Profile of Covid-19 hospitalizations and deaths in northeast brazil in 2020

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ABSTRACT
COVID 19 is still a new disease, involved in the pandemic that has been plaguing us since 2020. It has 4 stages: 1°) Upper respiratory tract infection with fever, muscle fatigue and pain; 2°) Dyspnea and pneumonia; 3rd) Hyperinflammatory clinical picture-cytokine storm and 4th) Outcome due to death or recovery of the patient, with possible sequelae in his recovery. In the Northeast region, there are states with a very low Human Development Index (HDI), where diseases prevail and succumb to undesirable outcomes. Thus, the objective of this study was to trace the epidemiological profile of hospitalizations and deaths by COVID-19 in the Northeast, in the year 2020. An epidemiological, descriptive, time series study was carried out, with secondary data from the SUS-DATASUS Information System, that were tabulated in an EXCEL spreadsheet and exported to Bioestat 5.3 for statistical analysis. The results showed a predominance of hospitalizations in: Pernambuco (21.58%), Ceará (20.33%) and Bahia (19.45%); male-had 53.53% of notifications and female-44.33%; brown race/color - most registered (54%); schooling-predominance of non-completion (40.67%); age group - over 60 years old (55.83%); proportions of deaths from hospitalizations: Maranhão (45.8%), Ceará (40.2%) and Alagoas (39.1%). The high number of deaths in hospitalizations due to COVID-19 in 2020 reinforces that more efficient public policy management is essential, with coordination, consistent theoretical basis, resource management, action in preventive measures and improvement in treatment, which includes improvement of measures. taken during hospitalization, aiming to reduce this frightening percentage of deaths due to hospitalizations.

Keywords: Covid 19, Epidemiology, Deaths, Teaching.

1 INTRODUCTION

In the city of Wuhan, capital of Hubei province in China, an outbreak of cases of undetermined pneumonia was identified in December 2019. The emergence of a new virus, later named SARS-CoV-

2, which causes the respiratory disease now known as COVID-19, was found (Tan et al., 2020); (Wang et al., 2020).

In most cases, the coronavirus in humans causes mild seasonal respiratory tract infections. However, the Severe Acute Respiratory Syndrome (SARS-CoV), Middle East Respiratory Syndrome (MERS-CoV) and SARS-CoV-2 coronaviruses, which have emerged in the last 20 years, are responsible for cases with greater aggravation and impairment of the respiratory system (V'Kovski et al., 2021).

Four stages of COVID-19 were identified in 2020, the first stage characterized by an upper respiratory tract infection accompanied by fever, muscle fatigue, and pain. The second was due to dyspnea and pneumonia. The third was due to a hyperinflammatory clinical picture due to a cytokine storm. The fourth is the outcome of the patient's death or recovery (Stasi et al., 2020). Most infected people develop mild to moderate respiratory disease. However, elderly patients and/or those with cardiovascular diseases, diabetes, chronic respiratory diseases, and cancer are more likely to develop the severe form of COVID-19. It is transmitted by droplets of saliva and nasal secretion during a cough or sneeze, so protection and hygiene practices are essential (WHO, 2020).

In February 2020, the first case of SARS-CoV-2 infection was confirmed in Brazil in the city of São Paulo. On March 17, 2020, the first death from the disease was recorded in the country. Since then, this disease has spread rapidly and in less than a month of its onset, it was already possible to identify community transmissions in some cities (Trompieri Neto & Oliveira et al., 2020). Exactly one year after the first death from COVID-19 in Brazil, 284,775 deaths and 11,693,838 cases were recorded, placing the country among the main nations worldwide in the registration of deaths from COVID-19, raising several questions about the actions to combat the virus throughout the national territory (Brasil, 2021).

The Northeast has about 27% of Brazil's population with a cumulative of 23% of registered cases and approximately 22% of deaths from COVID-19, being the second most affected region in the country (Brasil, 2021). Initially, the first case appeared in the state of Bahia, with its first death in the state of Pernambuco. Thus, the disease had a distinct evolution among the states of the Northeast. Its high rates are initially associated with the large flow of tourists in some locations (Marinelli et al., 2020).

Due to the notoriety of the occurrences of morbidity and mortality due to COVID-19 in the world and in the population of Brazil, specifically in the Northeast, the epidemiological study of this topic has become relevant, since the data need to be described and exposed in a comprehensive way, in order to identify the profile that can guide the improvement of health decision-making, which includes prevention, diagnosis, treatment and control of the disease. Therefore, the objective of this

study was to outline the epidemiological profile of hospitalizations and deaths due to COVID-19 in the Northeast in 2020.

2 METHODOLOGY

Data on COVID-19 in Brazil were collected in the 1st and 2nd semesters of 2020 through Open DATASUS, an official database of the SUS, Ministry of Health, in the public domain. The region covered was the Brazilian Northeast, which is composed of nine states (Alagoas, Bahia, Ceará, Maranhão, Paraíba, Pernambuco, Piauí, Rio Grande do Norte and Sergipe) and 1,793 municipalities. It has an area of 1,558,000 km² with a population estimate of around 57,374,243 for the year 2020 (IBGE, 2020).

The variables studied were: year, final classification (code 5), SARS COV-2, Northeast, Federation Units, hospitalizations, deaths, sex, skin color, and age group.

To this end, an epidemiological, descriptive, time-series study with a quantitative approach was carried out, with secondary data from the Ministry of Health, Brazil, specifically in the OpenDATASUS.gov.br – coronavirus data – dataset, available at: https://opendatasus.saude.gov.br/dataset/bd-srag-2020, accessed on April 1, 2021.

The DATASUS data were transferred to Excel where they were tabulated, and graphs and tables were elaborated, later exported to the Bioestat 5.3 program (statistical program freely distributed by the Mamirauá platform). In this way, it was possible to present absolute data, frequencies and descriptive statistics for analysis in the results. These data were discussed based on data from the available scientific literature.

This research did not require submission and approval by an ethics committee, thus dispensing with a consent form, as it was based on public data from a population distributed in the public domain, without identification that would jeopardize or cause any harm to any participant in the sample.

3 RESULTS

Based on the survey carried out in OpenDATASUS, a database of the Ministry of Health, on Covid-19, the data show that among the universe of severe acute respiratory syndromes (SARS), Covid-19 as a final classification, presented a relevant impact on public health in 2020, representing 58% of the overall cases notified by general SARS and 62% of the classified SARS. The Northeast, in turn, had 19.21% of the cases of final classification covid-19, in relation to the total of COVId-19 in Brazil in 2020 (Graph 1).
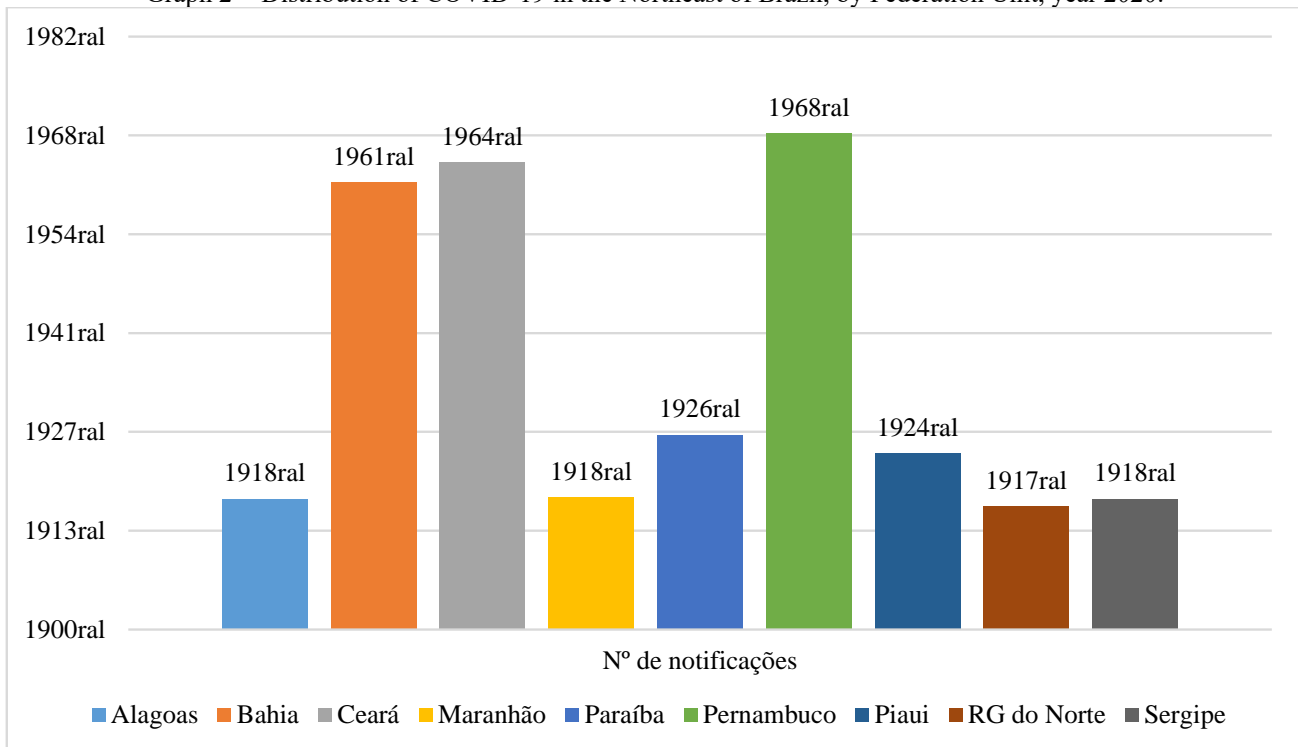
Graph 1 - Distribution of COVID-19 in relation to SARS in Brazil, Northeast, 2020.
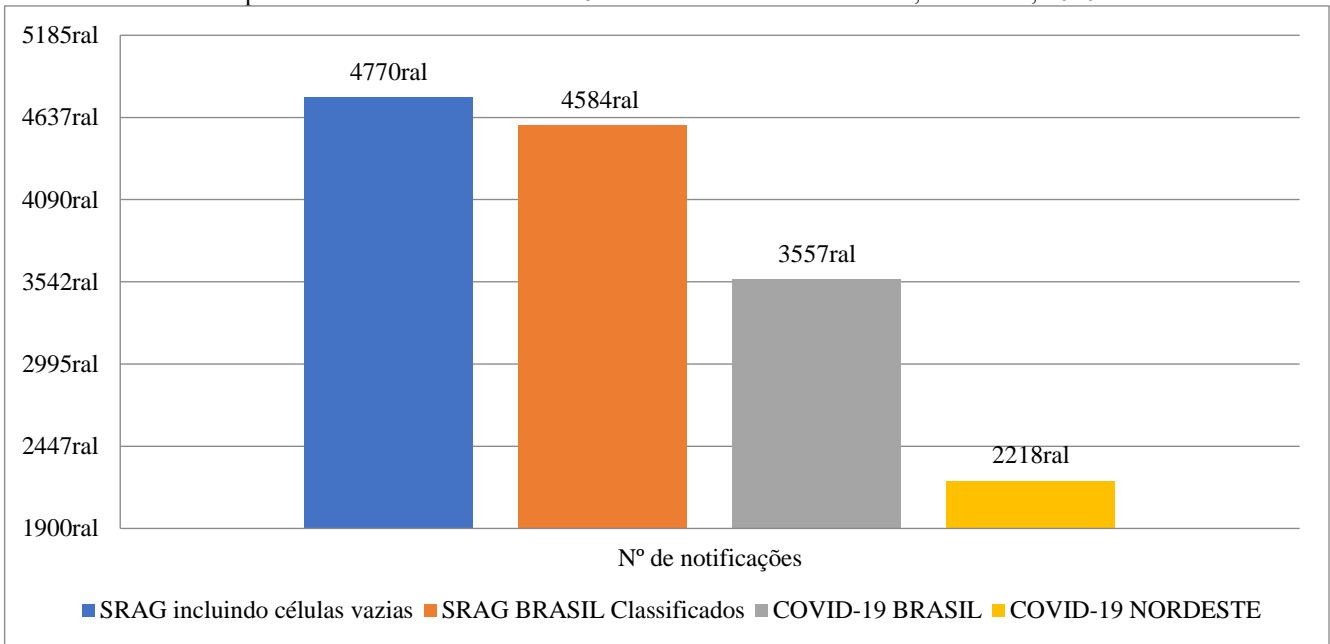
Source: Prepared by the author, with data from OpenDATASUS, 2020.

The results regarding the distribution of COVID-19 by Federation Units of the Northeast, Graph 2, show that Pernambuco had the most reported cases of covid-19 in 2020 with 21.58% of the COVID-19 cases in the Northeast, followed by Ceará 20.33%, Bahia 19.45%, Paraíba 8.48%, Piauí 7.66%, Maranhão 5.75%, Alagoas 5.7%, Sergipe 5.68% and Rio Grande do Norte 5.37%.

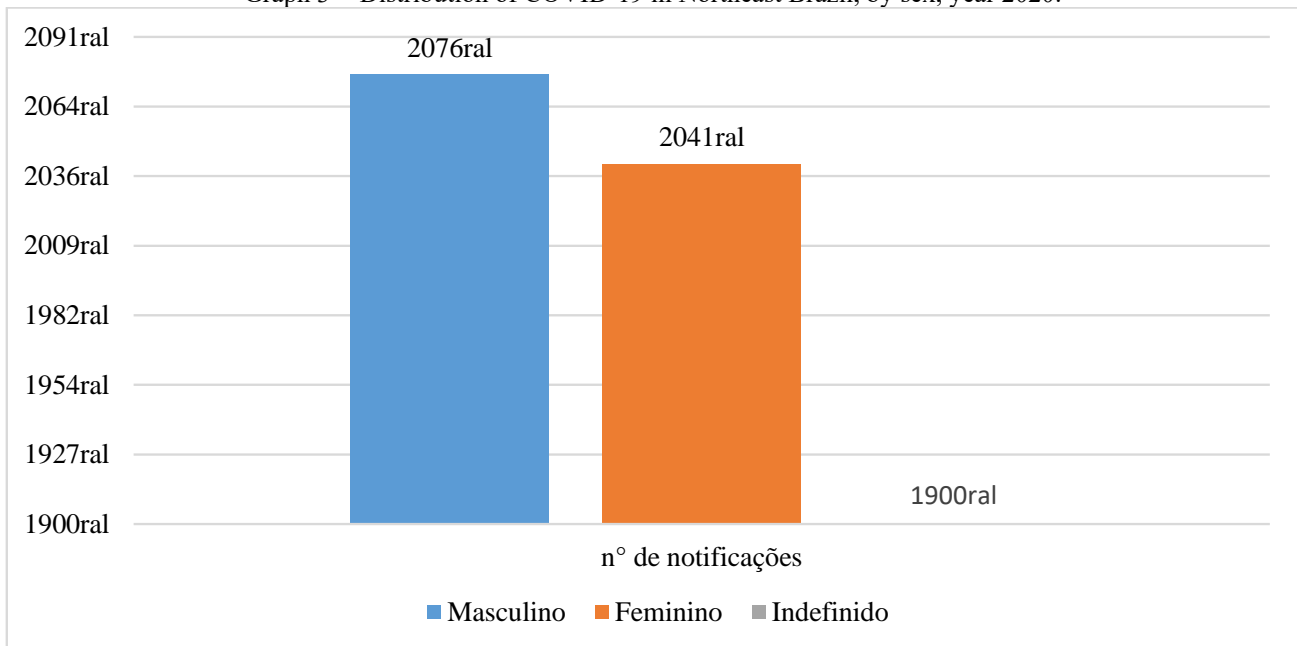Graph 2 - Distribution of COVID-19 in the Northeast of Brazil, by Federation Unit, year 2020.

Source: Prepared by the author, with data from OpenDATASUS, 2020.

Regarding gender (Graph 3), there was little difference between males and females, and the undefined sex was not very representative, with 53.53% male, 44.33% female and 0.03% undefined.
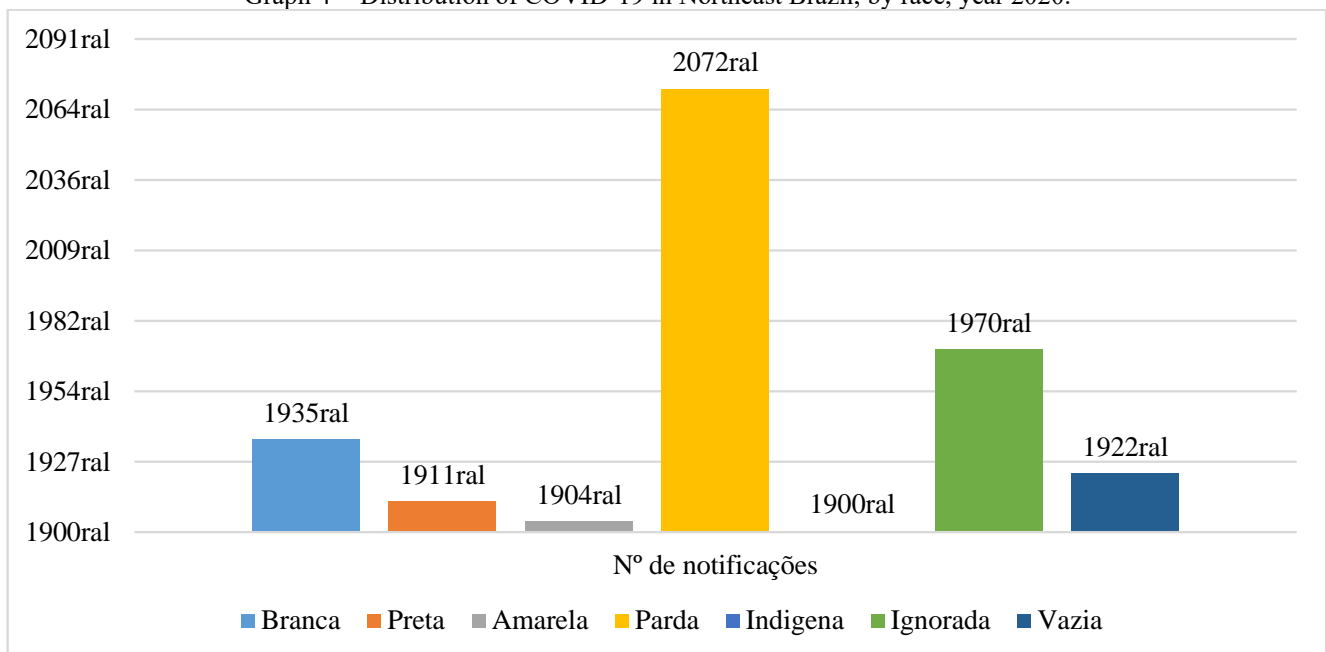
Graph 3 - Distribution of COVID-19 in Northeast Brazil, by sex, year 2020.

Source: Prepared by the author, with data from OpenDATASUS, 2020.

Regarding race (Graph 4), the vast majority of cases of notifications were in the brown race, followed by the unknown race, which represented 54% brown, 22% ignored, 11% white, 7.16% unfilled, 3.76% black, 1.3% yellow and 0.17% indigenous.

Graph 4 - Distribution of COVID-19 in Northeast Brazil, by race, year 2020.
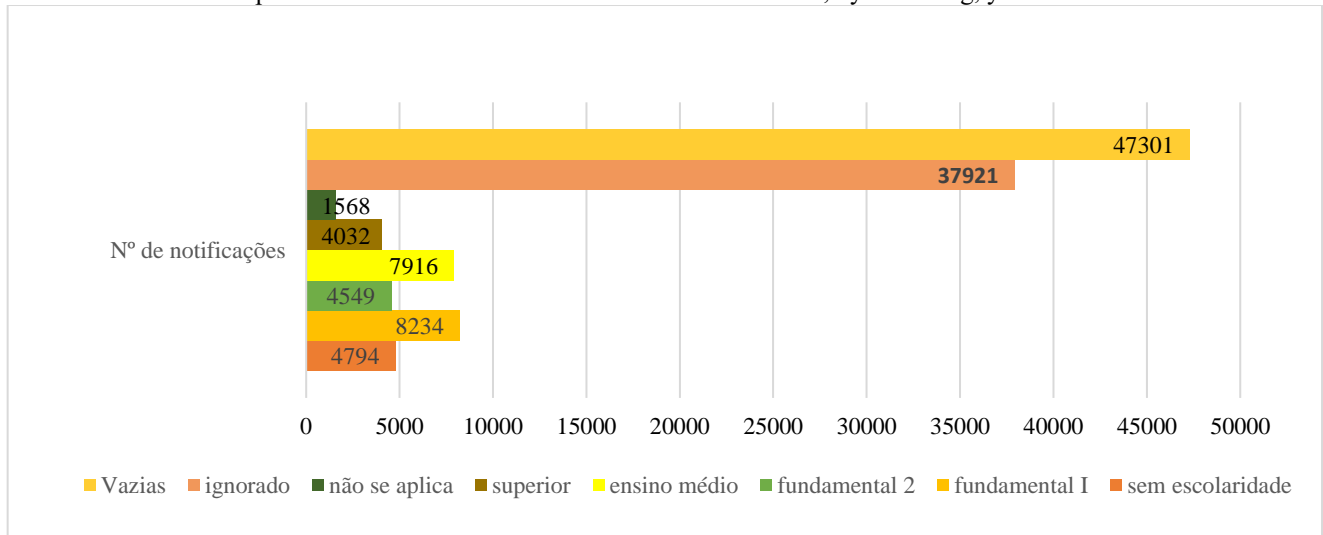

Source: Prepared by the author, with data from OpenDATASUS, 2020.

With regard to schooling (Graph 5), there was a predominance of people with final COVID-19 classification with no filling out of a form (empty) 40.67%, followed by unknown schooling 32.60%, elementary school I 7.08%, high school 6.8%, no schooling 4.12%, Elementary II 3.91%, higher 3.47%, no application 1.35%. Therefore, the vast majority do not present information on schooling.

Graph 5 – Distribution of COVID-19 in Northeast Brazil, by schooling, year 2020.

Source: Prepared by the author, with data from OpenDATASUS, 2020.

As for the age group (Graph 6), the age groups above 40 years show a significant increase in COVID-19 infection compared to the younger age groups. The age groups of 60 to 69 years and 70 to 79 years are the most affected. Age groups: 0-0.15%, 1 to 4 years-1.23%, 5 to 9 years-0.78%, 10-14 years-0.51%, 15-19 years-0.77%, 20-29 years- 3.85%, 30-39 years-8.83%, 40-49 years-12.09%, 50 to 59-15.96%, 60 to 69 years-19.30%, 70 to 79 years-19.07%, 80 years and +-17.46%.

Graph 6 - Distribution of COVID-19 in the Northeast of Brazil, by age group, year 2020.
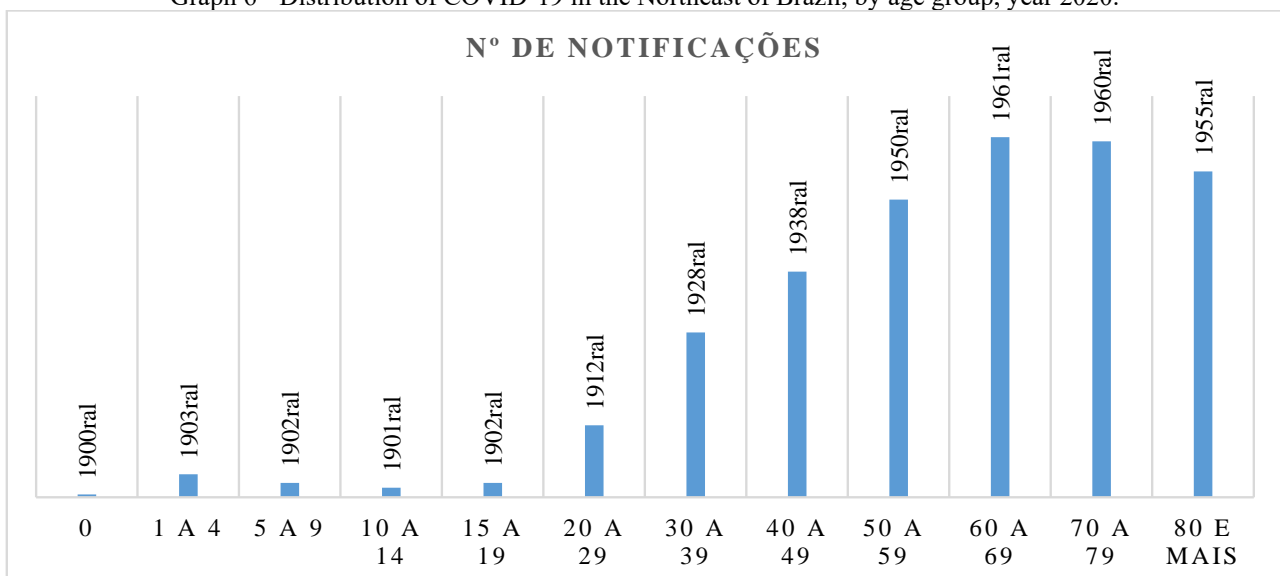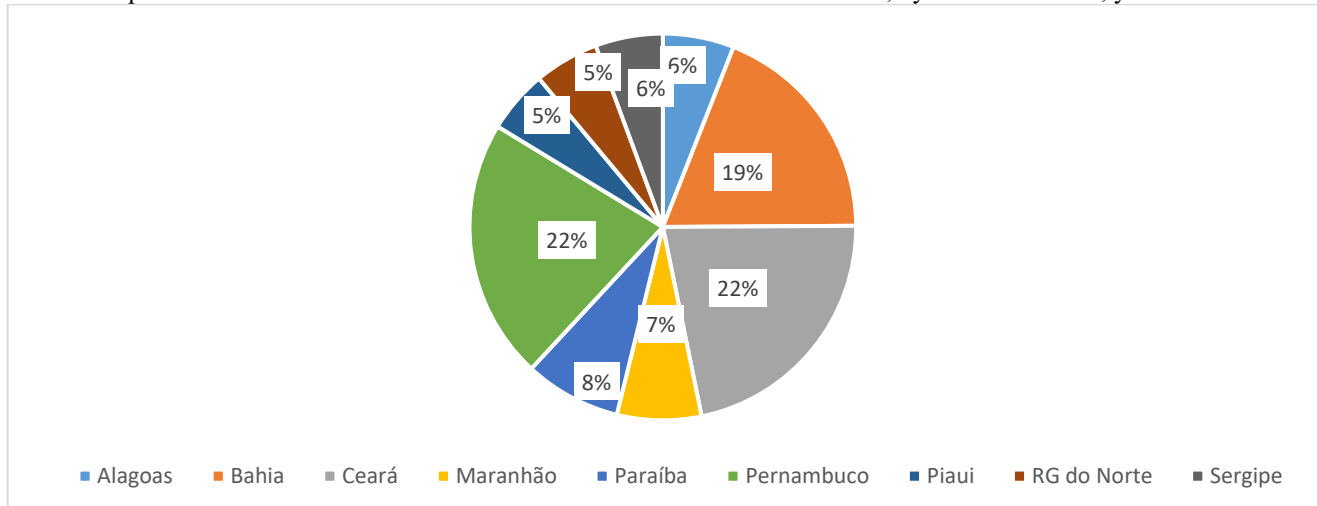

Source: Prepared by the author, with data from OpenDATASUS, 2020.

Regarding the number of deaths, there were 43444 deaths among patients with COVID-19 hospitalized in the Northeast, which distributed by the Federation Units represent the percentages described in Graph 7, number of deaths by Federation Unit: Alagoas (n=2590), Bahia (n=8229), Ceará (n=9505), Maranhão (n=3063), Paraíba (n=3509), Pernambuco (n=9465), Piauí (n = 2276), Rio Grande do Norte(n=2358), Sergipe(n=2449).

Graph 7- Distribution of deaths from COVID-19 in the Northeast of Brazil, by Federation Unit, year 2020.

Source: Prepared by the author, with data from OpenDATASUS, 2020.

Regarding the distribution of the number of deaths compared to the number of notifications of COVID-19 cases in hospitalized patients by state (Table 1), there are very high percentages of deaths in hospitalized patients, with higher frequencies of deaths in Maranhão (45.8%), Ceará (40.2%), Alagoas (39.1%), Pernambuco (37.7%), Rio Grande do Norte (37.7%), Sergipe (37.1%), Bahia (36.4%), Paraíba (35.6%), Piauí (25.5%) and representing, in relation to the total number of notifications in Brazil, 37.35% of deaths in hospitalized patients due to COVID-19.

Table 1 - Distribution of the number of deaths and number of notifications of hospitalized patients with final COVID-19 classification, in the Northeast of Brazil, by Federation Unit, year 2020.

COVID-19	DEATHS	N° OF NOTIFICATIONS
Alagoas	2590	6628
Bahia	8229	22619
Ceará	9505	23648
Maranhão	3063	6690
Paraíba	3509	9859
Pernambuco	9465	25099
Piaui	2276	8915
Rio Grande do Norte	2358	6249
Sergipe	2449	6608
TOTAL	43444	116315

Source: Prepared by the author, with data from OpenDATASUS, 2020.

4 DISCUSSION

In this study, we retrospectively analyzed the case data of patients hospitalized for SARS due to COVID-19 in the Northeast region, during the entire pandemic period in Brazil, referring to the year 2020, using a national database. According to the data collected, the number found in the Northeast was 116,315 cases with 43,444 deaths.

The state in the Northeast with the most hospitalizations was the state of Pernambuco (21.58%), followed by Ceará (20.33%) and Bahia (19.45%). The first death recorded in the Northeast was in Pernambuco, that is, the advance of the disease in this state occurred early. However, COVID-19 started almost simultaneously among the northeastern states. These three states with the highest rates are also the three most populous states in the region (Ximenes *et al.,* 2021); (IBGE, 2020).

A preponderant factor in the results is the tourism sector, which may have provided the highest incidence in these three states. According to the 2019 Continuous Tourism PNAD, the northeastern states that receive the most travelers are the states of Bahia with 31.2% of demand, Ceará with 15.4% and Pernambuco with 11.4% (Trompieri Neto & Oliveira, 2020).

Apparently, the State of Pernambuco had SARS-CoV-2 spread from the coastal region of the State to the interior, through the main access road to the Pernambuco hinterland. The particularities of local transportation seem to play an important role in the relentless advance of COVID-19. This may explain, in part, the rapid spread of the virus throughout the state and the hospitalizations recorded (Carmo *et al.,* 2020).

Regarding the incidence by sex, the results showed a slightly higher incidence of SARS due to COVID-19 in males with a reach of 55.53% compared to females with 44.43%. In terms of the number of total cases in Brazil, men are also the majority, especially in the second half of 2020. Initially, the outbreak in the country had a greater trend in women, which may be related to several factors such as the predominance of women occupying positions in health services. As the pandemic progressed, this scenario was reversed (Global Health 50/50, 2021).

Several factors may be associated with this repercussion in the male population. Studies point to lower adherence to prevention practices by males, which may be linked to cultural factors of masculinity and/or pandemic fatigue, which is more common in young men (Macintyre *et al.,* 2021).

Female hormones can be a protective factor for women. Estrogen levels can interfere with ACE2 expression, which considerably reduces virus entry and progression of COVID-19 disease. Regarding the immune system, innate and adaptive immune responses are stronger in women than in men, which can help in a more efficient elimination of pathogens, however women are more susceptible to autoimmune diseases (Mussini *et al.,* 2021).

Brown people in the Northeast are responsible for more than half of the number of hospitalizations (54.04%), in terms of race. In other studies, there is also a predominance of browns in Brazil, both in incidence and mortality. Whites, in general, are more likely to be admitted to the ICU than browns, who have the highest proportion of deaths outside the intensive care bed. Brown people, in general, have lower socioeconomic conditions, thus becoming a more vulnerable group (Baqui *et al.,* 2020).

The age group most affected by SARS and SARS-CoV-2 was the age group over 60 years, accumulating almost 65,000 cases (55.83%). Since the onset of the disease, advanced age has been seen as a risk predictor for COVID-19. Age 65 years or older, according to studies, was associated with a higher prevalence of death. The various comorbidities, which are more common in the elderly, are factors that contribute to these statistics. Immunological alterations, such as dysfunction of B and T lymphocytes and excessive cytokine production, can lead to prolonged pro-inflammatory responses and deficiency in the control of viral replication, which can lead to unfavorable outcomes (Parohan *et al.,* 2021).

Among children and adolescents, the age group with the highest incidence was 1 to 4 years old, with 1,427 hospitalizations, accounting for 1.23% of the total. On the other hand, according to global data, children under 1 year of age have the highest case fatality and ICU admission rates (0.55% and 1.52%) (Kitano *et al.,* 2021). In our study, we did not evaluate the profile of deaths by age group, only their total number. There is evidence that one of the main forms of contamination by children occurs due to family groupings. Of the asymptomatic cases, it is estimated that 30% of children may present with lung lesions after the infectious process (Hillesheim *et al.,* 2020).

The number of deaths was in accordance with the total number of notifications in relation to the three leading states. However, in this case, the first place went to the State of Ceará (9,505), which had a small difference with the State of Pernambuco (9,465), both with a percentage of around 22%. When we compare the distribution of the number of deaths with the number of hospitalizations, we observe a change in the trend of the states, Maranhão, which previously occupied the sixth position in

notifications, becomes the leader with 45.8%, with Ceará in second (40.2%) and Alagoas in third (39.1%).

According to IBGE (2016), Maranhão and Alagoas are the states with the lowest life expectancy and the worst HDIs in the Northeast. The populations of these states are younger and should have higher COVID-19 survival rates. However, socioeconomic conditions seem to be predictive of high mortality in these states.

In addition, the supply of ICUs in the Northeast varies, with scarcity in the poorest regions and faces problems due to the greater distance between municipalities that offer this service. Concomitantly, we found problems in hospital structures, access to adequate materials and to trained professionals to treat SARS episodes. The intubation of patients with COVID-19 is difficult to perform, due to the urgency of the procedure, it is usually not possible to perform an adequate analysis of the patient's airways and the risk of cross-infection of the professionals who perform the procedure is greater (Noronha *et al.,* 2020); (Barbosa, 2020).

Patients with COVID-19 undergoing Invasive Mechanical Ventilation (IMV) in an ICU setting have high death rates. For intubated patients in Brazil, the prospect of death reaches 80%, this is due to the lack of protocols, scarcity of supplies, unprepared teams, and early or late intubation. These are factors that may explain the performance of Maranhão, Ceará, and Alagoas, regarding the apparatus for the management of critically ill patients due to SARS-CoV-2 (Souza *et al.,* 2020); (Madahar *et al.,* 2021). This information indicates that there is a deficiency in the management of this pathology and highlights the obstacles that already exist in the health system throughout the Northeast. Thus, it is essential to have more efficient public policy management, with coordination, consistent theoretical basis and rational application of resources, since the pandemic persists, and few advances are observed in the treatment of the disease, in view of the hospitalization situation.

It is urgent that appropriate treatments be designated, because hospitalized for covid-19 already characterizes the failure in preventive actions, and in treatment at levels of care that did not require hospitalization, as well as the failure to contain the disease, in addition, deaths in very high percentages indicate that still in hospitalizations, where an improved level of care and institution of monitored and more appropriate treatments is expected, As well as, with more specialized professionals who face the treatment of diseases in general, even so, the adequate monitoring of the disease at the level of hospitalization is still chaotic.

In view of the continuity of the pandemic, it is imperative that appropriate treatments are instituted, including at the hospital level, or that preventive measures are instituted that have a relevant impact in the face of the scenario exposed. It should also be noted the difficulties in accessing databases on this disease and the need to use more elaborate data analysis programs, since in 2021 there were no

notifications for covid-19 in the DATASUS database, in the epidemiological and morbidity tab, as with other diseases.

The limitation of this study refers to the epidemiological study design, supported by secondary data, which does not provide us with cause/effect relationships and does not allow us to assess many interactions on causal networks. Additional studies based on clinical data, including studies of treatments that have been effective in resolving the disease, should be encouraged.

5 CONCLUSION

This research evidenced the epidemiological profile of COVID-19 in the Northeast by hospitalizations and deaths. The distribution of cases was concentrated in the most populous states and those that received more travelers, highlighting the importance of better strategies to cope with the disease in the Northeast, with adjustments to prevention, diagnosis, and treatment actions in order to avoid the largest possible number of hospitalizations, mainly due to the very high percentages of deaths in patients hospitalized for covid-19 in the Northeast of Brazil.

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