
Pesquisa Brasileira em Odontopediatria e Clínica Integrada

ISSN: 1519-0501

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Universidade Estadual da Paraíba

Brasil

Cavalcante Costa, Raphael; Berton Medeiros da Nóbreg, Johnys; Lívia de Andrade Dantas, Eugênia; Damascena, Lecidamia Cristina; Lacerda Protási, Ane Poline; Gondim Valença, Ana Maria

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Pesquisa Brasileira em Odontopediatria e Clínica Integrada, vol. 16, núm. 1, 2016

Universidade Estadual da Paraíba

Paraíba, Brasil

Available in: http://www.redalyc.org/articulo.oa?id=63749588011

**Brazilian Research in Pediatric Dentistry and Integrated Clinic 2016, 16(1):99-111**
**DOI: http://dx.doi.org/10.4034/PBOCI.2016.161.11**
**ISSN 1519-0501**

**Original Article**

# Profile of Hospitalizations and Deaths from Craniofacial Fractures in Brazilian Children and Adolescents: An Ecological Study

Raphael Cavalcante Costa[1], Johnys Berton Medeiros da Nóbrega[1], Eugênia Lívia de Andrade Dantas[1], Lecidamia Cristina Damascena[2], Ane Poline Lacerda Protásio[3], Ana Maria Gondim Valença[4]

[1]Undergraduate student, School of Dentistry, Federal University of Paraíba, João Pessoa, PB, Brazil
[2]Nurse, School of Nursing, Federal University of Paraiba, João Pessoa, PB, Brazil.
[3]PhD student, Models of Decision and Health, Federal University of Paraíba, João Pessoa, PB, Brazil
[4]Titular Professor, Department of Clinical and Community Dentistry, School of Dentistry, Federal University of Paraiba, João Pessoa, PB, Brazil.

Author to whom correspondence should be addressed: Raphael Cavalcante Costa, Rua Diógenes Chianca, nº 881, apto. 201-B, Água Fria, João Pessoa, PB, Brasil. 58053-000. Phone: (83) 9910-6277. E-mail: raphaelcavalcante_@hotmail.com.

Academic Editors: Alessandro Leite Cavalcanti and Wilton Wilney Nascimento Padilha

Received: 25 November 2015 / Accepted: 14 April 2016 / Published: 18 June 2016

**Abstract**

**Objective:** To characterize the profile of hospitalizations and deaths related to craniofacial fractures in Brazilian children and adolescents. **Material and Methods:** This is an ecological cross-sectional study with inductive approach with comparative-descriptive procedure and indirect documentation technique. Data were obtained from the DATASUS / SIH-SUS website for the years 2010-2014, considering information for each state of the five Brazilian regions. Admission rates were calculated per 100,000 inhabitants, and data were analyzed by population rates, averages and absolute and relative frequencies. **Results:** The Northeastern region of Brazil showed the highest hospitalization rate (81.72), followed by the Northern (56.84), Southern (50.94), Midwestern (44.25) and Southeastern regions (30.28). In all regions, the years with the highest hospitalization rates were: 2010 for the Northern (13.17) and Southeastern regions (6.61), 2013 for the Northeastern (20.07) and Midwestern regions (10.17) and 2014 for the Southerner region (10.52). The highest hospitalization rates in all regions of the country in the last five years were observed for male children and adolescent. In relation to age group, higher rates were recorded from 15 to 19 years. Of the total of 27,244 hospitalizations (3.8%), 1028 patients died and 35.5% of them occurred in the Northeastern region. Considering the years under study, the average length of stay and average daily hospitalization cost were respectively 4.0 days and US$ 82.7. **Conclusion:** The Northeast region of Brazil had the highest hospitalization rate of children and adolescents by craniofacial fractures, and male adolescents and those aged 15-19 years were the most affected in different regions of the country. Costs of hospital admissions due to this type of injury are significant, with more deaths as a result of these injuries in Brazil in the last 5 years evaluated with the highest prevalence in the Northeastern region of Brazil.

**Keywords:** Epidemiology; Jawfractures; Skull Fractures, Hospital Cost.

**Introduction**

The building of scientific evidence about diseases in public health is considered as competence of research in the field of epidemiology, so that preventive measures, policies and intervention programs can be organized, planned, implemented and assessed for the control of the determining factors [1].

Epidemiological surveys operate as pioneer and initial tools in logistic cost-effectiveness management processes, as well as in the decision making of managers of health policies, which suggest strategies that positively impact health-related quality of life. Epidemiological surveys significantly contribute to the reduction of deaths and injuries, as a result of the effective connection of the various health areas with epidemiological surveillance [2].

In this perspective, injuries are characterized as diseases of interest in the context of public health for being among the leading causes of morbidity and mortality worldwide that directly interfere in the operation of health services [3]. The World Health Organization (WHO) categorizes trauma as a result of various etiological situations, including those caused by external factors such as those of accidental origin (traffic injuries, work, falls, sports, drowning and other accidents) or even of intentional nature (aggression and self-injuries) [4].

Faced with the global growth of cases of interpersonal violence and domestic and traffic accidents, there is need to improve current policies and adoption of new preventive measures to reduce these rates in order to reduce the number of hospitalizations of patients with this type of injury. Hospitalizations due to fractures account for about 9% of global mortality as a result of high demand, little specialized infrastructure and significant costs [5,6].

Craniofacial trauma and injuries associated with the maxillofacial region are highlighted in the context of multiple fracture patients, especially for being an area related to the occurrence of many types of injuries whether isolated or associated with other organs or systems. Furthermore, the easy involvement of the face that is naturally exposed and unprotected results in numerous serious functional problems, many times causing deformities of large aesthetic, functional, psychological, and economic impacts [7-9].

In emergency centers, around 8% of calls made are related to head and / or face injuries, and jaw, nose and zygomatic bones are the most affected, depending on the variation of the type of aggression, instrument and affected population. Therapy includes from more conservative measures to hospitalization and extensive surgical interventions, involving multidisciplinary teams consisting of ophthalmologists, plastic, and maxillofacial surgeons, neurosurgeons, psychologists, speech therapists and other specialists who need equipment and costly inputs for treatment and rehabilitation [7,9,10].

Clinical and surgical management for assistance of fractured patient varies in the different stages of life. Trauma in children and adolescents account for around 5-15% of hospital admissions, so that this population presents relevant morphophysiological characteristics in the context of rehabilitation. The presence of the bone structure during growth and maturation, which has high

power of bone elasticity and remodeling, or even the prevalent involvement of restricted tissue injuries at epidermal level features a more effective postoperative rehabilitation [11].

However, despite the various treatment options, in cases of emergencies and the ease of recovery of these individuals, it is up for the professional the responsibility to proceed differently, performing adjustments in therapeutic approaches aimed at these patients, since the behavior, as well as psychological and physiological conditions inherent to age, may hinder the procedure, which requires longer surgery time, involving greater physical and financial resources for completion [12,13].

Therefore, it is important to analyze craniofacial trauma in pediatric patients due to the lack of investigations on this subject, as well as the financial impact of hospitalizations due to external causes in administrative health costs, and the impact in the lives of these patients, either of functional or social character.

Based on the above, the aim of this study was to describe the profile of hospital admissions and deaths, as well as government spending and occupation of hospital beds by children and adolescents with craniofacial fractures in the Brazilian regions in the period between 2010 and 2014

**Material and Methods**

This work is characterized by being a cross-sectional study with inductive approach with comparative-descriptive procedure and indirect documentation technique [14].

Data Sources

This study used secondary data of open access and public domain obtained from the SUS Hospital Information System (SIH-SUS) [15], provided by the portal of the Unified Health System Department of Data (DATASUS) [16], which aims to register all hospital admissions that were funded by the Ministry of Health of Brazil whether public or private. This registration is done through the Hospitalization Authorization (AIH), which is an instrument used in a mandatory form for the organization and approval of admissions by the Unified Health System (SUS).

Universe and Sample

The study was retrospective and had a census character, which universe was composed of all hospitalizations due to craniofacial fractures involving individuals aged 0-19 years registered in hospitals assisted by SUS from January 2010 to December 2014 in the five geographical regions of Brazil. The sample consisted of 27,224 records of hospital admissions.

Inclusion and Exclusion Criteria

The study included records of hospitalizations due to craniofacial fractures in children and adolescents (0-19 years) funded via MS / SUS, excluding records with incomplete data.

Data collection

The search in the information system was held in September 2015, and the evaluation period was from 2010 to 2014, since these would be the most current and complete data available in SIH-SUS.

Hospitalization records in Brazil and in its geographic regions in the years 2010-2014 were analyzed according to the following characteristics: gender and age group (age groups pre-established in the DATASUS bank: 0-4; 5-9; 10-14 and 15-19 years), days of hospital stay, operating expenses and number of deaths.

Data collection was carried out by consulting the DATASUS platform at linkhttp: //www2.datasus.gov.br/DATASUS/index.php. When accessing this portal at the system home page, the "Health Information (TABNET)" icon was selected and then the "Epidemiology and Morbidities" access icon. To obtain data by geographic regions of Brazil (Northern, Northeastern, Midwestern, Southern and Southeastern regions) and states of the federation, items "General, by place of hospitalization" and "Brazil by region and unit of the federation" were selected. Filters have been applied to the place of hospitalization, seeking information by regions in the years 2010-2014 and in the diagnostic category of Chapter XIX (Injury, poisoning and some other consequences of external causes) of the 10th revision of the International Classification of Diseases (ICD -10) elaborated by OMS[4].

For the calculation of hospitalization rates due to craniofacial fractures in children and adolescents, the numerator consisted of the absolute value of hospitalizations for each region according to year, sex and age. It was considered as the denominator the resident population in each state at the same age group according to IBGE / 2010 [17] census and from its annual estimates of the census years. The value obtained was multiplied by 100,000 [18].

Data analysis

Data were organized in proper forms and in a Microsoft Office Excel 2010 spreadsheet and analyzed using the SPSS software (Statistical Package for Social Sciences), version 20.0. Data analysis was performed using descriptive statistics through rates, averages and absolute and percentage values.

**Results**

Among the 27,244 hospitalizations due to craniofacial fractures of individuals aged 0-19 years treated in the 2010-2014 period in public or private hospitals funded by SUS resources, it appears that the highest hospitalization rates occurred in the Northeastern region (81.72/100,000 inhabitants), varying among Brazilian regions in different years of the study period (Table 1).

Table 2 shows that Piauí (15.25/100,000 inhabitants), Pará (17.46/100,000 inhabitants.), Mato Grosso (14.52 / 100,000 inhabitants), Minas Gerais (11.46/100,000 inhabitants) and Paraná

(20.11/100,000 inhabitants) were the states in their respective regions with the greatest hospitalization rates during the study period (2010-2014).

**Table 1. Hospitalization rates of children and adolescents with craniofacial fractures per 100,000 inhabitants by region of Brazil in the period from 2010 to 2014.**

| | 2010 | 2011 | 2012 | 2013 | 2014 | Total |
|---|---|---|---|---|---|---|
| Northeastern | 13.76 | 12.96 | 16.67 | 20.07 | 18.26 | 81.72 |
| Northern | 13.17 | 10.37 | 11.51 | 10.92 | 10.87 | 56.84 |
| Midwestern | 7.59 | 8.07 | 9.54 | 10.17 | 8.88 | 44.25 |
| Southeastern | 6.91 | 5.66 | 5.85 | 5.87 | 6.51 | 30.80 |
| Southern | 10.47 | 10.48 | 9.37 | 10.10 | 10.52 | 50.94 |

* Calculated based on census projections for 2010-2014 (IBGE).

**Table 2. Hospitalization rates of children and adolescents with craniofacial fractures per 100,000 inhabitants by Brazilian states in the period from 2010 to 2014.**

| | 2010 | 2011 | 2012 | 2013 | 2014 | Total |
|---|---|---|---|---|---|---|
| **Northeastern** | | | | | | |
| Maranhão | 0.64 | 1.21 | 1.91 | 1.84 | 1.93 | 7.53 |
| Piauí | 1.70 | 2.31 | 3.53 | 3.83 | 3.88 | 15.25 |
| Ceará | 2.44 | 1.56 | 1.73 | 2.18 | 1.63 | 9.54 |
| Rio Grande do Norte | 0.69 | 0.61 | 1.68 | 1.54 | 2.14 | 6.66 |
| Paraíba | 1.65 | 1.38 | 1.65 | 1.15 | 1.37 | 7.2 |
| Pernambuco | 1.89 | 1.71 | 1.81 | 2.22 | 1.97 | 9.6 |
| Alagoas | 0.83 | 0.86 | 0.91 | 1.91 | 1.72 | 6.23 |
| Sergipe | 2.85 | 1.77 | 1.75 | 3.83 | 1.89 | 12.09 |
| Bahia | 1.07 | 1.55 | 1.7 | 1.57 | 1.73 | 7.62 |
| **Northern** | | | | | | |
| Rondônia | 1.28 | 0.71 | 0.64 | 1.50 | 1.83 | 5.96 |
| Acre | 2.45 | 1.74 | 1.44 | 0.90 | 0.76 | 7.29 |
| Amazonas | 1.21 | 0.71 | 0.61 | 0.63 | 0.23 | 3.39 |
| Roraima | 0.67 | 0.85 | 1.04 | 1.23 | 1.61 | 5.40 |
| Pará | 3.22 | 3.51 | 4.08 | 3.55 | 3.10 | 17.46 |
| Amapá | 0.15 | 0.14 | 0.0 | 0.27 | 0.40 | 0.96 |
| Tocantins | 4.19 | 2.71 | 3.70 | 2.84 | 2.94 | 16.38 |
| **Midwestern** | | | | | | |
| Mato Grosso do Sul | 2.78 | 2.98 | 3.13 | 2.94 | 2.63 | 14.46 |
| Mato Grosso | 1.94 | 2.42 | 3.38 | 3.96 | 2.82 | 14.52 |
| Goiás | 2.52 | 2.48 | 2.85 | 3.05 | 3.04 | 13.94 |
| Distrito Federal | 0.35 | 0.19 | 0.18 | 0.22 | 0.39 | 1.33 |
| **Southeastern** | | | | | | |
| Minas Gerais | 2.49 | 2.18 | 2.17 | 2.18 | 2.44 | 11.46 |
| Espírito Santo | 1.74 | 0.93 | 0.90 | 1.15 | 1.13 | 5.85 |
| Rio de Janeiro | 1.14 | 0.94 | 1.28 | 1.19 | 1.47 | 6.02 |
| São Paulo | 1.54 | 1.61 | 1.50 | 1.35 | 1.47 | 7.47 |
| **Southern** | | | | | | |
| Paraná | 3.97 | 4.38 | 3.82 | 4.01 | 3.93 | 20.11 |
| Santa Catarina | 3.58 | 3.69 | 3.27 | 3.45 | 3.74 | 17.73 |
| Rio Grande do Sul | 2.92 | 2.41 | 2.28 | 2.64 | 2.85 | 13.10 |

Table 3 shows that, for all Brazilian regions, hospitalization rates are higher in male children and adolescents. The distribution by gender in each state of Brazilian regions is shown in Table 4.

**Table 3. Hospitalization rates of children and adolescents with craniofacial fractures per 100,000 inhabitants in the regions of Brazil according to sex in the period from 2010 to 2014*.**

| | Male | Female |
|---|---|---|
| Northeastern | 134.63 | 63.95 |
| Northern | 133.35 | 41.39 |
| Midwestern | 94.63 | 26.26 |
| Southeastern | 73.87 | 20.48 |
| Southern | 77.48 | 22.53 |

* Calculated based on census projections for 2010-2014 (IBGE).

**Table 4. Hospitalization rates of children and adolescents with craniofacial fractures per 100,000 inhabitants in the Brazilian states according to sex in the period from 2010 to 2014.**

| | Male | Female |
|---|---|---|
| **Northeastern** | | |
| Maranhão | 11.69 | 3.23 |
| Piauí | 24.87 | 5.82 |
| Ceará | 15.45 | 3.84 |
| Rio Grande do Norte | 10.89 | 2.54 |
| Paraíba | 10.82 | 3.84 |
| Pernambuco | 15.65 | 3.53 |
| Alagoas | 10.44 | 2.05 |
| Sergipe | 22.74 | 5.11 |
| Bahia | 12.08 | 2.99 |
| **Northern** | | |
| Rondônia | 13.00 | 5.31 |
| Acre | 18.8 | 6.38 |
| Amazonas | 9.70 | 3.86 |
| Roraima | 13.72 | 2.89 |
| Pará | 33.66 | 11.30 |
| Amapá | 8.97 | 2.15 |
| Tocantins | 35.50 | 9.50 |
| **Midwestern** | | |
| Mato Grosso do Sul | 25.33 | 7.58 |
| Mato Grosso | 30.40 | 8.39 |
| Goiás | 22.42 | 6.29 |
| Distrito Federal | 16.48 | 4.00 |
| **Southeastern** | | |
| Minas Gerais | 21.46 | 5.98 |
| Espírito Santo | 20.21 | 4.78 |
| Rio de Janeiro | 13.05 | 3.83 |
| São Paulo | 19.15 | 5.89 |
| **Southern** | | |
| Paraná | 31.48 | 8.16 |
| Santa Catarina | 26.59 | 7.75 |
| Rio Grande do Sul | 19.41 | 6.62 |

Table 5 presents the hospitalization rates by age group, showing that the highest hospitalization rates in different regions of Brazil were recorded among adolescents aged 15-19 years.

**Table 5. Hospitalization rates of children and adolescents with craniofacial fractures per 100,000 inhabitants in the regions of Brazil by age group in the period from 2010 to 2014*.**

| | 1 to 4 years | 5 to 9 years | 10 to 14 years | 15 to 19 years |
|---|---|---|---|---|
| Northeastern | 46.37 | 84.18 | 147.91 | 642.96 |
| Northern | 37.57 | 74.84 | 91.02 | 348.93 |
| Midwestern | 37.37 | 87.50 | 115.29 | 473.90 |
| Southeastern | 38.62 | 69.50 | 122.96 | 369.45 |
| Southern | 37.12 | 81.09 | 116.98 | 402.63 |

* Calculated based on census projections for 2010-2014 (IBGE).

Table 6 shows the distribution of hospitalization rates by age group in each state and the highest rates for each region were found for age groups 15-19 in Piauí (134.38/100,000 inhabitants), Pará (122.51/100,000 inhabitants), Mato Grosso (149.20/100,000 inhabitants), Minas Gerais (108.42/100,000 inhabitants) and Paraná (165.63/100,000 inhabitants).

**Table 6. Hospitalization rates of children and adolescents with craniofacial fractures per 100,000 inhabitants in the Brazilian states according to age in the period from 2010 to 2014.**

| | 1 to 4 years | 5 to 9 years | 10 to 14 years | 15 to 19 years |
|---|---|---|---|---|
| **Northeastern** | | | | |
| Maranhão | 4.05 | 6.09 | 11.41 | 54.57 |
| Piauí | 5.04 | 10.24 | 22.88 | 134.38 |
| Ceará | 6.41 | 11.93 | 19.19 | 65.56 |
| Rio Grande do Norte | 2.28 | 5.98 | 11.86 | 57.22 |
| Paraíba | 2.84 | 7.57 | 17.97 | 54.77 |
| Pernambuco | 5.32 | 13.75 | 14.63 | 74.12 |
| Alagoas | 3.78 | 5.57 | 11.28 | 43.79 |
| Sergipe | 9.5 | 12.76 | 24.27 | 103.09 |
| Bahia | 7.15 | 10.29 | 14.42 | 55.46 |
| **Northern** | | | | |
| Rondônia | 4.90 | 3.26 | 11.65 | 43.59 |
| Acre | 4.62 | 10.12 | 10.18 | 40.17 |
| Amazonas | 3.94 | 10.06 | 4.58 | 11.53 |
| Roraima | 3.91 | 14.71 | 7.19 | 22.81 |
| Pará | 8.42 | 12.12 | 26.48 | 122.51 |
| Amapá | 1.26 | 3.56 | 1.15 | 2.49 |
| Tocantins | 10.52 | 21.01 | 29.79 | 105.83 |
| **Midwestern** | | | | |
| Mato Grosso do Sul | 10.06 | 21.88 | 28.78 | 133.67 |
| Mato Grosso | 10.71 | 29.14 | 39.06 | 149.20 |
| Goiás | 8.39 | 13.87 | 26.13 | 121.74 |
| Distrito Federal | 8.21 | 22.61 | 21.32 | 69.29 |
| **Southeastern** | | | | |
| Minas Gerais | 10.64 | 20.75 | 34.21 | 108.42 |
| Espírito Santo | 10.27 | 16.49 | 36.53 | 91.48 |
| Rio de Janeiro | 7.50 | 12.33 | 20.68 | 67.68 |
| São Paulo | 10.21 | 19.93 | 31.54 | 101.87 |
| **Southern** | | | | |
| Paraná | 11.21 | 25.41 | 42.12 | 165.63 |
| Santa Catarina | 15.46 | 32.43 | 41.18 | 130.33 |
| Rio Grande do Sul | 10.45 | 23.25 | 33.68 | 106.67 |

Table 7 shows for each year, data regarding days of hospitalization and operating expenses resulting from hospitalization. It appears that, considering the study period, the average length of stay is 4.0 days and the average cost per day was US$ 82.7.

**Table 7. Average annual hospital admissions of children and adolescents with craniofacial fractures, days of hospitalization, daily cost (US$), value per hospitalization (US$) and total amount paid for admissions (US$) in Brazil in the period from 2010 to 2014.**

| Year | Average annual hospital admissions | Mean length of stay (days) | Daily cost (US$)* | Value average per hospitalization (US$)* | Average annual amount paid in admissions (US$)* |
|---|---|---|---|---|---|
| 2010 | 5.464 | 3.7 | 75.8 | 280.7 | 1.534.098 |
| 2011 | 5.230 | 3.7 | 82.1 | 303.8 | 1.589.368 |
| 2012 | 5.408 | 4.0 | 79.4 | 317.9 | 1.719.610 |
| 2013 | 5.444 | 4.3 | 86.4 | 371.9 | 2.024.696 |
| 2014 | 5.698 | 4.2 | 89.6 | 376.4 | 2.144.891 |
| Média | 5.449 | 4.0 | 82.7 | 330.1 | 1.802.531 |

* Values referring to the US dollar price on the date of 11/12/15 (Central Bank of Brazil).

Table 8 shows the distribution of 1,028 deaths, which correspond to 3.8% of hospitalization records (n = 27,244) occurred in the period from 2010 to 2014, according to Brazilian regions, among patients aged 0-19 years, with craniofacial fractures that were admitted in hospitals funded by SUS to treat this disease. It is clear that the Northeastern region accounted for the highest percentage of deaths during the study period (35.5%) and considering national data, the years 2013 and 2014 recorded the highest number of deaths, 208 and 220, respectively, compared the other years.

**Table 8. Distribution of child and adolescent deaths with craniofacial fractures in Brazil and Brazilian regions in the period from 2010 to 2014.**

| | 2010 | 2011 | 2012 | 2013 | 2014 | Total | |
|---|---|---|---|---|---|---|---|
| | | | | | | n | % |
| Northeastern | 91 | 68 | 59 | 70 | 77 | 365 | 35.5 |
| Northern | 18 | 36 | 18 | 19 | 18 | 109 | 10.6 |
| Midwestern | 12 | 14 | 24 | 18 | 15 | 83 | 8.1 |
| Southeastern | 76 | 51 | 66 | 69 | 86 | 348 | 33.8 |
| Southern | 10 | 26 | 31 | 32 | 24 | 123 | 12.0 |
| Brazil | 207 | 195 | 198 | 208 | 220 | 1.028 | 100.0 |

## Discussion

The results of this study show that the hospitalization rates of hospital admissions for treatment of pediatric patients with craniofacial fractures over the study period had its highest value in the Northeastern region - 13.76 / 100,000 inhabitants in 2010 and 18.26 / 100.00 inhabitants in 2014. The Northeastern region showed higher hospitalization rate (81.72 / 100,000 inhabitants) compared to the other regions. These findings may be associated with the use of motorcycles in the Northeastern region by families on a large scale, which is the means of transport routinely used for

the displacement of children and adolescents in small- and medium-size cities in northeastern Brazil, as pointed out in previous studies [19,20].

According to current legislation in Brazil, people under 18 years are unable to conduct automated vehicles. However, the consequences of traffic accidents are comprehensive and include drivers and passengers indiscriminately [9]. In addition, the presence of minor drivers without national driving license or even adults without safety devices in traffic, are reports present on the national scene, which are characterized as a security problem that has direct impact on public health [21].

The states of Piauí (15.25%), Tocantins (16.38%), Mato Grosso (4.52), Minas Gerais (11.46%) and Paraná (20.11%) had the highest hospitalization rates respectively for each region. A previous study reported an increase in hospitalization rates over the years in almost all Brazilian states, which is associated with increased automobile fleets, deficient supervision and precariousness of public transportation, and the state of Piauí was the state with the highest occurrence of deaths for traffic accidents in recent years [22].

In addition to the external factors, the Human Development Index (HDI) could be an explanatory variable to understand the factors that influence the increased morbidity, since HDI is based on three pillars: education, income and longevity. In this perspective, it was observed that the states with the highest hospitalization rates such as Piauí and Pará were those with the lowest HDI values by region. However, Mato Grosso, Minas Gerais and Paraná are classified as with the highest HDI in the ranking. This shows that this index would not explain the highest hospitalization rates recorded in these states and psychological aspects of social life and could be decisive for the occurrence of craniofacial fractures [23].

The state of Amapá showed the lowest rate among all Brazilian states (0.96 / 100.000 inhabitants).This finding could be attributed to the fact that in Amapá, there is a concern about the high prevalence of endemic diseases such as malaria, dengue, sting of animals and venomous insects as well as the existence of different means of transportation and human activities in the field, providing less risk of injuries due to accidents in the maxillofacial area [24].

An increase in hospitalization rates was observed in the different regions, with higher values in different years, namely, in 2010 to the Northern (13.17) and Southeastern regions (6.61); 2013 in the Northeastern (20.07) and Midwestern regions (10.17); and 2014 in the southern region (10.52). Studies have shown that the nighttime and weekends are characterized as of higher demand in emergency centers [10,25]. In this perspective, it is possible that years with large number of national holidays, sporting, political or social events increase the chance of occurrence of hospitalizations, resulting in higher annual values in the different regions of Brazil and in different years.

In epidemiological surveys with the outcome of fractures in Brazilian patients, there is consensus in literature the highest prevalence of this disease in males in the different age groups [3,9,10,26], corroborating the results of this research. Compared to younger children, even in the

face of cultural changes, it was observed that girls show greater involvement in group activities or restricted to toys and hand games, which make them less exposed to situations and / or risk for the occurrence of fractures, the latter being more common among male children [13].

In the case of the age group 15-19 years, which accounted for the highest hospitalizations rates of this study, the prevalence of male patients may be related to the effect of socio-cultural behaviors, such as running more risks when driving vehicles, exposing themselves more often to dangerous experiments such as abuse of alcohol and drugs [27,28].

In the current context, it is common the absence of parents for most of the day due to work and commitments of professional nature. Therefore, children tend to spend most of their time in schools, daycare centers, under the supervision of caregivers or even alone. These facts may be decisive for the occurrence of situations that predispose them to the occurrence of fractures [29].

Studies carried out in São Paulo with the use of secondary data have shown that, for children aged 0-9 years, falls are the main external causes for the occurrence of craniofacial fractures [12,19]. This fact is related to the lack of knowledge and sense of danger or even to impaired movement and balance at this stage of life. With growth and proximity to the adult stage, falls suffered by adolescents aged 15-19 years may be associated with other factors such as the increase in interpersonal violence and early alcohol consumption [8].

It was observed that the hospitalization rate rises with increasing age, being more significant in this study in the age group 15-19 years, being in line with other national [8,9,13,29] and international 30 studies. These findings cause concern, both from the financial point of view and from the perspective of rehabilitation of these patients due to the severity of fractures, which can lead to irreversible consequences, as well as the slower process of bone and tissue repair when compared with regeneration and osteosynthesis in children [11].

The stay of patients in emergency care centers varies according to the disease complexity and type of intervention applied for resolution. An average of 4.0 days for hospitalizations due to maxillofacial injuries was observed. Interestingly, this hospitalization profile does not seems to characterize the situation of tertiary care in Brazil, since hospitalization due to craniofacial fractures in children and adolescents has a low hospital stay compared to other types of trauma, which require long hospitalizations and may compromise the institution, as they take up hospital beds available and require expenses for maintenance [31].

The daily cost and the amount paid for admission increase every year, requiring significant financial investments from the Ministry of Health for the treatment of these diseases. Thus, we emphasize the importance of the development of epidemiological studies in order to generate information that can support decision-making about cost control in hospitals, as well as the organization of levels of more complex health care services aimed at pediatric patients who require differentiated intervention, whether by professional training or environment adequacy [32,33].

In this perspective, the implementation of preventive measures and public awareness about car accidents, forms of violence and domestic accidents involving children and adolescents [3,5,8,12]

appears to be strategic in order to reduce the flow of users of specialized care and increase the effectiveness of care.

Worldwide, the death rate is an indicator of the stage of development of countries and the analysis of deaths from information of hospital admissions would enable a better understanding of the reasons that lead to the death children and adolescents, thus contributing in the search for strategies to reduce them. The present study showed higher prevalence of deaths among children and adolescents in the Northeastern region (35.5%), which is the region with the highest number of hospital records (81.72/100.000 inhabitants). Other authors have reported that there were increased mortality rates in the Northeastern region in the period from 2000 to 2010 due to car accidents, corroborating this result [22].

The Southeastern region showed lower frequency of craniofacial trauma (30.80/100,000 inhabitants). However, this region showed a significant percentage of deaths (33.8%). This finding could highlight weaknesses in the hospital care service provided in this region since the effectiveness of services would possibly be deficient to meet the demands resulting from craniofacial trauma. In contrast, the Midwestern region has registered the lowest hospitalization rate (44.25/100.000 inhabitants) and percentage of deaths (8.1%), which require future studies to seek to explain these findings.

The high record of deaths of children and adolescents at the national level in recent years (2013 and 2014) found in this study could be attributed to the urbanization process, which would favor the increased mortality rate due to traffic accidents and/or violence [5].

The findings of this study corroborate the need for new studies, especially with longitudinal design, random samples and defined selection criteria that seek to support the decision-making process to reduce the occurrence of craniofacial fractures in children and teenagers and the number of deaths.

A limitation of this investigation is the fact that this is a study with secondary data, in which the quality of information obtained through AIH may be compromised due to incomplete filling, lack of data or underreporting, thus compromising the reliability and accuracy of results. The literature confirms that SIH / SUS needs improvement in the quality of information provided [34].

Moreover, another limitation concerns the calculation of population rates, since it is based on IBGE census projections, generating an estimated population value. Therefore, the final value does not express, in a real way, the gross value of the study population. However, this calculation is valid for taking into account the dynamics of the population growth.

However, due to ease of access and availability in public places, ecological studies such as this work can contribute to the scientific knowledge when characterizing the profile of hospitalizations due to craniofacial fractures in children and adolescents and determine the number of deaths from these diseases, providing the basis for the development of new studies on this subject.

**Conclusion**

The Northeastern region of Brazil showed the highest hospitalization rates of children and adolescents due to craniofacial fractures as well as the highest number of deaths, while in the Southeastern region showed the lowest hospitalization rates and in the Midwestern region, the lowest frequent of deaths was observed. It was found that, in Brazil, in the years 2013 and 2014, there were more deaths as a result of these hospitalizations.

Males and individuals aged 15-19 years were the most affected by admissions due to craniofacial fractures in different regions of the country, noting that the hospitalization costs in SUS showed increase each year, targeting health investments for this level of care.

**References**

1. SzkloM. Epidemiologia translacional: algumas considerações. Epidemiol Serv Saúde 2015; 24(1):161-72.
2. Araújo JD. Polarização epidemiológica no Brasil. Epidemiol Serv Saúde 2012; 21(4):6-15.
3. Godoi MS, Basualdo A, Oliveira KC. Índice de fraturas faciais no Hospital São Vicente de Paulo em Passo Fundo RS: estudo retrospectivo de dez anos. J Oral Invest 2013; 2(2):14-9.
4. Organização Mundial de Saúde. Classificação Estatística Internacional de Doenças e Problemas Relacionados à Saúde. 10ª Revisão. São Paulo: Universidade de São Paulo, 1997.
5. Maciel WV, Maciel SSV, Farias AHC, Silva ETC, Gondim LAM, Oliveira, TF. Internações hospitalares por fraturas do crânio e dos ossos da face no Nordeste brasileiro. Revista da AMRIGS 2009; 53 (1):28-33.
6. D'Avila S, Campos AC, Cavalcante GMS, Silva CJP, Nóbrega LM, Ferreira EF. Caracterização de vítimas de agressão e de acidentes de transporte atendidas no Instituto de Medicina e Odontologia Forense – Campina Grande, Paraíba, Brasil – 2010. Ciência & Saúde Coletiva 2015, 20(3):887-94.
7. Carvalho TBO, Cancian LRL, Marques CG, Piatto VB, Maniglia JV, Molina FD. Six years of facial trauma care: an epidemiological analysis of 355 cases. Braz J Otorhinolaryngol 2010; 76(5):565-74.
8. Wulkan M, Perreira-Júnior JG, Botter DA. Epidemiologia do trauma facial. Rev Assoc Med Bras 2005; 51(5):290-5.
9. Scannavinol FLF, Santos FS, Neto JPN, Novo LP. Análise epidemiológica dos traumas bucomaxilofaciais de um serviço de emergência. Rev Cir Traumatol Buco-Maxilo-Fac 2013; 13(4):95-100.
10. Cavalcanti AL, Lima IJD, Leite RB. Perfil dos pacientes com fraturas maxilo-faciais atendidos em um hospital de emergência e trauma, João Pessoa, PB, Brasil. Pesq Bras Odontoped Clin Integr 2009, 9(3):339-45.
11. Sassi LM, CesaTS,Giustina JCD, Dissenha JL. Fratura de mandíbula em paciente pediátrico no momento do parto: relato de caso. Rev Cir Traumatol Buco-Maxilo-Fac 2012; 12(3):55-60.
12. Morano FG, Sampaio MMC, Freitas RS, Alonso N, Ferreira MC. Análise de 126 fraturas de face em crianças menores de 12 anos. Rev Colég Bras Cirurgiões 1997; 25(3):201-4.
13. Pereira IF, Oliveira CR, Figueiredo CD, Cunha DA, Sales GLD, Valença AMG. Perfil das Internações de Crianças e Adolescentes com Fraturas do Crânio e Ossos da Face na Região Nordeste do Brasil. Rev Bras Ciências Saúde 2013; 17(3):275-80.
14. Lakatos EM, Marconi MA. Fundamentos da metodologia científica. 6. ed. São Paulo: Atlas, 2009.
15. Brasil. Ministério da Saúde. Departamento de Informática do SUS. [Accessed on 23 Sept. 2015]. Available at: <http://www2.datasus.gov.br/DATASUS/index.php>.
16. Brasil. Ministério da Saúde. Sistema de Informações Hospitalares do SUS. [Accessed on 23 Sept. 2015]. Available at: http://tabnet.datasus.gov.br/cgi/deftohtm.exe?sih/cnv/niuf.def>.
17. Instituto Brasileiro de Geografia e Estatística (IBGE). Projeção da População do Brasil por sexo e idade: 1980-2050. [Accessed on 28 Sept. 2015]. Available at: http://www.ibge.gov.br/home/estatistica/populacao/projecao_da_populacao/2008/default.shtm.
18. Medronho R; Bloch KV; Luiz RR; Werneck GL. Epidemiologia. 2. ed. Atheneu: São Paulo, 2009.
19. Cavalcanti AL, Alencar CRB. Injuries to the head and face in 0-4 year-old child victmis of fatal external causes in Campina Grande, PB, Brazil. Turk J Pediatr 2010; 52(1): 612-17.
20. Cavalcanti AL, Lino THA, Oliveira TBS, Oliveira TSB, Cardoso AMR, Macedo RF, Padilha WWN, Xavier AFC. Head and maxillofacial injuries in child and adolescent victims of automotive accidents. Sci World J 2014;15(1):1-6.

21. Brasileiro BF, Vieira JM, SILVEIRA CES. Avaliação de traumatismos faciais por acidentes motociclísticos em Aracaju/SE. Rev Cir Traumatol Buco-Maxilo-fac 2010; 10(2):97-104.
22. Morais-Neto OL, Montenegro MMS, Monteiro RA, Siqueira-Júnior JB, Silva MMA, Lima CM, Miranda LOM, Malta DC, Silva-Júnior JB.Mortalidade por acidentes de transporte terrestre no Brasil na última década: tendência e aglomerados de risco.Ciência & Saúde Coletiva 2012; 17(9):2223-36.
23. Instituto Brasileiro de Geografia e Estatística (IBGE). Pesquisa Nacional por Amostra de Domicílios. 2008.Rio de Janeiro: IBGE; 2009.
24. Lima ACSF, Campos CEC, Ribeiro JR. Perfil epidemiológico de acidentes ofídicos do Estado do Amapá. Rev Soc Bras Med Trop 2009; 42(3):329-35.
25. Oji C. Jaw fracture in Enugu, Nigéria, 1985-95. Br J Oral Maxillofac Surg 1999; 37(2):106-9.
26. Dantas LS, Barros AWP, Brandt LMT, Cardoso AMR, Cavalcanti AL. Traumatismo facial em pacientes atendidos em um hospital de emergência. Rev Saúde Ciência 2015; 4(1):81-9.
27. Malta DC, Mascarenhas MDM, Bernal RTI. Accidents by external causes in adolescents: care in sentinel urgency and emergency services in the Brazilian States Capitals-2009. Ciência & Saúde Coletiva 2012; 17(9): 2291-2304.
28. Bastos YGL, Andrade SMD, Soares DA. Characteristics of traffic accidents and victims treated through a pre-hospital service in a city in Southern Brazil, 1997/2000. Cad Saúde Pública 2005; 21(3):815-22.
29. Ykeda RBA, Ballin CR, Moraes RS, Ykeda RBA, MikszaAF. Epidemiological profile of 277 patients with facial fractures treated at the emergency room at the ENT Department of Hospital do Trabalhador in Curitiba/PR, in 2010. Int Arch Otorhinolaryngol 2012; 16(4):437-44.
30. QingBin Z, ZhaoQiang Z, Dan C, Yan Z. Epidemiology of maxillofacial injury in children under 15 years of age in southern China. Oral Surg Oral Med Oral Pathol Oral Radiol 2013; 115(4):436-41.
31. Souza DF, Santili C, Freitas RR, Akkari M, Figueiredo MJPSS. Epidemiologia das fraturas de face em crianças num pronto-socorro de uma metrópole tropical. Acta Ortop Bras 2010; 18(6):335-8.
32. Pagotto V, Silveira EA, Velasco WD. Perfil das hospitalizações e fatores associados em idosos usuários do SUS. Ciência & Saúde Coletiva 2013, 18(10):3061-70.
33. Rodrigues CG, Afonso LE. O efeito do status de sobrevivência sobre gastos com internações hospitalares públicas no Brasil em uma perspectiva temporal. Rev Est Econ 2012; 42(3):489-510.
34. Mascarenhas MDM, Barros MBA. Evolution of public health system hospital admissions due to external causes – Brazil, 2002-2011. Epidemiol Serv Saúde 2015; 24(1):19-29.