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Original article

Epidemiology of nasal fracture surgeries performed by the Brazilian Unified Health System (UHS) from 2012 to 2022

Epidemiologia das cirurgias de fratura nasal realizadas pelo sistema único de saúde (SUS) no período 2012-2022

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Abstract

Objective: to describe the epidemiology of nasal fracture surgeries performed by the Brazilian Unified Health System (UHS) during the period from 2012 to 2022. **Materials and Methods**: this cross-sectional, retrospective study was based on data obtained from the UHS regarding surgical reduction of nasal bone fractures. The specific treatment was identified by the code 0404020542, and data were collected for the period from 2012 to 2022. The DATASUS system was used as the data source, from which information about the treated patients was obtained, including the average length of hospital stay, number of hospitalizations, hospital service costs, and mortality rate. **Results**: during the analyzed years, 41,879 patients were hospitalized due to nasal fractures, with a national average hospital stay of 1.9 days. The mortality associated with these hospitalizations was low, with only 22 cases recorded in absolute numbers, and the total cost of hospitalizations reached R$9,572,786.78. **Conclusion**: nasal fractures represent a health issue that affects many individuals annually in Brazil. These fractures present a low lethality rate and an average hospital stay for treatment of around two days, suggesting that they are generally mild traumas, but the costs and implications of the injury should be considered. This study is expected to provide epidemiological data that can be used in future publications.
Keywords: Nasal fracture. Epidemiology. Nose, Trauma. Expenditure.

Resumo

Objetivo: descrever a epidemiologia das cirurgias de fratura nasal realizadas pelo Sistema Único de Saúde (SUS) no período 2012-2022. **Materiais e Métodos:** este estudo transversal, retrospectivo se baseou na obtenção de dados do SUS referente à redução cirúrgica de fraturas dos ossos próprios do nariz. O tratamento específico foi identificado pelo código 0404020542, e os dados foram coletados no período de 2012 a 2022. Utilizou-se o DATASUS como fonte de dados, onde foram obtidas informações sobre os pacientes atendidos, incluindo a média de tempo de internação, número de internações realizadas, valor dos serviços hospitalares e taxa de mortalidade. **Resultados:** dentre os anos analisados, 41.879 pacientes foram internados devido às fraturas nasais, com uma média nacional de permanência hospitalar de 1,9 dias, a mortalidade associada a essas internações foi baixa, com apenas 22 casos registrados em números absolutos e o custo total das hospitalizações atingiu R$9.572.786,78. **Conclusão:** as fraturas nasais representam um problema de saúde que afeta muitos indivíduos anualmente no Brasil. Essas fraturas apresentam taxa de letalidade baixa e um tempo médio de internação para tratamento em torno de dois dias, sugerindo que são geralmente traumas leves, mas gastos e implicações da lesão devem ser levados em conta. Espera-se que este estudo forneça dados epidemiológicos que possam ser utilizados em outras publicações.
Palavras-chave: Fratura nasal. Epidemiologia. Nariz. Trauma. Gastos.

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Introduction

Among the most common causes for nasal bone fracture are interpersonal physical violence, sports activities, falls, car accidents, motorcycle accidents, non-fall-related impacts and work accidents[1].

Studies related to the epidemiology of nasal bone fractures are scarce; few studies address this trauma separately, usually addressing these fractures together with general facial traumas because they are considered low. This may hinder standardization in the diagnostic and treatment criteria of nasal fractures[2,3]. There is a study that opposes the speech of nasal fractures to be a mild trauma, exposing an incidence of up to 50% of nasal and residual deformity after treatment, which demonstrates significant aesthetic and functional implications of this lesion[3].

It is essential to systematize the care of facial traumas, considering that these traumas can affect individuals of any age, although they are more frequent among young people. The complexity of the lesions, the presence of fractures in addition to the nasal fracture, the patient's adherence to treatment and the existence of lesions in the nasal septum are important factors in managing these conditions, as well as the appropriate time and the most suitable technique for the surgery[4,5]. Moreover, the interval between trauma and reduction, the type of anesthesia and the surgical technique used are crucial aspects in treatment planning. The most common method to treat nasal fractures has been closed reduction with local anesthesia, and in general, these fractures can be treated within 10-14 days after trauma. The only exception is septal hematoma drainage, which should be performed immediately[6].

Traumatic brain injury (TBI) is a complex condition, representing an injury to the brain caused by external physical force. This injury can lead to several consequences, from changes in consciousness to impairments in cognitive skills, physical, behavioral and perceptual function. Epidemiological data reveal a high incidence of TBI-related hospitalizations, highlighting it as a relevant cause of death and morbidity in young adults[7]. Therefore, it is important to address TBI in this study, since it is a facial trauma that may be related to nasal fractures.

In this sense, the objective of this study is to describe the Brazilian epidemiology of nasal fracture surgeries performed by the Brazilian Unified Health System (UHS) in the time interval between 2012 and 2022.

Materials and Methods

This is a cross-sectional and retrospective study carried out in Brazil, with data from the DATASUS platform on surgical treatment of fractured nasal bone. In DATASUS, the surgical

treatment of fractured nasal bone is presented with code 0404020542[8]. The data collection period began in January 2012 and lasted until December 2022.

The variables analyzed were: average length of stay, number of admissions, value of hospital services and mortality rate. For better evaluation of the information obtained, the data were entered and processed in the program Microsoft Excel (2016).

To discuss the results obtained, national and international publications were analyzed, with emphasis on the variables addressed in this study. It is noteworthy that this review was conducted using the platforms PubMed, SciELO (Scientific Electronic Library Online) and Google Scholar. The descriptors used were in Portuguese, such as *epidemiologia*, *fratura nasal*, *traumatismo cranioencefálico* and *trauma bucomaxilofacial*, while in English they were epidemiology, nasal fracture, and bucomaxilofacial trauma, and in Spanish, *epidemiología*, *fractura NASA* e *traumatismo craneoencefálico*.

Results

Regarding the number of patients admitted in Brazil during the period studied, the Southeast region presented the highest number of hospital admissions, followed by the Northeast region. In the study period, 41,879 patients were hospitalized and the annual arithmetic mean of nasal fracture cases between 2012 and 2022 was 3,807.2. The Southeast region stood out with 18,002 cases, representing the highest annual average with 1,637. In contrast, the North region presented the lowest number of cases, totaling 2,726 in the period and an annual average of 247.8 (Chart 1).

Chart 1. Regional distribution of hospitalizations due to nasal trauma in Brazil per year.

Year	North	Northeast	Southeast	South	Midwest	Total
2012	521	1,076	1,836	704	398	4535
2013	443	1,059	1,579	783	398	4262
2014	307	1,029	1,724	727	381	4168
2015	245	1,098	1,744	613	305	4005
2016	166	1,086	1,754	694	350	4050
2017	177	962	1,746	759	328	3972
2018	157	931	1,726	703	326	3843
2019	200	945	1,816	747	253	3961
2020	151	577	1,239	618	170	2755
2021	160	586	1,258	623	187	2814
2022	199	621	1,580	841	273	3514
Total	2726	9,970	18,002	7812	3369	41879

The average days of hospitalization showed variations between the different regions during the years analyzed, maintaining the national average in an interval of 1.88 to 2.06 days of

hospitalization. The North and Northeast regions showed longer permanence time, in contrast to the Southeast, South and Midwest regions. During the period studied, the average total hospital stay was 1.9 days. The southern region had the lowest average stay, with 1.44 days, while the northern region recorded the highest average, with 2.6 days (Chart 2).

Chart 2. Regional distribution of the average number of days of hospitalization due to nasal trauma in Brazil per year.

Year	North	Northeast	Southeast	South	Midwest	Mean
2012	1.7	1.6	1.6	1.4	2.1	1.68
2013	1.8	1.7	1.7	1.5	1.7	1.68
2014	2.4	1.6	1.7	1.4	1.6	1.74
2015	2.6	1.7	1.7	1.5	1.6	1.82
2016	2.7	1.8	1.6	1.6	1.5	1.84
2017	2.8	1.7	1.8	1.7	1.9	1.98
2018	3.1	1.5	1.8	1.4	1.8	1.92
2019	2.9	1.7	1.8	1.3	1.7	1.88
2020	3	2	1.7	1.4	2.2	2.06
2021	2.6	2.7	1.6	1.3	2.1	2.06
2022	3	3.2	1.6	1.3	2.1	2.24
Mean	2.6	1.93	1.69	1.44	1.85	1.9

The mortality rate during the period studied corresponded to a small number of hospitalization cases for nasal fracture, totaling less than 0.5% of the admitted cases. The Southeast region presented the highest number of deaths, with 9 cases, while the North region presented the lowest value, with 2 cases. It should be noted that the whole values present in the chart represent absolute numbers (Chart 3).

Chart 3. Regional distribution of the recurrent mortality rate from nasal trauma in Brazil by year.

Year	North (%)	Northeast (%)	Southeast (%)	South (%)	Midwest (%)
2012	0.19	N/A	0.05	N/A	N/A
2013	N/A	0.09	0.06	N/A	N/A
2014	N/A	0.10	0.06	N/A	0.26
2015	N/A	0.18	N/A	N/A	0.33
2016	N/A	0.09	N/A	N/A	N/A
2017	N/A	N/A	0.06	N/A	N/A
2018	N/A	N/A	0.06	N/A	0.31
2019	N/A	N/A	0.11	N/A	N/A
2020	N/A	N/A	0.08	0.16	N/A
2021	N/A	N/A	N/A	0.16	N/A
2022	0.50	N/A	0.06	0.12	N/A

The total hospital cost of hospitalizations over the analyzed time was R$9,572,786.78, and the annual average cost was R$ 870,253.34. The value of the first year studied (2012) was R$929,793.95

and the value of the last year studied (2022) was R$870,233.87, the difference between these two values was R$59,560.08, which represents a percentage decrease in expenses of the years 2012 and 2022 of 6.4%. Among the years studied, 2012 presented the highest number of hospitalization cases and 2022 presented one of the lowest. The Southeast region showed the highest number of hospital admissions compared to other regions (Chart 4).

Chart 4. Regional distribution of hospital expenditure (BRL) for the treatment of nasal trauma in Brazil per year.

Year	North	Northeast	Southeast	South	Midwest	Total
2012	106,386.20	226,959.48	384,827.27	133,622.96	77,998.04	929,793.95
2013	88,524.12	240,338.57	330,046.26	157,486.10	79,010.59	895,405.64
2014	80,560.95	216,971.61	376,641.22	145,853.20	80,895.18	900,922.16
2015	49,088.99	259,196.24	387,193.35	134,833.98	63,826.29	894,138.85
2016	39,445.54	254,243.29	391,208.11	149,649.39	80,154.24	914,700.57
2017	38,035.36	231,997.70	402,357.31	174,777.22	70,176.33	917,343.92
2018	47,387.62	224,676.44	407,213.48	156,481.23	69,446.52	905,205.29
2019	51,507.48	236,467.35	440,783.49	164,088.96	53,518.33	946,365.61
2020	35,651.00	138,597.68	318,472.51	155,296.20	41,092.61	689,110.00
2021	39,271.51	155,677.19	307,297.92	153,637.96	53,682.34	709,566.92
2022	56,537.11	164,344.66	369,834.08	212,993.59	66,524.43	870,233.87
Total	632,395.88	2,349,470.21	4,115,875.00	1,738,720.79	736,324.90	9,572,786.78

Discussion

Facial trauma is an important public health problem due to its high prevalence and social impacts. Studies on the epidemiology of nasal fractures are crucial to understand their magnitude and assist in developing strategies that minimize the damage caused by this type of trauma. In this context, the data presented by this study, together with other investigations, allow a better understanding of the epidemiology of nasal fractures and favor comparative analyses.

During the period analyzed, a reduction in the number of hospitalizations due to nasal fractures was observed, with the exception of 2016 and 2019, when there was a small increase compared to the previous year. In 2016, there was an increase of 45 cases compared to 2015, and in 2019, an increase of 118 cases compared to 2018. In 2020, there was a significant drop in the number of hospitalizations, with a reduction of 1206 cases compared to the previous year, followed by stability in 2021. In 2022, the numbers returned to pre-2020 levels, reflecting the downward trend already observed in previous years. This decrease may be related to the impact of the COVID-19 pandemic caused by the SARS-CoV-2 coronavirus.

A Brazilian epidemiological study on traumatic brain injury (TBI) in UHS patients highlighted the constant increase of hospitalizations between 2008 and 2018, as well as a significant number of

associated deaths, highlighting the severity and direct and indirect costs of this type of injury, which substantially affect the UHS[7]. The analysis reinforces the need for public policies focused on road safety and trauma prevention, aiming at improvements in Brazilian public health[7]. In contrast, the data from this study indicated a reduction in hospitalizations due to nasal fractures over the years. This discrepancy can be explained by the fact that TBI data were collected in the pre-pandemic period of COVID-19[7].

Concerning sex, studies indicate a male predominance among cases of nasal fractures[9-11]. In a retrospective study conducted in China with 2881 cases, the male/female ratio was 2.44/1[9]. In Oman, among 171 patients analyzed between 2012 and 2017, 81.87% were men and 18.13% women, with a ratio of 4.5/1[10]. In Finland, in a study with 2465 patients, 71% of the cases were male (n=428)[11].

In relation to the age group, the data indicate a higher prevalence among young people[9-11]. In the Chinese study, the predominant age group was 19 to 29 years[9], while in Oman, the most affected group was 21 to 30 years[10]. In Finland, the average age at diagnosis was 26.3 years[11].

Studies on the costs associated with nasal fractures are scarce, but a detailed analysis conducted in the USA between 2006 and 2014 revealed trends and costs of 1,253,399,741 medical records related to open and closed nasal fracture[2]. Despite the reduction in the total number of visits, costs increased significantly, especially for closed fractures (76.65% increase)[2]. The average hospitalization expenses reached US$ 62,414, with an average admission time of 6.23 days[12]. Although the costs were higher than those observed in Brazil, the USA study was not restricted to only nasal fracture[12].

Data from DATASUS revealed that, although the number of hospitalizations decreased between 2012 and 2022, hospital expenses did not follow a clear trend of reduction. This decrease in hospitalizations may be associated with the COVID-19 pandemic, which resulted in lower annual costs during this period. However, the data do not include information from the private health system, which limits the generalization of findings.

Previous studies highlight differences in the causes of nasal fractures. In China, the main factors were car accidents (33.84%) and assaults during robberies (24.12%)[9]. In Oman, sports accidents (34.50%), mainly related to football, were prevalent, followed by falls (31.58%)[10]. In South Korea, falls were the most common cause among the elderly (51.3%), while in young adults, violence represented 31.4% of cases[13]. In Finland, 24% of the cases were caused by sporting practices. During lockdown in the UK, falls outweighed sports practices and robberies as major causes of fractures[14]. A Brazilian analysis carried out in São Paulo with 164 patients revealed that physical aggression was the main cause of facial fractures (48.1%), followed by falls (26.2%)[15]. The study concluded that

facial trauma is associated with age and type of injury, with no obvious relationship with sex or severity of the lesion[15].

Although the present study presents relevant contributions, it is important to highlight its limitations, such as the exclusion of data from the private health system and the absence of information on quality of life after treatment, indirect costs and comorbidities. These aspects are fundamental for a more comprehensive understanding of the problem of nasal fractures.

Conclusion

It can be said that nasal fractures are a health problem that affects many individuals annually, not only in Brazil. When analyzed separately, the trauma presents a low mortality rate and the hospitalization time for treatment around two days on average, resuming the idea of being a mild trauma in most cases, however, it is important to take into account studies that point out aesthetic and functional implications after injury and financial expenses. The studies discussed point out men as the most affected, whose main causes of injury were aggressions, falls and vehicular accidents.

Therefore, this study is expected to provide epidemiological data that can be used in other publications. This will enable the analysis of the epidemiology of this lesion over the years in Brazil, especially to understand the years with significant differences compared to others, as well as explain the different values found between the five regions of the country.

Authors contribution

César Augusto Ribeiro Silva: Conception and design of the research; data collection; analysis and interpretation of the data; manuscript writing. **César Augusto Ribeiro Silva and Marcelo José da Silva de Magalhães** Critical review of the manuscript regarding the intellectual content and final presentation. The authors approved the final version of the manuscript and declared themselves responsible for all aspects of the work, including ensuring its accuracy and integrity.

Competing interests

The authors declare that there are no competing interests.

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