TREND OF HOSPITALIZATIONS DUE TO BURN INJURIES IN BRAZIL, 1998-2018.


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Abstract

Objective: The aim of this study was to analyze the trend of hospitalizations due to burns injuries in Brazil between 1998 and 2018. Method: Ecological time series study of hospitalizations for burn injuries in Brazil, of individuals of both sexes and of all age groups. Data was collected by the DATA-SUS, Brazilian Hospital Information System. The simple linear regression method was used to analyze the trend of burn admissions. Results: There were a total of 574,184 burn admissions in the period, with a reduction in the hospitalization rate (1998-2018) from 16.45/100,000 to 12.6/100,000 inhabitants. There was a predominance of males, with an average rate of 18.38 hospitalizations/100,000 inhabitants, and from 0 to 9 years of age (34.05/100,000 inhabitants in males, and 23.66/100,000 inhabitants in females). The Brazilian region with the highest hospitalization rate due to burn injuries was the Midwest. Conclusion: There was a downward trend in the overall rate of hospitalizations for burn injuries, in both sexes, in all age groups and Brazilian regions, except for male age groups over 20 years and Midwest region, which remained stable. Keywords: Hospitalization; Epidemiology; Burns; Brazil.

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Resumo
Objetivo: Analisar a tendência de hospitalizações por queimaduras no Brasil entre 1998 e 2018. Método: Estudo ecológico de séries temporais de hospitalizações por queimaduras no Brasil, de indivíduos de ambos os sexos e de todas as faixas etárias. Os dados foram coletados pelo DATA-SUS, por meio do Sistema de Informações Hospitalares. O método de regressão linear simples foi utilizado para analisar a tendência de admissão por queimaduras.
Resultados: Houve um total de 574.184 internações por queimadura no período, com redução da taxa de hospitalização (1998-2018) de 16,45/100.000 para 12,6/100.000 habitantes. Houve predominio do sexo masculino, que apresentou taxa média de 18,38 internações/100.000 habitantes e de 0 a 9 anos de idade (34,05/100.000 habitantes no sexo masculino, e de 23,66/100.000 no sexo feminino). A região brasileira com maior taxa de hospitalização por queimaduras foi a Centro-oeste.
Conclusão: Houve uma tendência de redução na taxa geral de hospitalizações por queimaduras, em ambos os sexos, em todas as faixas etárias e regiões brasileiras, exceto nas faixas etárias masculinas acima de 20 anos e na região Centro-Oeste, as quais se mantiveram estáveis no período.
Descritores: Hospitalização; Epidemiologia; Queimaduras; Brasil.

Resumen
Objetivo: Analizar la tendencia de las hospitalizaciones por quemaduras en Brasil entre 1998 y 2018. Método: Estudio ecológico de series temporales de hospitalizaciones por quemaduras en Brasil de individuos de ambos sexos y de todos los grupos de edad. Los datos fueron recolectados por DATA-SUS, en Sistema de Información Hospitalaria de Brasil. El método de regresión lineal simple se utilizó para analizar la tendencia de admisión de quemaduras.
Resultados: Hubo un total de 574,184 ingresos por quemaduras en el período, con una reducción en la tasa de hospitalización (1998-2018) de 16,45/100,000 a 12,6/100,000 habitantes. Predominó el sexo masculino, con una tasa promedio de 18,38 hospitalizaciones/100.000 habitantes y de 0 a 9 años. La región brasileña con la tasa más alta de hospitalización por quemaduras fue el Medio Oeste.
Conclusión: Hubo una tendencia a la baja en la tasa general de hospitalizaciones por quemaduras, en ambos sexos, en todos los grupos de edad y regiones brasileñas, excepto en los grupos de edad masculina mayores de 20
1. Introduction

Burns are injuries caused by excessive heat that affect the skin, and may occasionally compromise the lungs and airways, muscles and other tissues, and which, when severe, require hospitalization and specialized medical care\(^1\).

The World Health Organization (WHO) considers this grievance a critical global public health issue, and estimates that there are at least 300,000 deaths annually from burns by fire alone, without accounting for deaths from other forms of burns, especially in low- and middle-income countries (LMICs)\(^2\). In addition to the high mortality in the population, WHO also highlights the sequelae in the mental and physical health of these burn victims, who will live with pain, scarring and disfigurement, often permanent, carrying the stigma for the rest of their lives.

In Brazil, the incidence of burns is estimated to be approximately 1,000,000 each year, of which 100,000 (10\%) will seek medical attention, and of these at least 25\% will die, whether or not due to physical injuries caused\(^3\).

Most cases of burns occur in the home environment, in children under 6 years, and scalding is the main etiological agent, in up to 47.1\% of these cases\(^4\). Regarding gender, men are the main affected by burn injuries, where the occupational environment represents the place where most cases occur at working age\(^5\).

For each individual who dies from burn injury, many others remain with sequelae and limitations, being an important cause of morbidity in the population\(^2\). Regarding preventable external causes, burns predominate among the most neglected, especially in underdeveloped countries, and constitute a notable public health problem due to the high socioeconomic costs involved\(^6\). In summary, conducting epidemiological studies on hospitalizations for burns in Brazil is relevant to the knowledge of data related to this cause, which may contribute to the discussion of public health policies and, especially, so that preventive measures can be reinforced in the population. Therefore, the aim of this study was to analyze the trend of hospitalizations for burns in Brazil, between 1998 and 2018.
2. Materials and Methods

Time series ecological study on hospitalizations due to burn injuries in Brazil, conducted with data from the entire Brazilian territory, composed of 27 federative units, with an estimated population of 208,840,141 inhabitants [7]. Data were collected from the Hospital Information System (SIH) database, available through the Informatics Department of the Unified Health System (DATA-SUS)°. The study included data from 574,184 hospitalizations, of individuals of both sexes and of all age groups, whose cause was due to burn and corrosions injuries that occurred between 1998 and 2018. Data were collected using the electronic portal of the SIH, by its virtual address: “tabnet.datasus.gov.br”, and included according to the International Classification of Diseases (ICD-10) from T20 to T32 (burns and corrosions). Information about the total Brazilian population was obtained by estimation made by the Brazilian Institute of Geography and Statistics (IBGE), according to gender, age group and for each Brazilian region. Until 2010, demographic censuses were used and, from that point on, intercensal projections were used.

The independent variable of the study was the year in which data were collected (1998 to 2018). The dependent variables were the overall rate of hospitalizations for burns in Brazil, the rate of hospitalizations according to age group by sex (0-9 years, 10-19 years, 20-39 years, 40-59 years, 60 years; male and female), gender (male and female) and by regions of Brazil (north, northeast, southeast, south and midwest). The overall rate was calculated as the ratio of total burn admissions in Brazil to the total population in the country, multiplying the total by 100,000. Similarly, for each year in the period, the hospitalization rates for burns were calculated according to age group by sex, sex and regions, divided by the respective populations in the period, multiplying the total by 100,000. The Percentage Annual Variation (PAV) was determined according to the formula: PAV = 100 x (2018 rate - 1998 rate) / 2018 rate, by sex and age group (0-9 years).

The information was computed using Windows Excel software and analyzed using the Statistical Package for Social Sciences (SPSS) Version 18.0 program. [Computer Program]. Chicago: SPSS Inc; 2009. To analyze the trend of hospitalizations for burn injuries, the simple linear regression method was used, obtaining an estimated model according to the formula Y = b0 + b1X, where
Y refers to the standardized coefficient; b0 is the average coefficient of the period; and b1, the average annual increment; and X is the year. To analyze the behavior (increase, decrease or stability) and the Annual Average Variation of the hospitalization rates due to burn injuries, the value, positive or negative, and the statistical significance of the regression coefficient (β) were evaluated. Statistical significance of the model was tested for p <0.05.

3. Results

In the current study, a total of 574,184 hospitalizations due to burns were observed between 1998 and 2018 in Brazil. The trend of hospitalizations for burns in the analyzed period, according to sex, age group, sex by age group and region, is described in table 1.

The overall rate decreased from 16.45/100,000 (1998) to 12.6/100,000 inhabitants (2018), which represents a 23.4% variation, and an annual decrease of 0.32/100,000 inhabitants (β = –0.32, p <0.001). Males, who started the period with a rate of 19.6/100,000 and ended with a rate of 15.98/100,000 inhabitants, had an average rate of 18.38/100,000 inhabitants, which represents a variation of 18.46% and downward trend (table 1 and figure 1).

Analyzing age group by sex, there was a higher average rate of hospitalization for burns in individuals aged 0 to 9 years, being 34.05/100,000 inhabitants in males (p <0.001) with variation of 25.6%, and of 23.66/100,000 female inhabitants (p <0.001), with a variation of 27.38%. It was observed that, in the other age groups, there was a small reduction in relation to the beginning and end of the period, except for the male age groups from 20 to 39 years old, 40 to 59 years old and over 60 years old, which remained stable, but without statistical significance, as shown in table 1 and figures 2 and 3.

There was a reduction in all burns hospitalization rates according to the Brazilian regions, except for the Midwest, which also had the highest rate of 26.19/100,000 inhabitants, remaining stable in the period. For the other regions, the most important reductions were observed in the southern region, with an average rate of 17.07/100,000 inhabitants, followed by the northeast (15.01/100.000 inhabitants), southeast (11.92/100.000 inhabitants) and north (11.57/100,000 inhabitants), as shown in table 1 and figure 4.
4. Discussion

When assessing the trend of hospitalizations due to burn injuries, in Brazil between 1998 and 2018, all studied variables tended to decrease, except for the age groups of 20–39, 40–59 and over 60 years in males, and the Midwest region, which remained stable.

Despite the lack of epidemiological studies on the external causes of morbidity and mortality, including burn injuries, it is estimated that they are responsible for 5 million deaths worldwide each year, and most of these individuals require hospitalization. Regarding the temporal trend, there are few studies that evaluate the behavior at the national level, which makes it pertinent to carry out ecological studies on hospitalizations due to burns in recent decades.

Regarding the general rate of hospitalizations due to burn injuries, in the current study, there was a decrease over the period. These results are similar to a study conducted in Brazil by Santos et al., which identified an average rate of 14.56 hospitalizations/100,000 inhabitants between 2000–2014. Citron et al. found that there were approximately 17,264 deaths and 129,858 individuals were admitted to public hospitals in Brazil, funded by the Unified Health System (SUS), due to burn injuries, resulting in an annual average of 2,466 deaths and 18,551 hospitalizations. However, according to the author of the study, these indicators could be even higher, since 79.1% of burn deaths occurred in the prehospital environment, which may be justified due to the greater severity of injuries and to poor access to specialized care in Brazil.

Burn traumas are more prevalent among populations with lower socioeconomic conditions and in less developed countries, but there is still a gap in the literature on studies that determine the trend of burn hospitalizations in these regions. In a systematic review, Smolle et al. evaluated 46 studies, most of them from very high income (69%, n = 32) or high income (22%, n = 10) countries. In most of these studies, the incidence, severity, mortality and length of stay of burn injuries tended to decrease, and this reduction may be due to more effective prevention programs, greater safety in the occupational environment, and the existence of specialized burn care units in most of these countries. Tantulla et al. found a reduction in the trend of burn admissions in Finnish hospitals between 1980 and 2010 from 30/100,000 inhabitants, at the beginning of the period, to 17 hospitalizations/100,000 inhabitants (2010), which is comparable to the current
Brazilian average rate (14.63/100,000 inhabitants). In England and Wales, by contrast, Stylianou et al. observed an increase in hospital admission rates due to burn injuries from 0.11/1,000 to 19.06/1,000 over the period 2003–2011, despite the decline in mortality in recent decades due to optimal therapeutic management of burns in the specialized centers in the United Kingdom.1

Regarding the sexes, male and female, the results of the study under discussion showed a reduction in the trend of hospitalization for burn injuries in both, and the male population presented the highest rates throughout the analyzed period. These results are consistent with the literature, which identifies males as the most affected by burns3-6,10-19, in up to 62.1% of hospitalizations10. Nestor et al.6 and Santos et al.5 attribute the fact that the male population is more vulnerable and prone to burn injuries due to greater exposure to agents, especially during work activities.

In the current study, there was also a reduction in the trend of hospitalizations for burn injuries in all female age groups and among male children and adolescents, with higher rates in individuals aged 0 to 9 years, in both sexes. In this scenario, Santos et al. found that 24% of burn admissions in Brazil occur in the under-5 age group (40 admissions/100,000 inhabitants/year), which is about 4 times higher than in the rest of the population10, compared with a study conducted in Portugal between 2011–2015, whose rates were 54.56/100,000 inhabitants in the same age group14.

Several studies15-19 have identified scalding as the main cause of burn injuries, which is more prevalent in the pediatric population (81.07%)17, and may be related to the fact that younger children are more curious to explore their surroundings without knowledge of the potential danger of burn agents. In addition, injuries caused by overheated liquids in children occur mainly due to carelessness by caregivers in the domestic environment, which represents the place where most accidents occur6,19.

Regarding the regions of Brazil, there was a reduction in hospitalization rates due to burn injuries, except for the Midwest region, which remained stable in the period. In this context, the study by Santos et al. found that rates in the Brazilian regions ranged from 9.4/100,000 to 28.8/100,000 inhabitants (Midwest), and that in all regions there was a decreasing trend during the period 2000–201410.
Followed by the Midwest, in the study under discussion, the southern region appears among the highest hospitalization rates for burn injuries in Brazil. In this context, Favassa et al. evaluated the trend of hospitalization for burn injuries in southern Brazil between 2008 and 2014, and found a total of 37,571 hospitalizations. The hospitalization rate for burns started the period with 13.11 hospitalizations/100,000 inhabitants (2008), and ended with 14.60/100,000 inhabitants (2014), with slight variations and a trend of stability [3]. Northern Brazil, while having the lowest hospitalization rates due to burn injuries during the period, is considered the region with the highest proportion of prehospital deaths compared to other Brazilian regions [11]. According to Citron et al. [11], this fact may be justified due to unfavorable geographical and socioeconomic conditions compared to the rest of the country, in addition to the scarcity of specialized units in the management of burn patients in this region.

5. Limitations

The limitations of this study are related to the reliability of epidemiological and sociodemographic information provided by DATA-SUS, including data on hospitalizations for burns in Brazil, computerized by SUS since 1998. It is known that SIH only contain data from individuals who were admitted to public hospitals, which may lead to underestimation of the reality and underreporting of the presented results, since the other cases that occurred in private centers are not considered, besides not contemplating those who died before needing hospitalization. However, in order to generate discussion about prevention strategies and burn care policies in Brazil, the data pointed out in the study are of extreme epidemiological relevance, since the SUS portrays the reality of a large part of the Brazilian population, which enjoys public resources for health care services.

6. Conclusion

In Brazil, there is a downward trend in the general rate of hospitalizations due to burn injuries in the last two decades (1998–2018), from 16.45/100,000 to 12.6/100,000 inhabitants. There is also a reduction in hospitalizations for burn injuries in individuals of both sexes in all age groups, except in male patients over
20 years old, whose hospitalization rates remained stable over the analyzed period.

The individuals most affected by burns and that most require hospitalization in Brazil are male patients, with an average rate of 18.38/100,000 inhabitants. Regarding the age group, hospitalizations due to burns predominate in children aged 0 to 9 years, with the average rate in males being 34.05/100,000 inhabitants, and, in females, 23.66/100,000 inhabitants.

There is a higher rate of hospitalization for burns in the Midwest Brazilian region (26.19/100,000 inhabitants), followed by the south, northeast, southeast and north regions. There is a downwards trends in hospitalizations in all Brazilian regions, except in the Midwest, whose rates remained stable between 1998 and 2018.

References


Table 1 – Trend of hospitalizations due to burn injuries in Brazil, 1998-2018, by sex, age group and region.

<table>
<thead>
<tr>
<th></th>
<th>Average Rate</th>
<th>r*</th>
<th>β†</th>
<th>pValue</th>
<th>Trend</th>
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<td><strong>Total</strong></td>
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<td>0,82</td>
<td>-0,32</td>
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<td><strong>Sex</strong></td>
<td></td>
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<tr>
<td>Male</td>
<td>18,38</td>
<td>0,75</td>
<td>-0,34</td>
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<tr>
<td>Female</td>
<td>10,98</td>
<td>0,90</td>
<td>-0,29</td>
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<tr>
<td><strong>Age (Male)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-9 years</td>
<td>34,05</td>
<td>0,87</td>
<td>-0,83</td>
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</tr>
<tr>
<td>10-19 years</td>
<td>12,02</td>
<td>0,54</td>
<td>-0,16</td>
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</tr>
<tr>
<td>20-39 years</td>
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<td>0,31</td>
<td>-0,10</td>
<td>0,17</td>
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</tr>
<tr>
<td>40-59 years</td>
<td>16,43</td>
<td>0,06</td>
<td>0,02</td>
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<tr>
<td>≥ 60 years</td>
<td>13,65</td>
<td>0,15</td>
<td>-0,07</td>
<td>0,53</td>
<td>Stability</td>
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<tr>
<td><strong>Age (Female)</strong></td>
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<td>20-39 years</td>
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<td>-0,19</td>
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<td>0,091</td>
<td>Stability</td>
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Source: Research data (DATA-SUS).

* Correlation Coefficient; † Linear Regression Coefficient.
Figure 1 – Trend of burn hospitalizations in Brazil, 1998-2018.
Figure 2 - Trend of burns hospitalizations in males by age group, 1998-2018. Brazil.
Figure 3 – Trend of burns hospitalizations in females by age group, 1998-2018. Brazil.
Figure 4 – Trend of burns hospitalizations by Brazilian regions, 1998-2018.