


## Factors associated with pertussis in Brazil: An epidemiological analysis (2018-2023)

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### ABSTRACT

An upward trend was observed in the incidence of pertussis in Brazil, leading to an epidemic alert, based on epidemiological bulletins issued by government health agencies. Our objective in the present study was to identify the epidemiological profile of pertussis in Brazil. We used the incidence of notifications of the disease in the period from January 2018 to December 2023. A quantitative, retrospective, and epidemiological methodological approach was used, showing the number of hospitalizations due to pertussis. Data were

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collected through the SUS Department of Informatics (DATASUS), and the variables investigated were year of processing, region, sex, color/race, age group, and pertussis-related deaths. The information pointed out that the need for robust and continuous public policies for the control and prevention of pertussis is highlighted, with a special focus on the most affected populations and regions.

**Keywords:** Pertussis, Epidemiology, Observational Study.



## INTRODUCTION

Pertussis is a highly transmissible acute infectious disease and represents a significant cause of morbidity and mortality in children. It is caused by the bacteria *Bordetella pertussis* and *B. parapertussis*. The human being is the only known natural reservoir, although the existence of chronic carriers has not yet been proven. (MEDEIROS, 2017)

This disease mainly affects the respiratory system, including the trachea and bronchi. It is manifested by intense episodes of dry cough. In infants, it can lead to serious complications and even death.

Pertussis is transmitted mainly by direct contact between a sick person and an unvaccinated person, through droplets expelled during coughing, sneezing or even when speaking. In some cases, transmission can occur through objects recently contaminated with secretions from infected people. However, this form of transmission is infrequent, as the causative agent of the disease has difficulty surviving outside the human body. The incubation period of the bacteria, that is, the time between infection and the onset of symptoms, usually ranges from 5 to 10 days, but can extend from 4 to 21 days and, rarely, up to 42 days.

The characteristic symptoms of pertussis begin with a catarrhal phase and evolve into a paroxysmal phase, marked by intense coughing and the characteristic whooping cough. These symptoms are caused by the toxins produced by the bacterium *B. pertussis*. The colonization of the airways by the bacterium and the resulting cellular lesions are central aspects in the pathophysiology of the disease. (MEDEIROS, 2017).

The differential diagnosis of pertussis should be made considering other acute respiratory infections, such as tracheobronchiolitis, bronchiolitis, adenoviruses, and laryngitis. In addition, there are other diseases known as "pertussis syndrome" or coqueluchoid diseases, which can present similar symptoms (TREVIZAN; COUTINHO, 2008).

Laboratory diagnosis of pertussis involves several strategies. Nasopharyngeal culture is considered the "gold standard" due to its high specificity, although its sensitivity varies. In addition, other methods, such as the Elisa test for immunoglobulin detection, fluorescent antibody (DFA) testing, and real-time PCR, can also be used to confirm the diagnosis. It is worth mentioning that PCR can detect both live and dead bacteria, so it is important to consider clinical symptoms when indicating this test. Serology is beneficial in patients vaccinated for more than 2 years and should be collected in two stages, preferably in the catarrhal phase (MOTTA; CUNHA, 2012).

The treatment of pertussis is carried out with antibiotics, with macrolides being the first choice. Erythromycin, azithromycin, and clarithromycin are appropriate agents for initial treatment. It is important to administer them during the catarrhal phase for greater effectiveness. In addition, the



choice of antimicrobial should consider factors such as potential adverse events, drug interactions, tolerability, adherence to the prescribed regimen, and cost

Therefore, it is important to conduct research to identify the factors that contribute to the increase in the number of cases of disease and to understand the characteristics of the most affected population. In addition, it is essential to develop more effective prevention and control strategies, considering the growing concern of health authorities around the world (TREVIZAN; COUTINHO, 2008).

Therefore, the objective of the present study was to identify and characterize the epidemiological profile of confirmed pertussis cases in Brazil between 2018 and 2023.

## **OBJECTIVE**

This study aims to investigate and understand the factors associated with the incidence of pertussis in Brazil in the period between January 2018 and December 2023. In addition, it seeks to analyze the geographic distribution of the disease, as well as possible seasonal variations. This research will contribute to a deeper understanding of the spread of pertussis and will allow the identification of the most affected population groups. In addition, individual characteristics that may make certain groups more vulnerable to the disease will be investigated.

## **METHODOLOGY**

This is an observational epidemiological study of a descriptive nature. Descriptive epidemiological studies play a significant role in health sciences research, constituting the first stage in the application of the epidemiological method to understand the behavior of a health problem in a population.

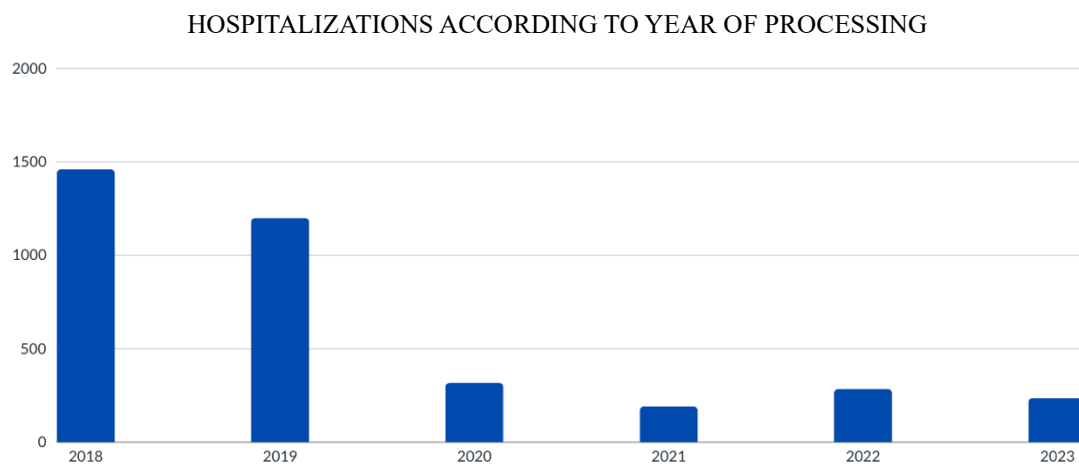
The data were obtained by consulting the SUS Notifiable Diseases Information System (SINAN) databases, referring to the period from 2018 to 2023. The following aspects were evaluated: year of processing, region, sex, color/race, age group, and pertussis-related deaths. Information was also obtained from the SCIELO and GOOGLE SCHOLAR databases, in which the keywords "pertussis", "epidemiological profile" and "observational study" were used.

The study population consisted of the number of confirmed pertussis cases diagnosed in Brazil and recorded from January 2018 to December 2023. The indicator used to project the results (tables) was the number of confirmed cases of pertussis, with A37 being the code of the International Classification of Diseases (ICD-10). To avoid incomplete information in the system, such as that of the year 2024, it was decided to use only the years prior to 2024 available in the system. From the data obtained from the DATASUS SINAN, new tables were built in Microsoft Excel, which were later analyzed by means of descriptive and analytical statistics.

Due to the information obtained through a database in the public domain, according to item III of Resolution No. 510/2016, it was not necessary to submit the study to the Research Ethics Committee (CEP).

## RESULTS

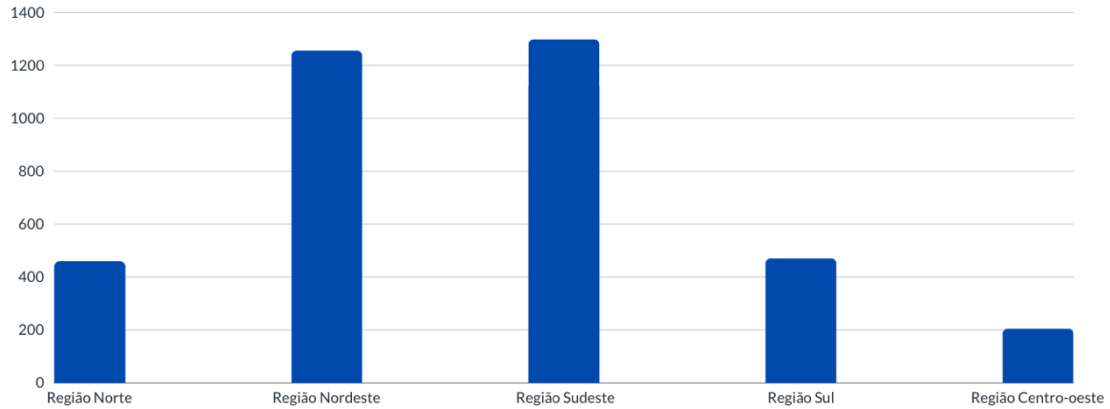
There were 3,691 cases of hospitalizations for pertussis in Brazil from January 2018 to December 2023. The average length of stay was 6.2 days. The highest number of cases was recorded in 2018, 1,460 (39.5%) of total hospitalizations. The year 2021 represented the lowest number of hospitalizations with 192 (5.2%).



Source: Ministry of Health - SUS Hospital Information System (SIH/SUS)

The Southeast Region had the highest number of hospitalizations, 1,299. The total number of hospitalizations due to pertussis in the Southeast Region of Brazil, which is formed by the states of São Paulo, Minas Gerais, Rio de Janeiro and Espírito Santo, corresponds to 35.1% of the total number of hospitalizations reported. However, the region that presented the lowest number of cases for the same period was the Central-West Region with 205 cases, representing 5.5% of total hospitalizations.

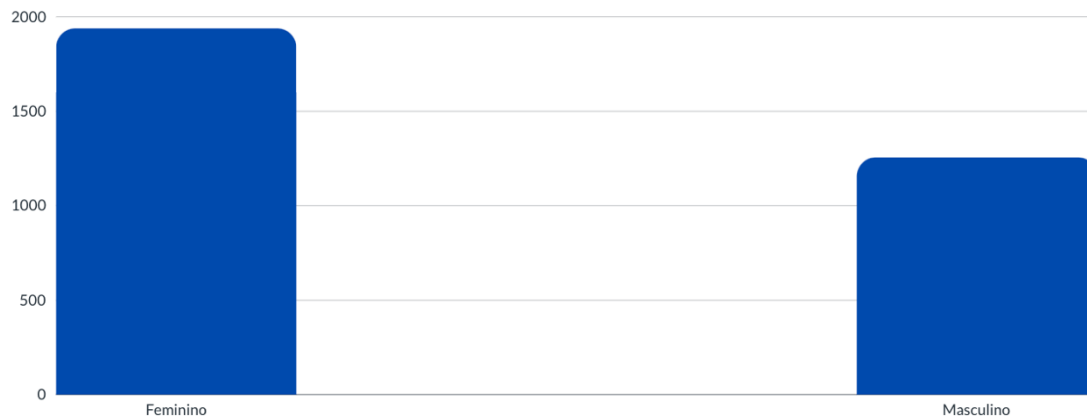
### HOSPITALIZATIONS ACCORDING TO REGION



Source: Ministry of Health - SUS Hospital Information System (SIH/SUS)

The individuals most affected by the disease were female, with 1,939 hospitalizations, representing 52.5%. Males had 1,752 hospitalizations, expressing 47.4%.

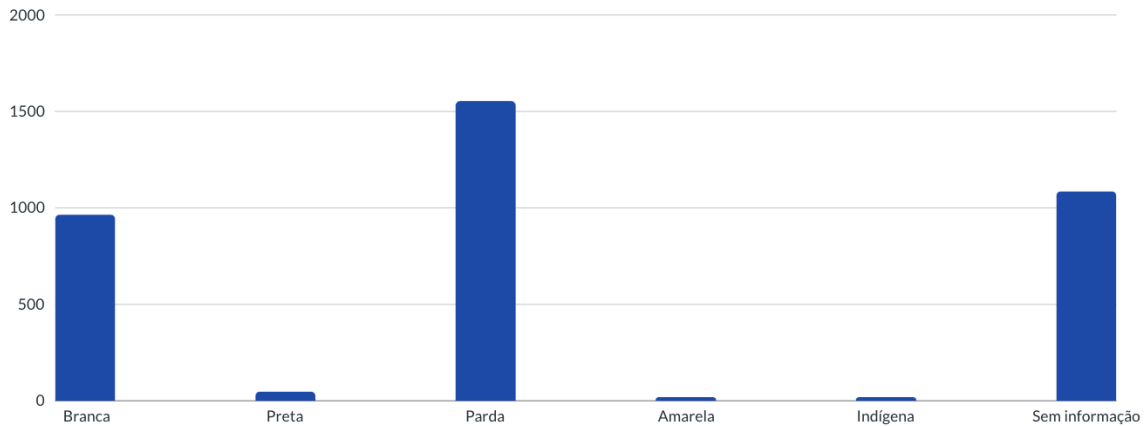
### HOSPITALIZATIONS ACCORDING TO SEX



Source: Ministry of Health - SUS Hospital Information System (SIH/SUS)

The brown color/race registered 1,554 hospitalizations, representing 42.1% of the cases. This data shows the prevalence of pertussis in brown individuals, mainly, followed by white individuals with 965 hospitalizations, making up 26.1% of total hospitalizations. However, there were 1,086 cases that did not obtain information regarding the color/race of the affected patients.

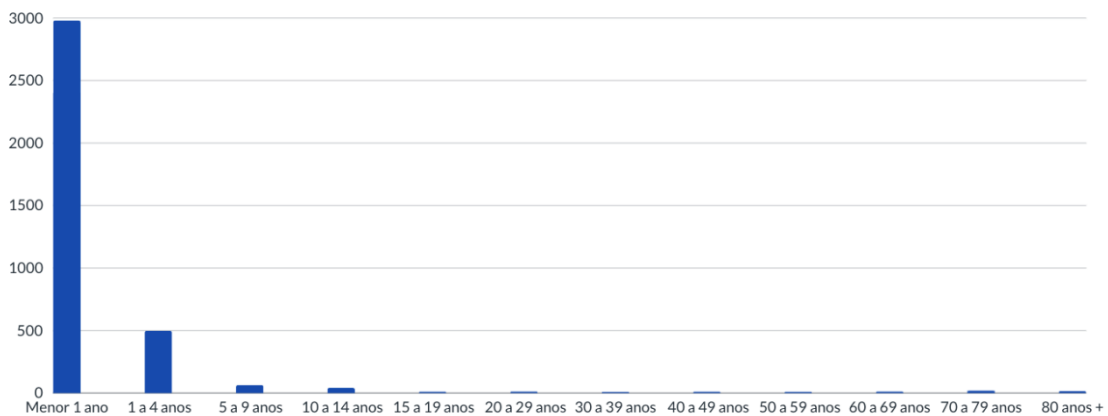
### HOSPITALIZATIONS ACCORDING TO COLOR/RACE



Source: Ministry of Health - SUS Hospital Information System (SIH/SUS)

The age group with the highest number of hospitalizations was the one under 1 year of age, with 2,981 cases, representing 80.7% of total hospitalizations and corroborating the theories seen in the literature on this topic.

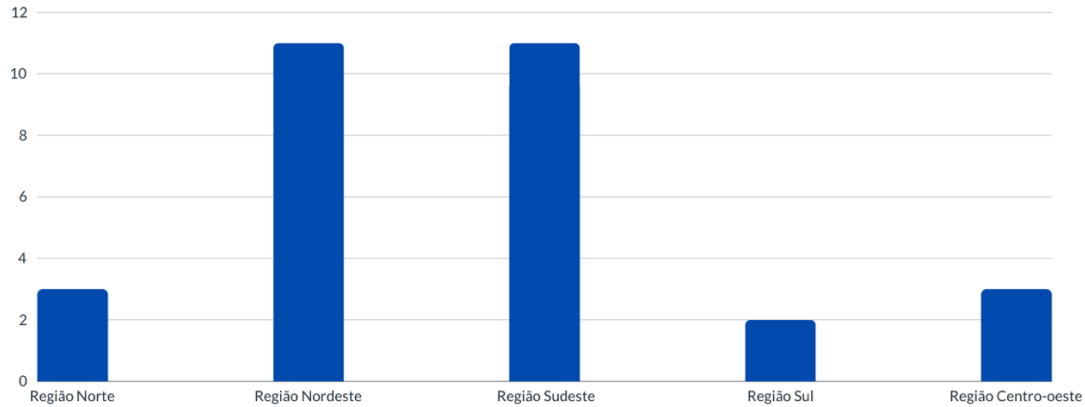
### HOSPITALIZATIONS ACCORDING TO AGE GROUP



Source: Ministry of Health - SUS Hospital Information System (SIH/SUS)

Regarding the total number of deaths from pertussis, a total of 30 deaths were recorded between 2018 and 2023, which were more expressive in the Northeast Region and in the Southeast Region, with 11 cases in each.

### DEATHS ACCORDING TO REGION



Source: Ministry of Health - SUS Hospital Information System (SIH/SUS)

## CONCLUSION

Based on the results obtained, we can conclude that pertussis continues to be a public health problem in Brazil. During the period from January 2018 to December 2023, 3,691 hospitalizations for this disease were recorded. The year 2018 had the highest number of cases.

The Southeast Region concentrated the highest number of hospitalizations, representing 35.1% of the total. This suggests that the states of São Paulo, Minas Gerais, Rio de Janeiro, and Espírito Santo face a significant challenge in controlling pertussis.

Demographics are also relevant. Women were most affected, accounting for 52.5% of hospitalizations. Brown color/race was the most prevalent among the patients, with 42.1% of the cases.

The most vulnerable age group was children under 1 year old, with 80.7% of hospitalizations. This observation is in line with the existing literature on the subject, which highlights the susceptibility of infants to pertussis.

As for deaths, 30 deaths were recorded in the period. The Northeast and Southeast regions were the most affected, with 11 cases each. These results indicate the continued need for pertussis surveillance, prevention, and education to protect the health of the population.





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