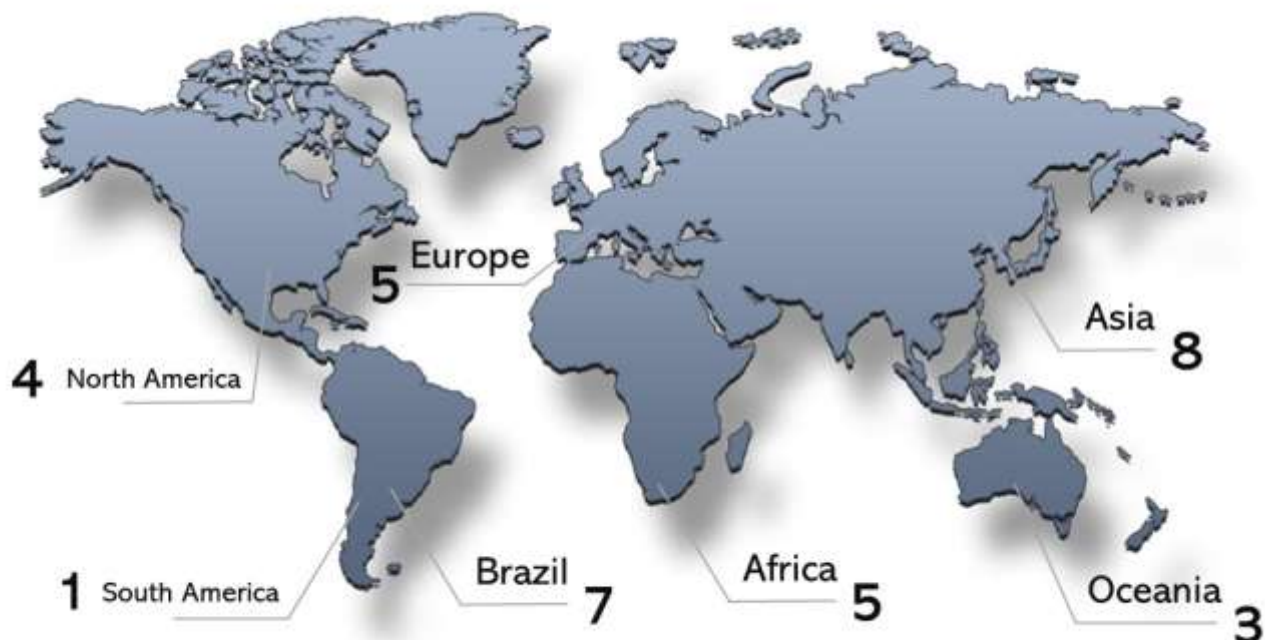
This study was conducted in accordance with the precepts determined by resolution 196/96 of the National Health Council of the Department of Health, published on October 10, 1996 and the Code of Professional Dental Ethics, under resolution CFO 179/93. It was approved by the Research Ethics Committee of the Dental Research Center and São Leopoldo Mandic Dental School under number 4,904,926.

Data from patients treated at the Unimed General Hospital - HGU, located in Belém-PA were analyzed. The period examined was 60 calendar months from July 1st, 2015 to July 1st, 2020. All medical records of patients treated by exclusively hired by Unimed de Belém - Cooperative of Medical Work Maxillofacial Surgeons and Traumatologists for the selected period for the examination. The suggested sample for work includes approximately 300 medical records. It is therefore expected that the proposed number of samples will be achieved, evaluating the total number of medical records available during the study period, excluding only records that have not been filled out completely or correctly. The population was determined by a computerized list obtained from the information technology sector of that unit. Incomplete or incorrectly completed medical records were eliminated.

This is an epidemiological, descriptive, retrospective and analytical study that fully examines the selected sample. The information gathered in this research is expected to provide data to better clarify the nature of the care provided by the service, which is fundamental to the planning, organization and improvement of care for these patients. In addition, they can serve as data to compare performance and its impact on pre-clinical activities.

To consolidate the information presented, a bibliographic search was performed to assess whether the data collected is consistent with other geographic regions. Since the literature on this subject is extensive around the world, it was decided to include the articles by reading the title, trying to be as comprehensive as possible in terms of geographic location in order to evaluate the incidence of facial fractures in different parts of the world, articles from all populated continents were included (figure 1). Brazilian articles were included to allow for national comparison, but some had to be excluded because of the difficulty of obtaining the articles. All animal and experimental studies were excluded.

Figure 1 - Continental geographic layout of the articles included in the literature review.



Source: Own authorship.

3. Results

Data was collected from medical records of the Unimed-Pará system between July 1st, 2015 and July 1st, 2020 about operations to treat facial fractures. The codes of the Unified Terminology of Supplementary Health (TUSS) were used for the respective treatments carried out (Table 1).

Table 1 - TUSS Codes and related procedures.

TUSS	Procedure
30207010	Zygomatic fracture (closed reduction)
30207029	Zygomatic fracture (open reduction)
30207045	Frontal bone fracture
30207061	Zygomatic arch (closed reduction)
30207070	Zygomatic arch (open reduction)
30207088	Simple mandible fracture (closed reduction)
30207096	Simple mandible fracture (open reduction)
30207100	Nasoorbitoethmoid fracture
30207118	Comminuted mandible fracture (open reduction)
30207126	Comminuted mandible fracture (closed reduction)

30207134	Alveolar bone fracture
30207142	Maxillar Le Fort I and II fracture (closed reduction)
30207177	Maxillar Le Fort I and II fracture (open reduction)
30207193	Multiple face middle third face fracture (open reduction)
30207207	Complexe face middle third face fracture (open reduction)
30302064	Orbit fracture (open reduction)
30302072	Orbit fracture (open reduction and bone graft)
30501229	Nasal fracture (open reduction)
30501237	Nasal fracture (closed reduction)
30501547	Nasal fracture (proservation)

Source: Agência Nacional de Saúde Suplementar (ANS). Available at:
http://www.ans.gov.br/images/stories/Legislacao/in/anexo_in34_dides.pdf

Based on the collected medical records, it was possible to assess the gender of the patients, the anatomical region affected by the trauma and the type of operation performed, whether it was open reduction (open reduction, with fixation material), closed or conservative reduction. A total of 494 operations were performed. The data to be evaluated are listed in table 2.

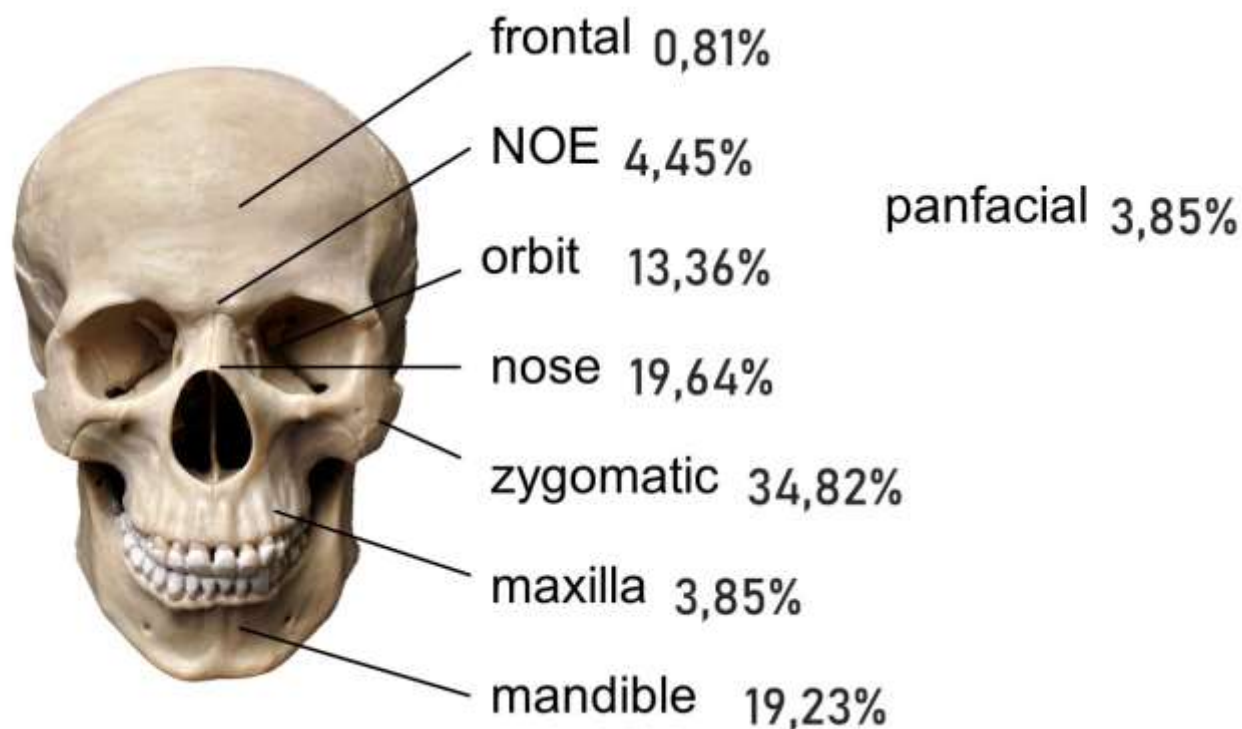
Table 2 – Number of patients submitted to facial fracture surgery.

	Male			female			N
	open	closed	proservation	open	closed	proservation	
Frontal	4						4
Mandible	56	7		27	5		95
Maxila	5	13			1		19
Nose	59	7	2	28	1	0	97
NOE	20			2			22
Orbit	52			14			66
Panfacial	16			3			19
Zygomatic	114	29		26	3		172
N	326	56	2	100	10	0	494

Source: Own authorship.

A significantly higher incidence of facial fractures with a ratio of 3.5:1 was found in men compared to women. Facial fractures were classified according to TUSS codes into frontal, mandible, maxilla, nose, nasoorbitethmoidal (NOE), orbit, panfacial and zygomatic bones. The percentage of facial fractures is shown in Figure 2. The 494 facial fractures were divided into open reduction, closed reduction and proservation.

Figure 2 – Percentage of facial fractures in relation to the affected anatomical area.



Source: Own authorship.

4. Discussion

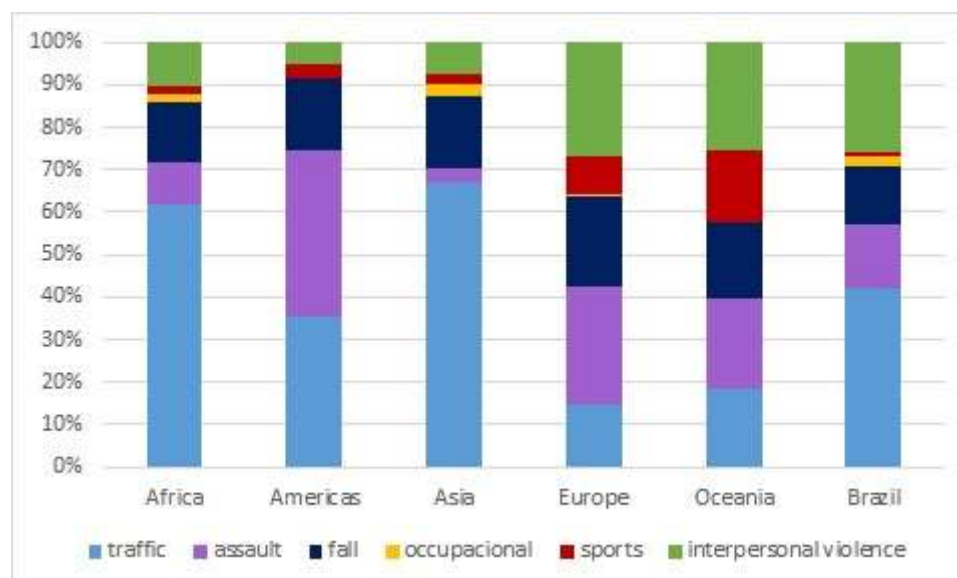
Patients of all ages are affected by facial fractures, but the 21-30 age group is the largest sample (Adeyemo et al. 2008; Bede 2015; Morris et al. 2015; Munante-Cardenas et al. 2015; Verma and Chambers 2015; Chen et al. 2020), which is justified because people at this age are more active and take part in activities outside the home (Boffano et al. 2015; Hassanein 2019) regardless of geographic location. Very young patients with any type of mandibular fracture are of great concern to some authors because of the risk of developing temporomandibular ankylosis (Hassanein 2019). A common etiology in this age group is falling from standing height or cycling (Silva et al. 2009; Siwani et al. 2014; Owusu et al. 2016; Hassanein 2019), falls that are also etiological factors for the elderly (Silva et al. 2009). However, in developed countries, the frequency of fractures in children and adolescents has an important relationship with comorbidities (asthma and migraines), a history of mental illness (depression, anxiety and hyperactivity) and/or alcohol, tobacco and marijuana abuse (Siwani et al. 2014; Brucoli et al. 2019; Kanala et al. 2021). The incidence curve of facial fractures in elderly patients is increasing, due to the increased life expectancy, especially in industrialized countries (Tatsumi et al. 2015).

Men are significantly more affected than women (Leporace and Paulesini Júnior 2009; Rashid et al. 2013; Siwani et al. 2014; Flandes et al. 2019; Kanala et al. 2021), which was confirmed by the present study, but in a lower ratio (3.5:1) than all other regions examined, including Brazil itself. There have been reports that the more severe the facial fracture the more likely it is that a man is involved (Horibe et al. 2004). In developing countries such as the African and South American continents, the number of men working outside the home is greater than that of women who exercise more and are therefore more traumatized (Hassanein 2019; Moshly et al. 2020), drive and exercise more frequently than women (Elgehani and Orafi 2009; Leporace and Paulesini Júnior 2009; Silva et al. 2011; Elarabi and Bataineh 2018), and more involved in physical

aggression (Leporace and Paulesini Júnior 2009; Silva et al. 2009; Eskitaşcioğlu et al. 2013). An interesting piece of data concerns the correlation between etiology and gender, as men are severely affected by fractures due to road traffic accidents and interpersonal violence and women are affected by physical aggression and falls (Leporace and Paulesini Júnior 2009; Rashid et al. 2013; Sand et al. 2014).

Traffic accidents are the leading cause of facial fractures in developing countries (Falcão and Leite Segundo 2005; Elgehani and Orafi 2009; Silva et al. 2011; Agudelo-Suárez et al. 2015; Munante-Cardenas et al. 2015; Hassanein 2019; Liu et al. 2020; Moshy et al. 2020), in addition to being the most aggressive fractures (Flandes et al. 2019), while in developed countries the slightly higher number is due to individual victims of assault (Adeyemo et al. 2008; Eskitaşcioğlu et al. 2013; Verma and Chambers 2015; Owusu et al. 2016; Brucoli et al. 2019) (figure 3). There are epidemiological surveys that contradict this information and state that traffic accidents are the main cause of facial fractures in industrialized countries (Siwani et al. 2014; Chen et al. 2020). The main reasons are deficiencies in legislation and traffic, vehicle maintenance, bad roads and recklessness (Elgehani and Orafi 2009; Silva et al. 2009; Eskitaşcioğlu et al. 2013; Agudelo-Suárez et al. 2015; Bede 2015; Kanala et al. 2021). Illiteracy and difficulty reading road signs also influence the number of accidents in some countries (Elarabi and Bataineh 2018). Even during a civil uprising (Libya, 2011) the number of facial fractures from traffic accidents (109) was much higher than that of gunshot wounds (21) (Elarabi and Bataineh 2018). Laws that mandate the use of seat belts and personal safety items such as helmets can be extremely beneficial in reducing fractures of the entire maxillofacial complex due to traffic accidents (Bede 2015; Munante-Cardenas et al. 2015; Elarabi and Bataineh 2018), which has already been positively proven in Brazil, not the one reducing the number of accidents, but extremely effective in reducing the morbidity and mortality of these accidents (Farage et al. 2002; Queiroz and Oliveira 2002). Education about the consumption of alcohol and other substances before driving is of the utmost importance to reduce the number of road accidents (Munante-Cardenas et al. 2015; Verma and Chambers 2015).

Figura 3 – Main etiologies of facial fractures by continent on our reports and included articles.



Source: Own authorship.

Fractures from motorcycle accidents are more common than with other types of vehicles (Agudelo-Suárez et al. 2015; Munante-Cardenas et al. 2015; Chen et al. 2020) and these numbers increase relatively (Liu et al. 2020) in large urban

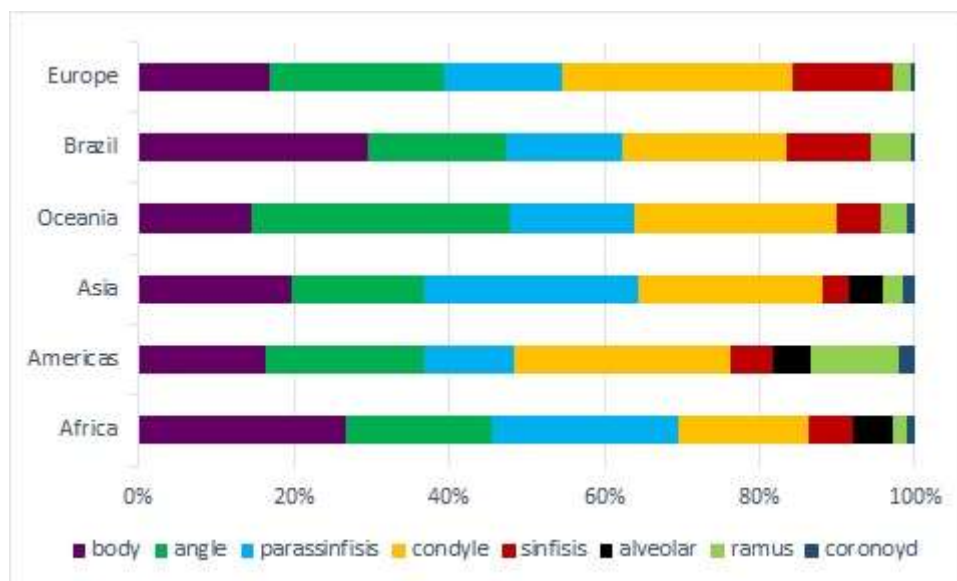
centers in developing countries for two reasons: lower cost of motorcycles (Adeyemo et al. 2008; Agudelo-Suárez et al. 2015; Chen et al. 2020; Moshly et al. 2020) and the ease of motorcycles to drive through areas with a higher volume of traffic (Adeyemo et al. 2008; Chen et al. 2020; Moshly et al. 2020). Motorcyclists and passengers who do not wear a helmet have an increased incidence of facial fractures, most notably in the jaw. (Adeyemo et al. 2008; Bede 2015; Munante-Cardenas et al. 2015; Abosadegh et al. 2019; Chen et al. 2020; Moshly et al. 2020). Cyclists also have a high incidence of jaw fractures due to the lack or improper use of helmets and personal safety items (Munante-Cardenas et al. 2015).

Driving under the influence of alcohol is one of the factors that cause traffic accidents, especially if the vehicle is a motorcycle (Lee 2008; Agudelo-Suárez et al. 2015; Verma and Chambers 2015; Flandes et al. 2019; Moshly et al. 2020). This is something difficult to assess because in a situation in which the patient was not visibly drunk, many in the anamnesis deny this information (Moshly et al. 2020). The influence of alcohol is present in many facial fracture cases, regardless of the etiological factor, and is responsible for the significant increase in hospitalization rates associated with facial trauma (Lee 2008; Brucoli et al. 2019).

Falls are the most common cause in developed countries such as Japan, where violence rates are low and road safety education is high (Tatsumi et al. 2015) and the most common cause in elderly (Rashid et al. 2013). Countries where some sports are considered more violent, such as Australian football or the use of animals for riding, have high incidences of fractures of sport etiology (Verma and Chambers 2015).

The most affected anatomical region (about half) in facial fractures is the mandible (Falcão and Leite Segundo 2005; Rashid et al. 2013; Motamedi et al. 2014; Liu et al. 2020; Kanala et al. 2021) followed by fractures of the middle third of the face, although in some studies this relationship is reversed but very close (Cabalg et al. 2014; Abosadegh et al. 2019), as in the present study (figure 4). The proportion of lower and upper jaw fractures was significantly lower compared to other studies, while the incidence of zygomatic and nasal fractures was significantly higher. One of the justifications for this response would be a high incidence of fractures due to interpersonal violence (Hage et al. 2018).

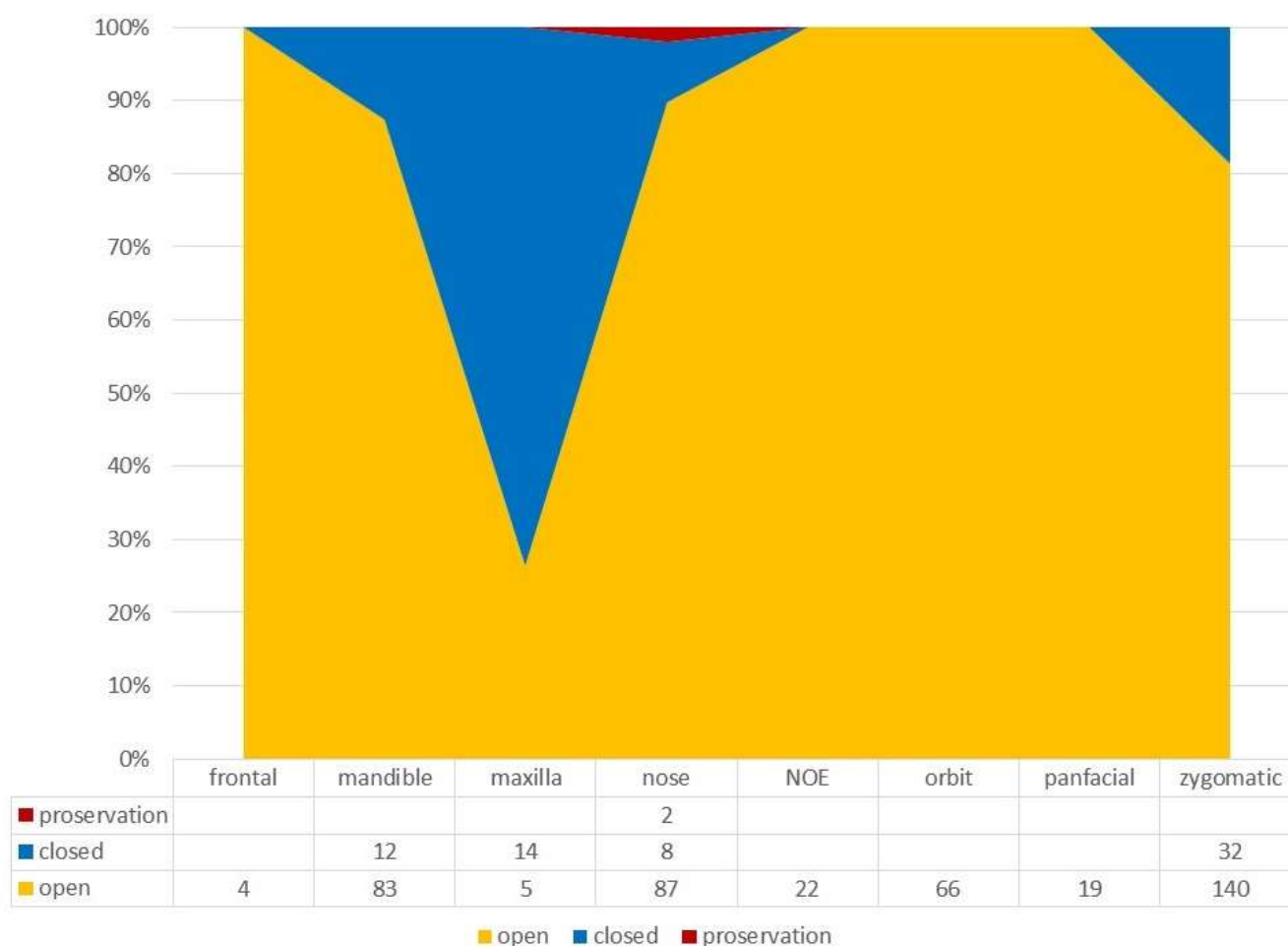
Figure 4 – Location of mandibular fractures on each continent on our reports and included articles.



Source: Own authorship.

Open reduction with stable internal fixation is the gold standard in the treatment of facial fractures (Adeyemo et al. 2008; Elgehani and Orafi 2009; Eskitaşcioğlu et al. 2013; Verma and Chambers 2015; Hassanein 2019; Moshy et al. 2020), in accordance with other studies and the preference of Brazilian surgeons (Horibe et al. 2004; Silva et al. 2011; Munante-Cardenas et al. 2015; Flandes et al. 2019) and with the present study (figure 5). However, in some regions where this material is not found with the same availability in Europe and the United States as it is in the African continent and some Asian countries, other treatments such as intermaxillary blocks and conservative treatments can be used successfully (Adeyemo et al. 2008; Bede 2015; Moshy et al. 2020). In addition to the economic aspect, the surgeon's preference and experience play a major role in the choice of treatment (Hassanein 2019). Condylar fractures are usually treated conservatively, without surgery and a high success rate with very few complications, in line with recommendations in the literature. (Lee 2008; Tatsumi et al. 2015).

Figure 5 – Proportion between the three types of treatment (open, closed or conservative reduction).



Source: Own authorship.

There are authors who certify that the treatment time for facial fractures does not affect the end result, which can be immediate up to three weeks after the trauma, although the faster the treatment, the less discomfort and the greater the potential for bone repair (Adeyemo et al. 2008; Eskitaşcioğlu et al. 2013). Most articles do not report complications, but the increase in the number of complications is related to substance abuse (Munante-Cardenas et al. 2015) and trauma with highly effective ballistics such as the use of missiles or military weapons (Bede 2015).

Traffic accidents are the leading cause of facial fractures worldwide. In many articles this etiology was not separated into passenger cars, motorcycles, utility vehicles, bicycles and pedestrians, but the articles that discussing which vehicle it was clearly show the relatively higher number of cases involving motorcycles (Chen et al. 2020). The implementation of training and inspection programs on the use of helmets is an essential public policy in reducing the number of facial traumas as a whole. (Motamedi et al. 2014; Boffano et al. 2015; Verma and Chambers 2015). Control and punishment over speed limits and the use of seat belts are effective ways to prevent facial trauma (Zix et al. 2011; Motamedi et al. 2014; Boffano et al. 2015).

Stricter measures against those involved in domestic violence and other forms of personal aggression are urgently needed, especially in developing countries (Bede 2015). Many cases of violence against women could be avoided if tougher sentences were imposed. Zero tolerance programs for guns and alcohol have made Japan one of the safest countries in the world, which is confirmed by some epidemiological studies that show violence lags far behind other causes of facial fractures. (Tatsumi et al. 2015). Even in developed countries that do not have more restrictive guidelines on alcohol consumption, they are more likely to suffer from jaw and facial trauma (Lee 2008; Verma and Chambers 2015; Liu et al. 2020).

High quality and accessible public transport for all classes of economy and society and the establishment of efficient emergency systems are examples of success from other countries such as Japan and should be pursued (Tatsumi et al. 2015). Increasing vehicle safety and technology is of great value in reducing facial fractures and, in domestic countries in which the fleet is younger, this difference is a remarkable (Zix et al. 2011; Verma and Chambers 2015).

5. Conclusions

Facial fractures affect men in a significantly higher proportion than men, in the city of Belém do Pará about 3,5:1 and open reduction has been the most commonly used to treat these fractures, both in full agreement with the literature. Facial fractures were more common in the middle third of the face, especially in the zygomatic bone and nose, than in the lower jaw, an inverse proportion to other studies. Public education, road safety, alcohol and other drug abuse are essential to reduce the rate of facial fractures. Efficient and accessible public transportation is an excellent alternative to reduce the incidence of facial fractures.

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