CHAPTER

8

Heart failure morbidity and mortality: The impact of the SARS-CoV-2 pandemic in Northeast Brazil

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ABSTRACT
Heart failure (HF) remains with a poor prognosis and high morbidity and mortality. The SARS-CoV-2 pandemic may have influenced these parameters due to the overload of health services, although regional characteristics may have had an influence. OBJECTIVE: To assess the impact of the SARS-CoV-2 pandemic on HF morbidity and mortality in Northeast Brazil through data analysis from DATA-SUS. METHOD: The average length of stay, the number of hospitalizations and deaths, and the mortality rate from 02/2017 to 11/2022 were evaluated, subdivided into pre-pandemic (02/2017 to 02/2020), pandemic (03/2020 to 06/2021), peak (12/2020 to 05/2021), the first and second trimester of the peak (12/2020 to 02/2021 and 03/2021 to 05/2021), mass vaccination (06/2021 to 12/2021) and year 2022 (01/2022 to 11/20222022). The subdivisions of the total evaluated period were compared with the others. The results were expressed in percentages. RESULTS: In the pre-pandemic, there was the highest monthly average of hospitalizations, with a reduction of 29% in the pandemic and 12% in the period of mass vaccination. There was a reduction in the monthly average of deaths in the pandemic period compared to the pre-pandemic period, with this average being similar in the mass vaccination and pre-pandemic periods. However, there was a significant increase in the mortality rate in the pandemic period (12.45%) when compared to the pre-pandemic period (10.9%), with the highest percentage observed in the mass vaccination period (12.79%). %). CONCLUSIONS: There were relevant consequences of the SARS-CoV-2 pandemic on HF morbidity and mortality in the Northeast region of Brazil, with a lower number of hospitalizations and increased mortality. During the vaccination period, the increase in hospitalizations and the higher mortality rate may reflect the difficulty in monitoring the disease in previous periods and greater access to health services.

Keywords: Heart failure, COVID-19, Pandemics, Brazil.

1 INTRODUCTION

To date, it is known that COVID-19 is a multisystem disease, and the presence of viral material in several organs, including the heart and blood vessels, has been reported. (1) The involvement of the cardiovascular system occurs through vasculitis, immunological phenomena, and changes in the coagulation cascade, most commonly causing myocarditis, pericarditis, acute myocardial infarction

(AMI), arrhythmias, thrombosis, and bleeding. (2) (3) The main comorbidities of COVID patients are cardiovascular diseases, also associated with increased in-hospital mortality from infection, (4) and up to 5% of patients have heart failure (HF) (5) Among the complications of infection, two of the main ones are cardiovascular: arrhythmias (17%) and acute cardiac injury (7%). (6)

In addition to the characterization of the cardiovascular clinic of the disease, it is also necessary to investigate the consequences of the pandemic on hospitalizations and in-hospital mortality from cardiovascular diseases, especially HF.

The prevalence of HF in adults is estimated at 1 to 2 %, however, the estimate is based on recognized cases and is likely to be underestimated. In addition, there is a progressive increase with age, which may affect more than 10% of the population aged 70 years or older. (7) Worldwide, about 23 million people have HF, (8) with approximately 9906000 years lived with disability. (9)

This chronic condition presents an unfavorable prognosis and high morbidity and mortality (10) that requires, for its adequate management, a frequent follow-up of the patient. After the initial diagnosis, patients with HF are hospitalized, on average, once a year. (7) The symptoms of COVID-19 can be confused with those of HF, such as dyspnea, tachycardia, fatigue, and, eventually, rales at the pulmonary bases and cramps. (11) In addition, in critically ill patients, changes in serum markers such as natriuretic peptides and troponins may occur, which makes diagnosis more difficult. (11)

In addition to the clinical-epidemiological importance, the proposed investigation is justified by the overload of health services and changes in the flow of care during the pandemic, restriction of service delivery in contexts other than urgency and emergency, reduced access to services and decreased demand for fear of contagion. (12)

Brazil is the fifth country with the most cases of COVID-19 in the world, behind the United States, India, France, and Germany, however, it is the country with the second-highest number of deaths. (13)

In addition to regional singularities, Brazil exhibits evident inequalities, also noticeable in health. Regarding professionals, the national average is 2.27 doctors per thousand inhabitants. However, the average of the Northeast region is 1.69 doctors per thousand inhabitants, and all states have indicators below the national average and all municipalities in the interior have one or fewer doctors per thousand inhabitants. Meanwhile, the Northeast region accounts for 27.2% of the Brazilian population, but only 18.4% of physicians, with 1.69 doctors per thousand inhabitants, and all states have indicators below the national average and all municipalities in the interior have one or fewer doctors per thousand inhabitants. (14)

Thus, the present study aims to evaluate the impact of the SARS-CoV-2 pandemic on HF morbidity and mortality in the Northeast region of Brazil through the analysis of DATASUS data from 2017 to 2022.

2 METHOD

This is a cross-sectional descriptive study conducted through data collection in the morbidity and mortality information system on the DATASUS platform, comparing the periods defined by the authors as pre-pandemic (February 2017 to February 2020), pandemic (March 2020 to June 2021), which was considered the peak (December 2020 to May 2021), first and second quarters of the peak (December 2020 to February 2021 and March 2021 to May 2021, respectively), a period in which mass vaccination occurred (June 2021 to December 2021) and year 2022 (January to November 2022).

The variables number of hospitalizations and deaths, days of hospital stay, as well as mortality rate (calculated by dividing the number of deaths by the number of hospitalizations), were analyzed.

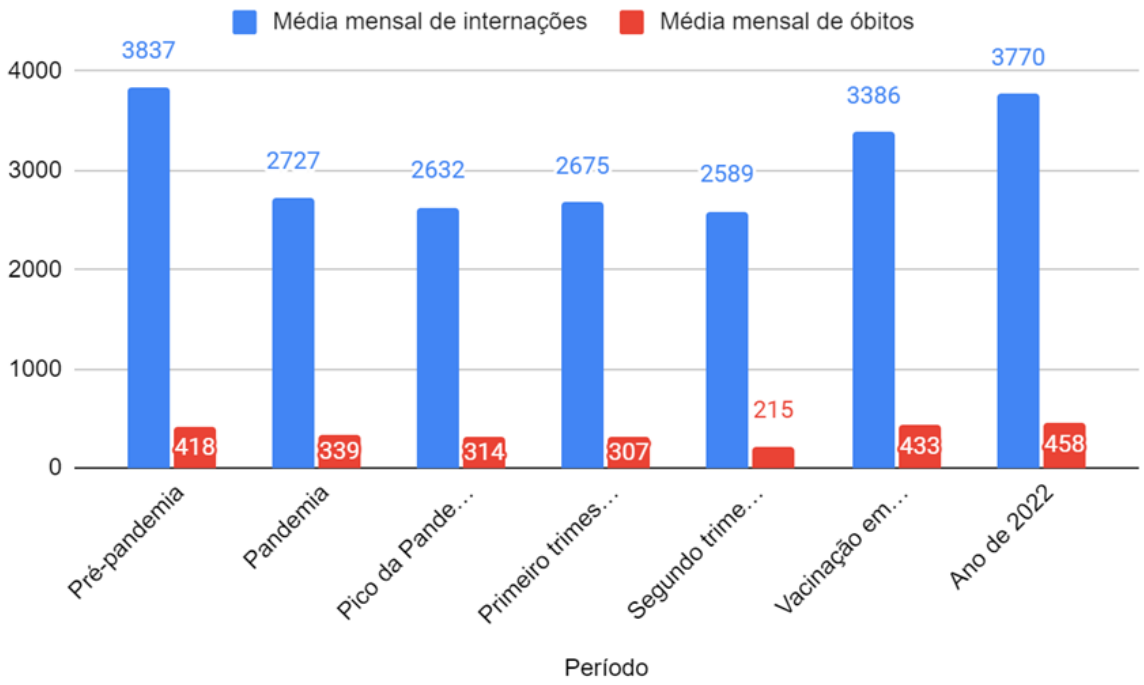
The means of each variable were calculated in general and by sex. The pre-pandemic and mass vaccination periods were compared with the others, with the results expressed as percentages.

3 FINDINGS

The numbers of hospitalizations in the pre-defined periods were: pre-pandemic (141,997), pandemic (43,633), peak (15,794), mass vaccination period (23,703) and during the year 2022 (41,475), and in the peak period most hospitalizations occurred in the 1st quarter, predefined as the 1st quarter of the peak (8,025).

As for the monthly average of hospitalizations, in the period defined as pre-pandemic the highest average occurred (3,837 hospitalizations per month), there was a reduction of 29% in the period defined as pandemic (2,727 hospitalizations per month) and 12% in the period of mass vaccination (3,386 hospitalizations per month). In the second trimester of the peak period, the lowest average number of hospitalizations was observed (2,589 hospitalizations per month). Compared to the peak period, there was a 50% increase in the number of hospitalizations and almost 30% in the monthly average during the mass vaccination period. In the year 2022, the average approach that observed in the pre-pandemic period, with 3,770 hospitalizations per month (Graph 01).

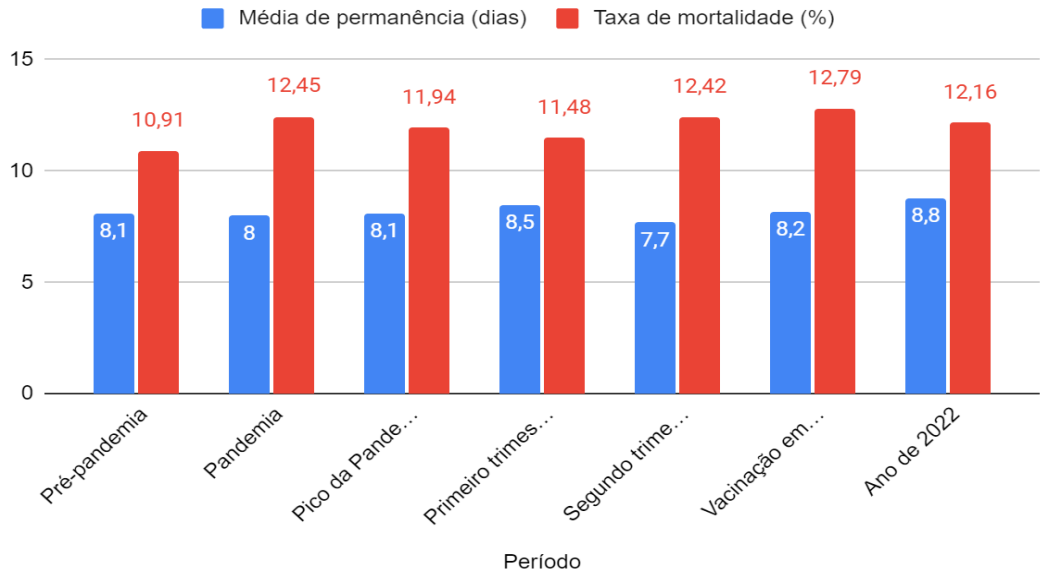
Graph 01 - Monthly average of hospitalizations and monthly average of deaths per period.



There was a reduction in the monthly average of deaths in the pandemic (19 percentage points) when compared to the pre-pandemic period, and this average was similar in the periods of mass vaccination, pre-pandemic and 2022 (Graph 01).

However, the mortality rate increased in the period defined as the pandemic (12.45%) when compared to the pre-pandemic period (10.9%). In the period of mass vaccination, the highest mortality rate was observed (12.79%) and in 2022, the mortality rate was 12.16% (Graph 02).

Graph 02 - Mean length of stay (days) and mortality rate (%) per period.



The average hospital stay, in days, was higher in 2022 (8.8), followed by the first quarter of the peak (8.5), pre-pandemic period (8.1) and lower in the second quarter of the peak (7.7) (Graph 02).

The mortality rate was higher and the mean length of stay was shorter in all periods for females (Table 01).

Table 01 - Data about pre-pandemic (February 2017 to February 2020), pandemic (March 2020 to June 2021), peak (December 2020 to May 2021), first and second quarters of peak (December 2020 to February 2021 and March 2021 to May 2021, respectively), mass vaccination (June 2021 to December 2021) and year 2022 (January to November) for males and females.

Period	Sex	Admissions	Average monthly hospitalizations	The average length of stay (days)	Deaths	Monthly average of deaths	Mortality rate (%)
Pre-pandemic	Male	76.497	2.067	8,2	7.926	214	10,36
	Female	65.500	1.770	7,9	7.570	204	11,56
Pandemic	Male	23.770	1.485	8,1	2.819	176	11,86
	Female	19.863	1.241	7,8	2.612	163	13,15
Peak of the Pandemic	Male	8.518	1.419	8,2	973	162	11,42
	Female	7.276	1.212	7,9	913	152	12,55
First quarter of peak	Male	4.316	1.438	8,6	463	154	10,73
	Female	3.709	1.236	8,3	458	152	12,35
The second quarter of peak	Male	4.202	1400	7,8	510	170	12,14
	Female	3.567	1189	7,5	455	151	12,76
Mass vaccination	Male	12.836	1.833	8,3	1.562	223	12,17
	Female	10.867	1.552	8,0	1.469	209	13,52
The year 2022	Male	22.708	2.064	9,0	2.644	240	11,64
	Female	18.767	1.706	8,5	2.398	218	12,78

4 DISCUSSION

According to the Panel of COVID-19 cases released by the Ministry of Health, (15) at the beginning of 2023, Brazil totaled more than 36 million confirmed cases, almost 700,000 cumulative deaths and 35 million recovered cases, resulting in an incidence of 17,544 per 100,000 inhabitants, mortality of 331.8 per 100,000 inhabitants and lethality of 1.9%. In the Northeast region, more than 7,200 million cases were registered, 134 thousand deaths, with an incidence of 12,768.9 per 100

thousand inhabitants, mortality of 235.2 per 100 thousand inhabitants and lethality of 1.8%, corresponding to the lowest coefficients in the country, except lethality, the second highest recorded, which may demonstrate an underreporting of milder cases of COVID-19.

Some of the possible contributing factors to the harmful consequences of the pandemic on the Brazilian health system include the lack of coordination between the different levels of government, acting with inadequate or late measures, (16) poor social distancing, non-identification of asymptomatic people, non-isolation of cases, lack of knowledge of the population about prevention measures, doubts about the management and effectiveness of masks, and the difficulty of acquiring vaccines. (17)

Based on the results of the present study, there was a decrease in hospitalizations during the pandemic, a reduction in the number of deaths, but an increase in the mortality rate. Such findings may reflect underreporting, worse clinical control that, due to the lack of follow-up, culminated in disease progression, hospital admissions of more severe cases and, consequently, with worse outcomes.

In 2020, in Brazil, an excess of deaths of 13.7% was recorded, with a ratio for deaths from COVID-19 (total number of deaths from all causes divided by the total number of deaths from COVID-19) of 0.90, suggesting a reduction of some causes of death in the period. In the country, the excess of deaths was heterogeneous, being higher in the Northeast, indicating a greater impact of the pandemic. (18)

The search for care for diseases with an incidence not influenced by COVID has decreased significantly during the pandemic. (19) A trend of reduction in hospitalizations due to HF, worse functional class and greater severity of hospitalized patients were observed in England, (20) as well as an increase in mortality due to HF was recorded in Germany. (21) In Brazil, by the end of 2020, there was a 17% reduction in hospital admissions for cardiovascular diseases, with an increase in lethality of 0.9 percentage points, (22) a reduction in the absolute number of deaths and a 45% decrease in the performance of diagnostic and surgical procedures. (23)

Some of the considerations of the American College of Cardiology in order not to expose professionals and patients to a higher risk of contagion, as well as to preserve limited resources, included the limitation of the performance of elective procedures, the prioritization of care for urgent and emergency cases and, when possible, the performance of non-face-to-face consultations, (24) although alternative clinical follow-up methods for therapeutic optimization of HF are not as successful as traditional care. (25) Such measures should be understood within the pandemic context, however, due to the dimensions reached in Brazil, the limitation of the population's access to technology and health services and the unavailability of professionals in the face of the existing demand, the usual

clinical follow-up was impaired, resulting in decompensation, delay in diagnosis and progression of the disease.

Worldwide, up to 83% of outpatient activities for diagnosing and monitoring cardiovascular disease have been canceled at some point during the pandemic. Echocardiogram decreased by up to 76% and coronary angiography by 55%. Greater reductions were seen in poorer countries, as well as lower availability of COVID-19 testing, personal protective equipment and access to telehealth. (26) Brazil was the 149th country in the ranking of testing per population for COVID-19, (13) and the Northeast region was second in the country in distribution of tests in absolute numbers. (27)

According to the 2021 European Heart Failure Directive, vaccination against the coronavirus is indicated in patients with HF, (7) since infection is a factor of decompensation of the underlying condition, and may culminate in up to 25% of mortality in HF patients hospitalized for COVID, while the in-hospital mortality of patients with decompensation for other causes is less than 3%. (28) However, the Northeast region of Brazil was among the places with the lowest vaccination coverage, presenting in December 2021 26.4% of the population with first dose immunization and only 2.7% with the second. (17) However, at the beginning of 2023, the same region was only behind the Southeast region in the number of vaccine doses administered, totaling more than 130 million doses, with 83% of the population with the first dose, 76% with the second and 48% with a booster dose. (29)

In the vaccination period, the increase in the number of hospitalizations, as well as a higher number of deaths and mortality rate may reflect the reduction in HF care in previous periods, greater access to health services and a greater sense of security on the part of patients in seeking care, reducing the patient's delay in seeking care.

It is assumed as probable that these results, evaluated in the Northeast region of Brazil, do not reflect the reality of the country as a whole, given the regional differences in access to health services, as well as the lack of uniformity of measures to control the pandemic.

5 CONCLUSIONS

There were relevant consequences of the SARS-CoV-2 pandemic on HF mortality in the Northeast region of Brazil, with a lower number of hospitalizations, and possibly, as a consequence, a lower number of deaths than expected. However, there was an increase in the mortality rate, thus demonstrating a worsening of the clinical picture of HF during the pandemic period due to the difficulty of clinical follow-up, associated with insufficient control of the pandemic.

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