



## Clinical outcome in patients with cardiovascular diseases with COVID-19 in the second macro-region of Alagoas

Desfecho clínico em portadores de agravos cardiovasculares com COVID-19 na segunda macrorregião de Alagoas

Evolución clínica en pacientes con enfermedades cardiovasculares con COVID-19 en la segunda macrorregión de Alagoas

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### ABSTRACT

**Introduction:** Body's response to the COVID-19 virus leads to systemic inflammation, in which there is an increase in inflammatory markers and myocardial injury and/or cardiac dysfunction, predisposing the individual to acute heart failure, myocarditis, thrombosis and arrhythmias. **Aim:** to describe the main clinical outcomes of individuals with COVID-19 who reported cardiovascular problems. **Outlining:** this is a documentary study with a quantitative approach. The research is based on the hospital censuses issued to the municipal health department of Arapiraca. The research has included the individuals infected with COVID-19 who self-reported preexistent cardiovascular diseases upon hospital admission, excluding the ones who developed cardiovascular diseases during hospitalization. Thus, the data analyzed were comprehended in the July to December 2020 period. The study was carried out between August and September 2021. After collecting the information, basic descriptive statistics were performed to systematize the data. **Results:** among the 260 self-reported cases of cardiovascular disorders, systemic arterial hypertension stands out for registering 85.38% of the cases. Next, cardiopathies exhibit 24.62% of occurrences. That said, it was possible to observe that the highest death rate was presented by heart diseases with 31.58% of the cases. On the other hand, it is noted that the highest rate of discharge occurrences was in patients with systemic arterial hypertension, with 55.40% of the target audience. **Implications:** the investigation made it possible to verify that discharge due to cure and death were the main clinical outcomes, respectively.

### DESCRIPTORS

COVID-19; Physiology; Heart Diseases.

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## INTRODUCTION

At the end of 2019, in Wuhan, Hubei province, China, a group of patients emerged with atypical pneumonia with unknown etiological agent. Samples of bronchoalveolar lavage fluid were collected from symptomatic patients who tested positive for the presence of a new virus. After genome sequencing, the virus was provisionally named as novel coronavirus 2019 due the etiological agent being SARS-CoV-2. This new coronavirus is able to infect humans and bears similarities to other pathogenic betacoronaviruses like the coronavirus of the severe acute respiratory syndrome (SARS-CoV) and the coronavirus of the Middle East respiratory syndrome (MERS-CoV).<sup>1</sup>

After the report of COVID-19 cases in other countries, such Japan, Singapore, South Korea, Australia, Philippines and United States, among others, on January 30, 2020, the Emergency Committee of the World Health Organization declared the outbreak of COVID-19 a public health emergency of international concern, being declared on March 11, 2020 a global pandemic due to the high spread worldwide.<sup>1</sup>

COVID-19 transmission occurs mainly through the inhalation of droplets expelled by the infected individual through speech, coughing or sneezing. The disease can also be self-inoculated due the use of inanimate infected objects by the contact of them with the mucous membranes of the mouth, nose, or eyes. This form of transmission can be the result of poor hand hygiene as well as the inappropriate use of Personal Protective Equipment (PPE).<sup>2</sup>

Approximately 40% of the individuals with COVID-19 are affected by mild symptoms such as cough, fever, myalgia, dyspnea,odynophagia, and headache. Another 40% may develop the moderate form, as pneumonia; about 15% have severe manifestations, requiring ventilatory support; and the remaining 5% can develop the critic form of the disease, displaying respiratory insufficiency, sepsis,

thromboembolism, multiple organ failure, heart failure, among others.<sup>3</sup>

According to Bielecka-Dabrowa et al.<sup>4</sup>, the risk factors for mortality in COVID-19 patients are: arterial hypertension, diabetes, obesity, chronic lung diseases, heart diseases, liver diseases, kidney diseases, cancer, immunodeficiency, and pregnancy. Coronary artery disease and arrhythmias are prominent amongst heart diseases.

Body's response to the virus leads to systemic inflammation, in which elevation of inflammatory markers, and myocardial injury and/or cardiac dysfunction can be observed, predisposing the individual to acute heart failure, myocarditis, thrombosis and arrhythmias. The cardiovascular complications worsen body's response to the virus, may causing shock, multiple organ failure and death.<sup>5</sup>

Furthermore, amongst the patients hospitalized with moderate to severe COVID-19 infection, mature adults with chronic comorbidities and those patients with risk factors for heart disease or with a preexisting diagnosis stand out. These have the worst prognosis in COVID-19.<sup>1</sup> That said, the present study aims to describe the main clinical outcomes of individuals with COVID-19 who self-reported pre-existing cardiovascular conditions at hospital admission.

## METHOD

This study was submitted to CEP/UNIT, which approved it according to CAAE: 36873320.60000.5641, with opinion number: 4.244.019 on August 28, 2020. This is a documental study of quantitative approach of the clinical outcomes of the individuals with COVID-19 who self-reported cardiovascular diseases in the second macro-region of Alagoas. This macro-region has a total of 1,082,877 inhabitants,<sup>6</sup> distributed in 46 municipalities that are divided into 4 sanitary regions.<sup>7</sup>

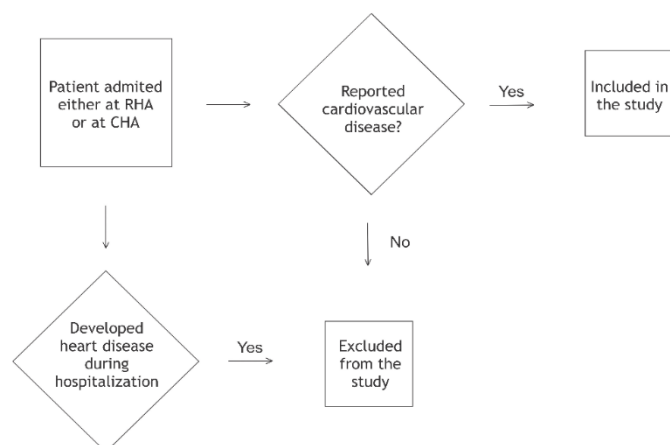
From this, the investigation had as data source the hospital censuses filled by the health professionals during hospital admission at the

Regional Hospital of Arapiraca (RHA) and at the Campaign Hospital of Arapiraca (CHA). These hospitals were strategically located in Arapiraca, as it is the largest municipality of the macro-region, comprising the hospital care network organized to serve all the municipalities of the second macro-region of the state of Alagoas. It is worth noting that the campaign hospital was built on an emergency basis in view of the need imposed by the pandemic.

The hospital censuses were issued on a daily basis to the municipal health department of Arapiraca, headquarters of the state's second macro-region. These censuses contained essential information for tracing the clinical outcome of individuals infected with COVID-19 who self-reported pre-existing cardiovascular problems upon hospital admission. The variables considered in the study were: gender, age group, destination (discharge, evasion, death and hospital transfer), presence of systemic arterial hypertension and cardiopathies.

The research included the individuals infected with COVID-19 who self-reported cardiovascular diseases upon hospital admission and excluded people who developed cardiovascular diseases after COVID-19 infection during hospitalization, in accordance to the flowchart below.

**Flowchart 1.** Partakers' inclusion and exclusion criteria in the study.

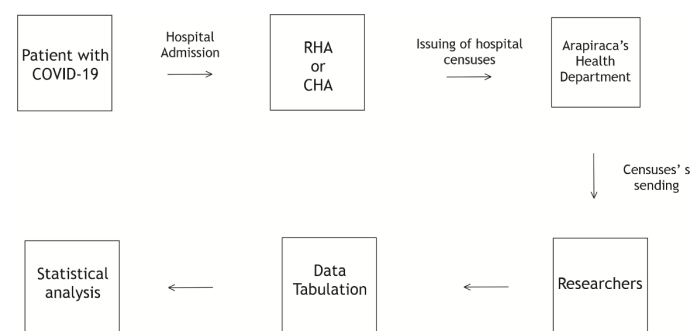


Source: Authors.

The exclusion criterion was adopted because it was not possible to justify, based on the issued censuses, who developed cardiovascular diseases during the hospitalization, which was seen as a limitation of the study. As from that, the sum of all patients who were in wards and intensive care units was considered, as long as the analysis respected the inclusion and exclusion criteria. Based on this, the data were tabulated in an electronic spreadsheet for further investigation. Then, using the Epi Info™ software, a basic descriptive statistical analysis of the records was carried out for their appreciation.

Thus, the study was based on a longitudinal observation of the cases in the period between July and December 2020. The analysis was carried out between August and September 2021. Below is the summary flowchart of the methodology employed.

**Flowchart 2.** Methodology used in the study



Source: Authors.

## RESULTS

The investigation made it possible to measure a total of 538 hospital admissions of individuals infected with COVID-19 at the Regional Hospital of Arapiraca and at the Campaign Hospital of Arapiraca. Amongst the pathologies associated with the infection, Table 1 illustrates the 260 self-reported cases of cardiovascular diseases.

**Table 1** - Frequency and percentage of individuals infected with COVID-19 as to preexistent cardiovascular complications, Alagoas, 2020.

Variables	Frequency (n)	Percentage (%)
<b>Cardiopathy</b>		
Yes	38	7.06
No	433	80.49
Without information	67	12.45
<b>Systemic arterial hypertension</b>		
Yes	222	41.26
No	248	46.10
Without information	68	12.64

Source: Data from the research, 2021.

In table 1, it can be seen that in addition to the individuals who self-reported or denied pre-existing complications, there is a large number of without information. These data relate to patients who were unaware of the existence of any disease in their body or who were not in favorable clinical conditions to fill in the data upon admission.

Data related to the discharge due infection's remission and death, main clinical outcomes of the

individual infected with COVID-19 who self-referred cardiopathies, were 55.26% and 31.58%, respectively, and can be observed in Table 2. The presence of this kind of disease predominated in female, with 55.26% of the cases. As for the frequency of individuals with heart diseases by age group, the sovereignty of the elderly is noted with 73.68% of the records.

**Table 2** - Gender, age group and destination of individuals infected with COVID-19 who self-reported pre-existing heart diseases, Alagoas, 2020.

Variables	Frequency (n)	Percentage (%)
<b>Gender</b>		
Male	17	44.74
Female	21	55.26
<b>Age range</b>		
Adult (20 - 59 years)	10	26.32
Elderly (60 years or older)	28	73.68
<b>Destination</b>		
Discharge	21	55.26
Evasion	2	5.26
Death	12	31.58
Hospital transfer	3	7.90

Source: Data from the research, 2021.

Furthermore, a prevalence of the age group elderly (70.27%) was observed in the cases of self-referred systemic arterial hypertension, as seen in Table 3.

In addition, it was found that the main clinical outcomes were discharge and death with 55.40% and 25.68% of cases, in due order.

**Table 3** - Gender, age range and Destination of the individuals infected with COVID-19 who self-referred preexistent systemic arterial hypertension, Alagoas, 2020.

Variables	Frequency (n)	Percentage (%)
<b>Gender</b>		
Male	112	50.45
Female	110	49.55
<b>Age range</b>		
Adult (20 - 59 years)	66	29.73
Elderly (60 years or older)	156	70.27
<b>Destination</b>		
Discharge	123	55.40
Evasion	16	7.21
Death	57	25.68
Hospital transfer	26	11.71

Source: Data from the research, 2021.

## DISCUSSION

From the assessment of Table 1, it is possible to suggest that the preexisting cardiovascular diseases are responsible for approximately 50% of the hospitalizations due COVID-19 infection in the analyzed period. This may be justified by the fact that, although COVID-19 clinical configuration is related to respiratory symptoms, many infected individuals display severe cardiovascular damage. Thus, individuals with cardiopathies and vascular problems manifest the need for intensive care, in addition to exhibiting a high risk of death.<sup>8</sup>

Similar data were recorded in a study carried out in the state of Rio de Janeiro, which showed a higher number of hospitalizations and risk of death in patients with heart diseases. Cardiac tissue has a greater number of receptors for the Angiotensin-converting Enzyme (ACE2), which is related to the endocytosis process of SARS-CoV-2,

which suggests direct damage to cardiac tissue by the virus.<sup>9</sup>

Furthermore, according to table 1, approximately 13% of the 538 hospitalized individuals were unaware or unable to answer whether or not they had any cardiovascular disease. In view of this, the study points out the limitation as appropriate for investigation since the underreporting of cardiovascular diseases presented in the analysis can directly impact the results. This indicator suggests that this population sample of the study did not undergo preventive follow-up at the basic level of health care. In this scenario, it is understood that is difficult for the health professional teams to carry out and to precociously diagnose cardiovascular diseases in the entire population.<sup>10</sup> Therefore, early identification of the occurrence of these pathologies, which are among the main causes of death in Brazil,<sup>11</sup>

reduces the probability of cardiovascular events after being infected with COVID-19.<sup>12</sup>

By analyzing Table 2, it can be inferred that female with advanced age who have some sort of cardiovascular impairment are more affected by Covid-19, and may progress to discharge or death, with percentages of 55.26% and 31.58%, respectively. In the study performed by Mascarello et al.<sup>13</sup>, the highest number of hospitalizations due to COVID-19 was recorded in males who have some comorbidity, including cardiopathies. It is believed that the difference between the levels and types of circulating sex hormones may influence the susceptibility to infection by the virus once sex hormones can modulate both the adaptive and innate immune responses. As to the remaining variables, the results were convergent.

The findings in Table 3 demonstrate that amongst individuals infected by COVID-19 who have Systemic Arterial Hypertension (SAH), there is a higher prevalence in male (50.45%) and elderly (70.27%) and 55.40% of the cases can progress to discharge, whilst 25.68% may go to death. Similar data were reported in the research carried out by Abayomi et al.<sup>14</sup>, in which the male/female rate is 1.4:1 and the elderly population with SAH has a greater risk of being infected with SARS-CoV-2, which, when other comorbidities are taken into account, can increase the percentage of deaths of

these individuals. SAH patients have an augment of Angiotensin-converting Enzyme (ACE2), which plays the role of receptor for the SARS-CoV-2, compared to the healthy population, which predisposes to the development of more severe cases of the pathology.<sup>15</sup>

## CONCLUSION

Although the limitation of the underreporting of cardiovascular conditions presented in the analysis directly impacts the study's findings, the investigation made it possible to verify that among the main destinations (discharge, evasion, death, and hospital transfer) of patients infected with COVID-19 who self-reported pre-existing cardiovascular conditions at hospital admission, discharge due to cure and death stand out as the main clinical outcomes.

Of the cardiovascular complications identified in the study, associated with infection, cardiopathies recorded the highest death rate, with 31.58% of cases. On the other hand, it should be noted that systemic arterial hypertension exhibited the highest rate of discharge occurrences with 55.40% of the target audience. It is therefore suggested that an initial cardiological assessment is beneficial for those patients who self-report cardiovascular disorders upon admission due to COVID-19, aiming at managing cardiovascular complications, with rapid identification and implementation of appropriate treatment.

## RESUMO

**Introdução:** A resposta do organismo ao vírus da COVID-19 leva a um quadro de inflamação sistêmica, na qual se observa elevação de marcadores inflamatórios e de injúria miocárdica e/ou disfunção cardíaca, predispondo o indivíduo a insuficiência cardíaca aguda, miocardite, trombose e arritmias. **Objetivo:** descrever os principais desfechos clínicos de indivíduos com COVID-19 que relataram agravos cardiovasculares. **Delineamento:** este é um estudo documental com abordagem quantitativa. A investigação teve como base censos hospitalares emitidos à secretaria municipal de saúde de Arapiraca. A pesquisa incluiu os indivíduos infectados com a COVID-19 que autorreferiram agravos cardiovasculares preexistentes na admissão hospitalar, sendo excluídos aqueles que desenvolveram agravos cardiovasculares durante a internação. Assim, os dados analisados foram compreendidos entre o período do mês de julho e dezembro de 2020. O estudo foi realizado entre os meses de agosto e setembro de 2021. Após a coleta das informações realizou-se estatística descritiva básica para sistematizar os dados. **Resultados:** dentre os 260 casos autorreferidos de agravos cardiovasculares, a hipertensão arterial sistêmica destaca-se por registrar 85,38% dos casos. A seguir, as cardiopatias exibem 24,62% das ocorrências. Posto isso, foi possível observar que a maior taxa de óbito foi apresentada pelas cardiopatias com 31,58% dos casos. Por outro lado, notabiliza-se que o maior índice das ocorrências de alta foi em portadores de hipertensão arterial sistêmica com 55,40% do público-alvo. **Implicações:** a investigação possibilitou constatar que a alta por cura e o óbito foram os principais desfechos clínicos, respectivamente.

## DESCRITORES

COVID-19; Fisiologia; Cardiopatias.

## RESUMEN

**Introducción:** La respuesta del organismo al virus COVID-19 conduce a la inflamación sistémica, en la cual hay aumento de los marcadores inflamatorios y lesión miocárdica y/o disfunción cardíaca, predisponiendo al individuo a insuficiencia cardíaca aguda, miocarditis, trombosis y arritmias. **Objetivo:** describir los principales desenlaces clínicos de individuos con COVID-19 que refirieron problemas cardiovasculares. **Deliación:** se trata de un estudio documental con enfoque cuantitativo. La investigación se basó en los censos hospitalarios emitidos por el departamento de salud municipal de Arapiraca. La encuesta incluyó a personas infectadas con COVID-19 que autoinformaron condiciones cardiovasculares preexistentes en el momento de la admisión al hospital, excluyendo a aquellas que desarrollaron condiciones cardiovasculares durante la hospitalización. Así, los datos analizados estuvieron comprendidos entre el periodo de julio a diciembre de 2020. El estudio se realizó entre los meses de agosto y septiembre de 2021. Luego de recolectada la información, se realizó estadística descriptiva básica para sistematizar los datos. **Resultados:** entre los 260 casos autorreferidos de trastornos cardiovasculares, se destaca la hipertensión arterial sistémica al registrar el 85,38% de los casos. A continuación, las enfermedades del corazón exhiben el 24,62% de las ocurrencias. Dicho esto, se pudo observar que la mayor tasa de mortalidad la presentaron las enfermedades del corazón con el 31,58% de los casos. Por otro lado, se destaca que la mayor tasa de ocurrencia de egresos fue en pacientes con hipertensión arterial sistémica, con 55,40% del público objetivo. **Implicaciones:** la investigación permitió verificar que el alta por curación y la muerte fueron los principales desenlaces clínicos, respectivamente.

## DESCRIPTORES

COVID-19; Fisiología; Cardiopatías.

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#### **COLLABORATIONS**

CRS: Indispensable contributions for the elaboration and structure of the work; data collection, analysis, and interpretation; article's writing and analytical review; and in the final version to be published. PDSS and GLPL: Substantial contributions on article's writing and critical review. DAVS, LMM and TFCS: Indispensable contributions in the critical review. **All authors agree and are responsible for the content of this version of the manuscript to be published.**

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Not applicable.

#### **AVAILABILITY OF DATA**

Not applicable.

#### **FUNDING SOURCE**

The original data can be recovered through the Municipal Health Department of Arapiraca/AL.

#### **CONFLICTS OF INTEREST**

There are no conflicts of interest to declare.