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EPIDEMIOLOGICAL PROFILE OF HOSPITAL ADMISSIONS FOR PNEUMONIA IN BRAZIL

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ABSTRACT

Introduction: Pneumonia is defined as one of the most prevalent pathologies in the world, with high mortality rates, being an acute inflammatory disease generated by an infection that settles in the lung and affects the air spaces, and can reach the alveoli region. They are caused by the penetration of various microorganisms and contaminating agents such as bacteria, viruses, fungi and chemical reactions into the alveolar space. According to the Ministry of Health, in Brazil, the Unified Health System (SUS) registers more than 600 thousand hospitalizations for pneumonia annually. Care must be taken with people who are in the extreme age groups – the elderly and children – and those in whom the immune system is more compromised. Objectives: To analyze the epidemiological profile of hospital admissions for pneumonia in Brazil from 2020 to 2023, sociodemographically characterizing the profile of patients hospitalized in each Brazilian region, identifying the most affected gender and age group, and quantifying the number of hospitalizations per year surveyed. Methods: This is an epidemiological, quantitative, exploratory, descriptive and retrospective study. Data collection was carried out by the Department of Informatics of the Unified Health System (DATASUS) on hospital admissions for pneumonia in Brazil from 2020 to 2023. Results: the Southeast and Northeast regions concentrate a greater number of patients hospitalized for this pathology. Men and women are affected in almost the same way. Children and the elderly are the age groups with the highest hospitalization. The years 2020 and 2021 had a lower number of hospitalizations than the two subsequent years. Conclusion: measures are necessary to improve the prevention of the disease in patients vulnerable to risk and avoid the occurrence of complications that lead to hospitalization.

Keywords: Lung diseases. Epidemiology. Hospitalization.

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INTRODUCTION

Pneumonia is defined as one of the most prevalent pathologies in the world, with high mortality rates, being an acute inflammatory disease generated by an infection that settles in the lung and affects the air spaces, and can reach the alveoli region. They are caused by the penetration of various microorganisms and contaminating agents such as bacteria, viruses, fungi and chemical reactions into the alveolar space, in which gas exchange occurs. Pneumonias can be classified into types, the main ones being: Community-Acquired Pneumonia (CAP), Hospital Pneumonia (PH) and Ventilator-Associated Pneumonia (VAP) (Ribeiro *et al.,* 2023; Saints; Padula; Waters, 2019; Vieira *et al.,* 2023).

Community-acquired pneumonia (CP) or community-acquired pneumonia (CAP) is a disease acquired outside the hospital environment or health care units, or when it manifests within 48 hours of admission to the unit. It is the leading cause of death in the world, with a significant impact on morbidity rates. Despite the great diversity of the respiratory microbiota, the wide dissemination of potentially pathogenic agents, the phenomenon of globalization, and the occurrence of viral epidemics, *Streptococcus pneumoniae* remains the most prevalent pathogen among the etiologic agents of CAP. In addition to this, other main agents involved are *Haemophilus influenzae* and gram-negative bacilli (Côrrea *et al.,* 2018; Vieira *et al.,* 2023).

CAP consists of lower respiratory tract infection resulting from microaspiration of oropharyngeal secretions or hematogenous dissemination, and its development depends on the host's immune response, exposure to highly virulent agents, or excessive inoculation of infectious agents. It manifests clinically through fever associated with productive cough and dyspnea and its diagnosis is made through clinical findings, laboratory and imaging tests, especially X-rays (Vieira *et al.,* 2023).

Regarding the severity of the disease, there are two classification criteria: the Pneumonia Severity Index (PSI) and the CURB-5. The PSI, although preferable by some guidelines, is more complex and more difficult to be performed in the emergency context. The CURB-5 is a simpler tool, based on the following variables: mental confusion, high blood urea levels, signs of respiratory distress, low blood pressure, and age 65 years or older (Vieira *et al.,* 2023).

Hospital Pneumonia (HP) is the second most common cause of hospital infection, occurring in around 5 to 10 cases due to hospitalizations. The presence of HP increases the patient's hospitalization stay by 7 to 9 days, and mortality is high – it can reach 70% in cases of *Pseudomonas* infection. The patient's evaluation mainly includes history and

physical examination, and the important diagnostic findings are X-ray, blood culture, and sputum test. Treatment includes the prescription of antibiotics based on culture results, antibiogram, and guidelines (Santos; Padula; Waters, 2019).

According to the Ministry of Health, in Brazil, the Unified Health System (SUS) registers more than 600 thousand hospitalizations for pneumonia annually. Care must be taken with people who are in the extreme age groups – the elderly and children – and those in whom the immune system is more compromised. Attention should also be redoubled in those who have comorbidities, such as diabetes and hypertension (Virtual Health Library, 2023).

The present study aimed to analyze the epidemiological profile of hospital admissions for pneumonia in Brazil from 2020 to 2023, and, as specific objectives, to sociodemographically characterize the profile of patients hospitalized in each Brazilian region, identify the most affected sex and age group, and quantify the number of hospitalizations per year surveyed.

The research is justified because, through it, it will be possible to obtain a situational overview of hospital admissions for pneumonia in the country, considering that it is a very common pathology in the hospital environment, and that understanding the profile of patients more susceptible to more severe conditions of the disease can help in a more efficient prevention, a faster diagnosis and more effective treatment.

METHODS

This was an epidemiological, documentary, quantitative, exploratory, descriptive and retrospective study. As these are public data, made available on an open access platform, it was not necessary to send them to the Research Ethics Committee. Even so, all the necessary measures were taken to comply with the resolution that determines the ethical aspects in research with human beings.

All individuals hospitalized for pneumonia in the five Brazilian regions, from 2010 to 2023, registered in the Hospital Information System (SIH/SUS), made available by the Department of Informatics of the Unified Health System (DATASUS), at the electronic address (http://www.datasus.gov.br), participated in the study. The following variables were selected: region of diagnosis, detailed diagnosis, gender, age group, and year of diagnosis. Data were collected through the analysis of records contained in the Department of Informatics of the Unified Health System (DATASUS) regarding hospital admissions for pneumonia in Brazil from 2020 to 2023, through data provided by the system itself.

The data obtained were organized and synthesized in tables and graphs developed in Microsoft Excel® programs. After that, they were analyzed through absolute and relative numbers, basic statistics in the base 100, calculations of the percentage of cases found and analysis of variance.

RESULTS AND DISCUSSION

In the present study, we analyzed the epidemiological profile of hospital admissions for pneumonia from 2020 to 2023, sociodemographically characterizing the profile of patients hospitalized in each Brazilian region, identifying the most affected gender and age group, and quantifying the number of hospitalizations per year surveyed. The data found are shown in Table 1.

Table 01 – Sample characteristics related to hospital admissions for pneumonia in Brazil from 2020 to 2023.

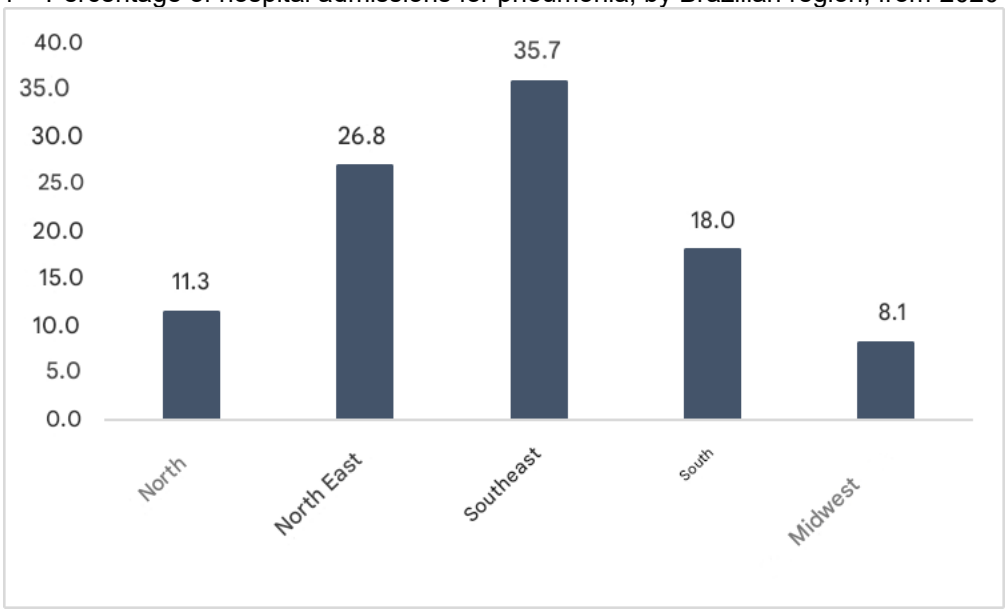
Features	Hospital admissions	
	N	%
AGE GROUP		
0 to 9 years	651752	29,9
10 to 19 years old	58219	2,6
20 to 29 years old	62681	2,9
30 to 39 years old	78980	3,6
40 to 49 years old	107684	4,9
50 to 59 years old	152756	7
60 years or older	911050	41,9
Total	2175878	100
SEX		
Female	963628	47,6
Male	1059494	52,4
Total	2023122	100
YEAR OF HOSPITALIZATION		
2020	374975	18,5
2021	376222	18,6
2022	637595	31,5
2023	634330	31,4
Total	2023122	100

Source: DATASUS, 2024.

When quantifying hospital admissions for pneumonia in Brazil from 2020 to 2023 (Table 01), a total of 2023122 hospitalizations were found, with the lowest number in 2020 (18.5%) and the highest in 2022 (31.5%). It should be noted that the number of hospitalizations recorded in the first two years analyzed (2020 and 2021) corresponds to about 50% of the number of cases recorded in the subsequent two years, which should probably be explained by the critical years of the pandemic, in which there may have been an underreporting of records for pneumonia, due to the fact that the clinic is similar to that found in patients with COVID-19. This reality has been observed in other studies, such as the one by Rossi *et al.* (2023), in which the number of hospitalizations found in the years

2020 and 2021 decreased compared to the two years prior to the pandemic, and in 2022 the number of hospitalizations increased by about 28%.

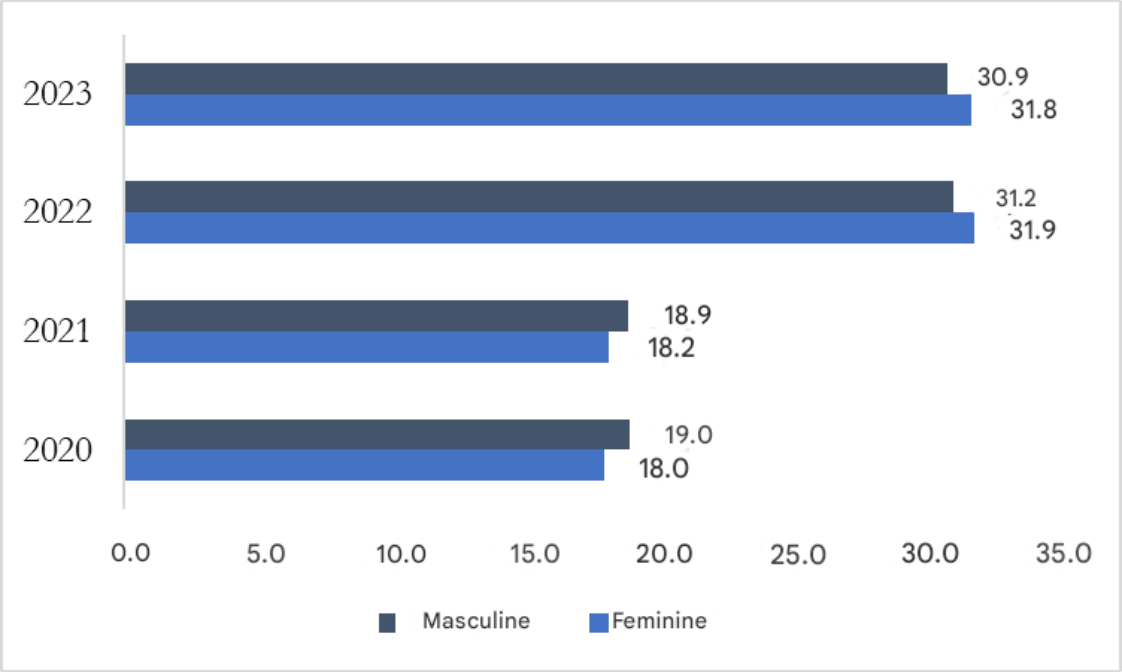
Graph 01 – Percentage of hospital admissions for pneumonia, by Brazilian region, from 2020 to 2023.



Source: DATASUS, 2024.

When the percentage of hospitalizations for pneumonia was extracted for each Brazilian region (Graph 01), the highest number of hospitalizations was concentrated in the Southeast (35.7%) and Northeast (26.8%) regions, whereas the lowest number recorded was found in the Central-West region (8.1%). It is believed that, when it comes to the Southeast region, the high percentage recorded is due to both greater access to health and the greater concentration of the existing population. In the Northeast region, the high rates of hospitalizations for pneumonia must be associated not only with the large number of populations, but also with precarious conditions that can make the inhabitants more susceptible to more severe infections.

Graph 02 – Percentage of hospital admissions for pneumonia, by sex, from 2020 to 2023.



Source: DATASUS, 2024.

Table 02 – Results of the analysis of the variance of hospital admissions for pneumonia, by sex, in the years 2020 to 2023.

SUMMARY						
Group	*Count*	*Sum*	*Average*	*Variance*		
Female	4	963628	240907	5852196989		
Male	4	1059494	264873,5	5451322864		
ANOVA						
Source of variation	*SQ*	*Gl*	*MQ*	*F*	*P-value*	*Critical F*
Between groups	1148786245	1	1148786245	0,20326168	0,66794	5,98738
Within the groups	33910559559	6	5651759927			
Total	35059345804	7				

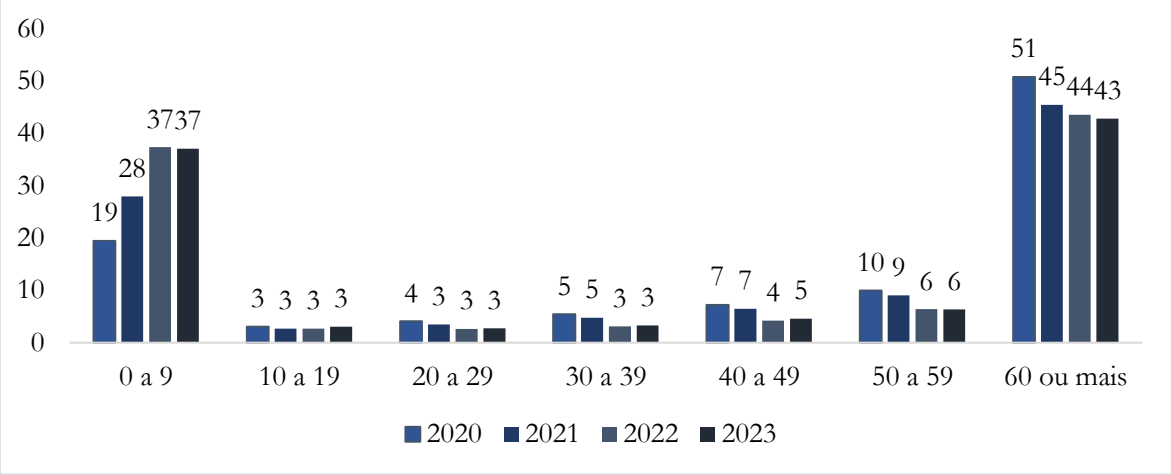
Source: Authors, 2024.

When surveying the percentage of hospital admissions for pneumonia quantified by sex (Graph 02), little difference was found between the number of men and women who need to be treated in the hospital environment due to the severity of the pathology. In 2020 and 2021, there was a slight predominance of male hospitalizations, while in the following two years, the opposite happened. The absence of significant prevalence between one of the sexes is also observed in the literature. In the research of Bahlis *et al.* (2018) and Santos Júnior; Silva; Santos (2022), the scenario analyzed also involved close amounts of

hospitalizations between men and women (H = 56.2% and M = 43.8% and H = 53.1% and M = 46.9%, respectively, with a slightly higher number of cases in males).

This analysis was proven after performing the calculations of variance between the data recorded for the two sexes, in order to statistically detect the existence or not of a pattern of predominance (Table 02). After the calculations generated by Microsoft Excel®, the P value found was analyzed, and it was possible to observe the absence of a statistically significant difference between hospital admissions recorded in males and females (since P = 0.66794, with this value greater than 0.05). The mean number of hospitalizations for pneumonia among men was 264873.5, slightly higher than that reported among women, 240907. These data corroborate values obtained in the study by Costa *et al.* (2022), in which the frequencies of hospital admissions for pneumonia in males were slightly higher than those recorded in females (H = 51.7% and M = 48.3%).

Graph 03 – Percentage of hospital admissions for pneumonia, by age group, in the years 2020 to 2023.



Source: DATASUS, 2024.

When investigating the number of hospital admissions for pneumonia by age group affected (Graph 03), it is noticeable that the high rates are found at the extremes of age (0 to 9 years and 60 years or older), which are usually more susceptible to more severe forms of the disease. This reality brings the need for greater attention to these populations considered at risk. According to Nascimento; Farah (2020), children and the elderly usually have higher mortality rates, since the immune system of these patients is usually still immature (in the case of children) or is already worn out (in the case of the elderly), in addition to possible problems regarding the vaccination schedule.

The study conducted by Costa *et al.* (2022) also confirms the results found in this study in relation to the age groups most subject to hospitalizations for pneumonia. According to the data analyzed by the authors, the groups with the highest prevalence of the pathology occurred between early childhood and the elderly. Consonant Junior;

Massaru (2019), diseases of the respiratory system are among the main causes of hospital admission, and the number of deaths of the elderly associated with complications from pneumonia is associated with weaknesses that arise with advanced age, such as low immunity, physiological issues, existing comorbidities, and hospital infections.

For Costa *et al.* (2014), respiratory problems usually occur in children in the first five years of life, being more prevalent between six and twenty-four months of age. In that study, most of the patients hospitalized with pneumonia were younger than two years of age (70.6%). According to Paredes *et al.* (2023), the consequences of the worsening of pneumonia in children can be mitigated by family support and support.

As demonstrated in this study, it is important to understand the epidemiological profile of patients hospitalized for pneumonia in Brazil, in addition to associating the panorama found with the context of the reality of each region of the country, as a way to focus on improvements that ensure not only the prevention of the disease, but also the adoption of measures aimed at reducing the severity of complications and, thus, to the number of hospitalizations for this pathology.

CONCLUSION

It can be concluded that, according to the analysis of hospital admissions for pneumonia in Brazil, the Southeast and Northeast regions concentrate a greater number of patients hospitalized for this pathology, whereas the lowest number is found in the Midwest region. In addition, there is no significant prevalence of one sex to the detriment of the other, with men and women being affected in an almost similar way. The age groups with the highest number of hospitalizations for pneumonia are found in children and the elderly, individuals who are generally more susceptible to more severe forms of the infection. The pandemic seems to have impacted data records, since the clinical pneumonia can be confused with the signs and symptoms of COVID-19.

The work was carried out in a well-elaborated and in-depth way. However, among the difficulties found in the study, the possible underreporting that existed, either during the pandemic period, or in cases not recorded due to problems in the operationalization of the system, stand out.

Therefore, the present study was important due to the collection of data outlining a profile of hospital admissions for pneumonia in Brazil in the last four years. In this sense, based on the organized registries, measures can be planned to improve the prevention of the disease in patients vulnerable to risk, as well as to avoid the occurrence of complications that lead to the hospitalization of these patients.

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