Overview of hospitalizations for covid-19 among aged individuals residing in Minas Gerais, Brazil

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Abstract

Objective: To characterize hospitalizations for covid-19 among aged individuals residing in Minas Gerais, Brazil, from March 2020 to March 2022, with a focus on geographical distribution, sociodemographic, clinical, epidemiological, and care data. *Method:* This quantitative and descriptive study used sociodemographic, clinical, epidemiological, and care data from the Severe Acute Respiratory Syndrome Database, including covid-19-related data. A total of 102,029 hospitalizations of aged individuals for covid-19 were analyzed for descriptive purposes and mapping the incidence by municipality and macro-region. *Results:* High incidence was observed in 196 of the 853 municipalities in Minas Gerais, ranging from 3,098 to 8,916 cases per 100,000 inhabitants. Hospitalizations were predominantly male (50.7%), aged 60-70 years (39.0%), of mixed race (41.6%), with 1st to 5th grade education (17.6%), and presenting risk factors or comorbidities (54.0%). Common symptoms included dyspnea and oxygen saturation below 95% (72.8% each). Regarding care data, a portion of patients required intensive care unit admission (34.0%), non-invasive ventilatory support (54.1%), and presented interstitial infiltrates in chest X-rays (20.4%). Although most cases resulted in recovery (55.6%), it is noteworthy that 41.8% of hospitalized aged individuals died. *Conclusion:* This study highlights the existence of areas in Minas Gerais with a higher incidence of covid-19 cases that require ongoing monitoring, with a focus on the care of subgroups of aged individuals who are male, younger, of mixed race, have lower educational attainment, and have risk factors or comorbidities. Additionally, special attention is needed for aged individuals with signs and symptoms indicative of clinical severity.

Keywords: Aged. covid-19. Hospitalization. Health Information Systems.

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INTRODUCTION

On March 11, 2020, the World Health Organization (WHO) declared the covid-19 pandemic, a scenario representing a global public health threat marked by the rapid spread of the disease, difficulties in virus control, a high demand for healthcare services, and socio-economic repercussions[1].

In Brazil, the detection of the first confirmed case of covid-19 occurred on February 26, 2020[2]. Considering the temporal and geographical context of this research, the Southeast region presented the highest number of confirmed cases, and the state of Minas Gerais recorded the highest rates of incidence and mortality during the epidemiological week 10 (from March 6 to March 12, 2022)[3].

The acute respiratory infection caused by the SARS-CoV-2 coronavirus, which leads to covid-19, is primarily characterized by its high transmission capacity, occurring through direct contact, exposure to respiratory droplets, or airborne particles and aerosols[4,5]. Among infected patients, clinical manifestations encompass asymptomatic, mild, moderate, severe, and critical cases[4,5]. Depending on the clinical severity of the disease, some cases require hospitalization[5].

Factors associated with hospitalization in covid-19 patients are reported in scientific literature, with advanced age being a notable one[6,7]. Aged individuals exhibit particularities, including physiological changes associated with the aging process and the presence of chronic diseases that account for clinical severity[8], consequently leading to a higher occurrence of hospitalizations for covid-19 in this population[6,9].

Previous studies have shown that among aged individuals hospitalized for covid-19, there is a predominance of certain sociodemographic characteristics, such as male gender[10-14], and a younger age group[10,12,15]. Concerning the clinical profile, some of the frequently reported signs and symptoms include fever[12,13], cough[12,13], dyspnea[12,13], and oxygen saturation below 95%[12,13]. Additionally, there may be atypical manifestations that can complicate the approach and treatment[8].

A systematic review with meta-analysis revealed that aged individuals included in the studies had at least one comorbidity[16]. Research has shown that 88.8%[13] and 89.5%[14] of aged individuals hospitalized with covid-19 reported comorbidities, with the most common ones being systemic arterial hypertension, diabetes mellitus, and cardiovascular diseases[12,13].

The presence of abnormalities in laboratory tests[11,14,17] and imaging[11-15], as well as adverse outcomes such as the need for ventilatory support[10-13] and mortality[11,14], are also features identified in a portion of aged individuals hospitalized with the disease.

Given that aged individuals exhibit physiological and clinical peculiarities[8] and considering the geographical heterogeneity of Brazil, with areas more susceptible to the disease[18], there is a need to identify the primary characteristics of hospitalizations in this population. These findings can be utilized to redefine actions already implemented in the context of healthcare services.

Despite the existence of research that has identified the characteristics of covid-19 hospitalizations in aged individuals[10-15] there is still a need to expand knowledge in Minas Gerais, one of the states with a higher aging population[19] and a significant number of recorded covid-19 cases[20].

Therefore, this present study aimed to characterize covid-19 hospitalizations in aged residents of Minas Gerais, Brazil, from March 2020 to March 2022. The study focused on geographical distribution, sociodemographic, clinical, epidemiological, and care-related data.

METHOD

This is a quantitative and descriptive study conducted using epidemiological data related to covid-19 cases among individuals aged 60 years or older who were hospitalized with SARS (Severe Acute Respiratory Syndrome / *SRAG* - acronym in Portuguese) in Minas Gerais, Brazil. The state in question comprises 853 municipalities and is divided into 14 health macroregions and 66 microregions[21].

The data for this study were obtained through the Individual Registration Form – Hospitalized Severe Acute Respiratory Syndrome Cases (*SRAG-HOSPITALIZADO*) – in the Severe Acute Respiratory Syndrome Database, which includes covid-19 data, available on the open DATASUS website. This information is part of the Information System for Epidemiological Surveillance of Influenza (*SIVEP-Gripe*), the official system for recording cases and deaths related to the disease[22]. Inclusion criteria for this study consisted of confirmed covid-19 notifications in the Individual Registration Form for Hospitalized Severe Acute Respiratory Syndrome (*SRAG-HOSPITALIZADO*), referring to individuals aged 60 years or older in the state of Minas Gerais.

The data used for this study were collected from notifications recorded from March 9, 2020 (the date of the first notification of covid-19 in an aged person in Minas Gerais in the database) up to March 8, 2022, as per the following records: a) SRAG 2020 (https://opendatasus.saude.gov.br/dataset/srag-2020/resource/06c835a6-cf33-448a-aeb1-9dbc34065fea): Created on January 15, 2022, with the last update considered on September 5, 2022; b) SRAG 2021 (https://opendatasus.saude.gov.br/dataset/srag-2021-e-2022): Created on January 14, 2022, with the last update considered on September 7, 2022; c) SRAG 2022 (https://opendatasus.saude.gov.br/dataset/srag-2021-e-2022): Created on January 26, 2022, with the last update considered on September 7, 2022.

From March 9, 2020, to March 8, 2022, a total of 3,886,818 SARS cases were reported. Among these, 2,109,458 were confirmed as covid-19 cases, with 212,275 cases in Minas Gerais filtered by the municipality of residence. Out of these, 108,248 cases pertained to aged individuals who were hospitalized, with 6,219 cases excluded due to falling outside the established data collection period. This resulted in a total of 102,029 notifications included in the study.

Initially, an analysis of the geographical distribution of accumulated covid-19 cases among aged individuals hospitalized for SARS in Minas Gerais during the specified period was conducted. The incidence of these cases was aggregated by municipalities, and in calculating the rate per 100,000 inhabitants, the estimated aged population (aged ≥60 years) for the year 2019 was taken into consideration[23]. To group this distribution, the classification method based on natural breaks was adopted[24]. Additionally, the distribution of municipal incidences was examined within the context of the 14 health macroregions existing in the state.

To proceed with the descriptive analysis, the following data of interest were collected from individual record forms:

a) Sociodemographic information: gender (female, male, unknown), age categorized into age groups (60-70 years, 70-80 years, 80 years or older), self-reported skin color/race (white, black, yellow, brown, indigenous, unknown), education level (no education/illiterate, 1st to 5th grade, 6th to 9th grade, 10th to 12th grade, higher education, not applicable, unknown);

b) Clinical and epidemiological data: presence of signs and symptoms (yes, no, unknown), if signs and symptoms are present, which ones (fever, cough, sore throat, dyspnea, respiratory discomfort, oxygen saturation <95%, diarrhea, vomiting, abdominal pain, fatigue, loss of smell, loss of taste, others), presence of risk factors/comorbidities (yes, no, unknown), if yes, which ones (postpartum, Down Syndrome, chronic cardiovascular disease, chronic hematological disease, chronic liver disease, asthma, diabetes mellitus, chronic neurological disease, other chronic respiratory diseases, immunodeficiency/immunosuppression, chronic kidney disease, obesity/IMC, others);

c) Care-related information: notification date, chest X-ray results (normal, interstitial infiltrate, consolidation, mixed, other, not performed, unknown), admission to the ICU (yes, no, unknown), use of ventilatory support (yes, invasive; yes, non-invasive; no; unknown), case outcome (death, discharge).

As selected variables were subjected to descriptive analysis using absolute and relative frequencies. The analysis of data quality in the database followed the criteria proposed by the Economic Commission for

Latin America and the Caribbean, with the following classifications: excellent when there are less than 5% of incomplete information, good from 5% to 10%, fair from 10% to 20%, poor from 20% to 50%, and very poor for 50% or more[25]. The completeness of sociodemographic data was excellent, except for education, which had 61.1% of the data reported as unknown/blank[25]. Among clinical and epidemiological data, there were predominantly fair and poor classifications for signs and symptoms and risk factors/comorbidities, respectively[25]. Regarding care-related data, the quality varied from excellent to poor[25].

The project was exempt from the review by the Ethics Committee on Human Research, as it utilized data from a publicly accessible spreadsheet.

DATA AVAILABILITY

The entire dataset supporting the results of this study is available upon request from the corresponding author, Flavia Aparecida Dias Marmo.

RESULTS

The analysis of the geographical distribution of accumulated covid-19 hospitalizations in aged individuals revealed variations in incidence rates in Minas Gerais. A concentration of higher incidences was observed in the central and southern regions of Minas Gerais, with incidence rates ranging from 3,098 to 8,916 cases per 100,000 inhabitants. This incidence range represents approximately 23% of the municipalities in the state (Figure 1).

In the context of the macroregions, the analysis of incidence distribution reveals that, in proportion to the number of municipalities, the lowest incidences occurred in the Norte, Nordeste, Jequitinhonha, and Centro Sul macroregions. Conversely, the highest incidences in proportion to the number of municipalities were observed in the Vale do Aço, Triângulo Norte, Leste, and Triângulo Sul macroregions, respectively, as shown in Figure 2.

Regarding sociodemographic characteristics, among the cases of covid-19 in aged individuals hospitalized for SARS in Minas Gerais, there was a predominance of males in the age group of 60-70 years, those of mixed race, and with an education level of 1st to 5th grade (Table 1).

Table 2 shows that the most prominent signs and symptoms among cases of covid-19 in aged individuals hospitalized for SARS in Minas Gerais were dyspnea and oxygen saturation <95%, followed by cough, respiratory discomfort, and fever. The least reported manifestation was abdominal pain.

It is worth noting that 54.0% of the cases of covid-19 in aged individuals hospitalized for SARS in Minas Gerais presented some form of risk factor or comorbidity, with chronic cardiovascular disease and diabetes mellitus being the most frequent. Table 3 provides a detailed breakdown of the risk factors/comorbidities identified in the individual record forms.

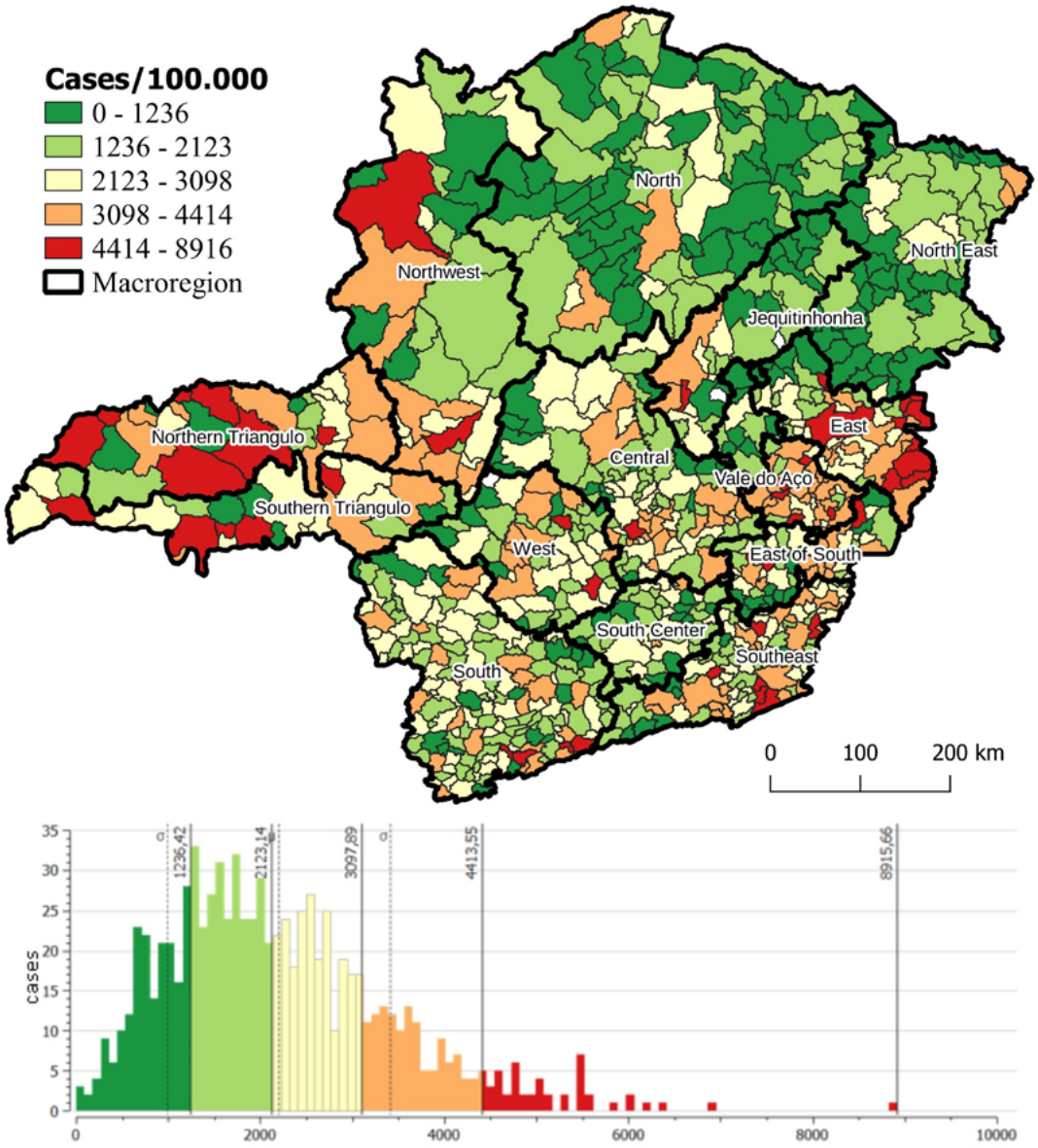

Figure 1. Incidence of accumulated covid-19 cases per 100,000 inhabitants in aged individuals hospitalized for SARS (N=102,029). Minas Gerais, 2020-2022.

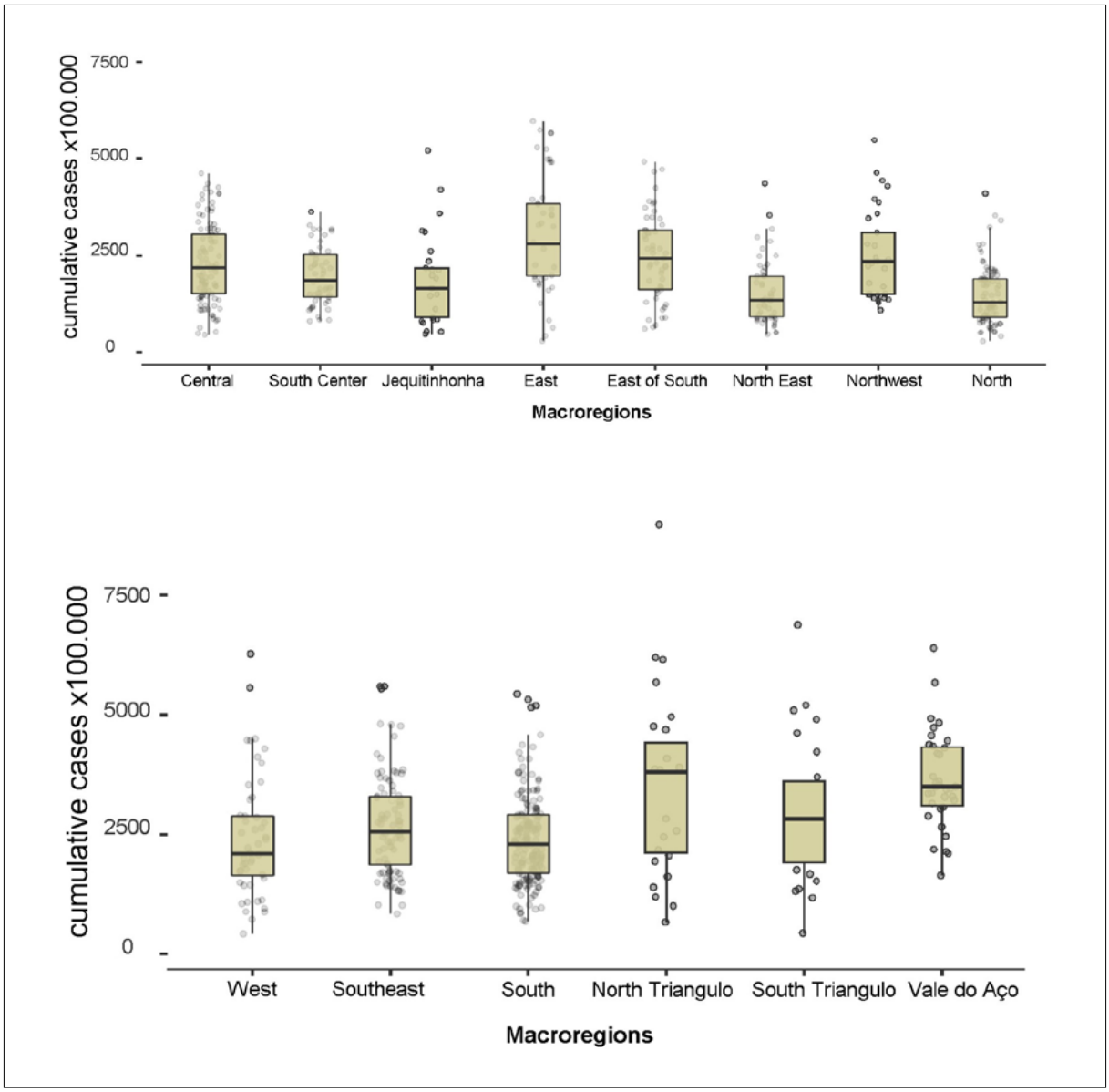

Figure 2. Distribution of the incidence of accumulated covid-19 cases per 100,000 inhabitants in aged individuals hospitalized for SARS (N=102,029) according to Health Macroregion. Minas Gerais, 2020-2022.

Table 1. Distribution of sociodemographic variables among cases of covid-19 in aged individuals hospitalized for SARS (N=102,029). Minas Gerais, 2020-2022.

Variables	N (%)
Sex	
Male	51.770 (50,7)
Female	50.220 (49,2)
Unknown	34 (0,1)
Blank	5 (-)
Age Group (in years)	
60 - 70	39.749 (39)
70 - 80	33.479 (32,8)
80 or more	28.800 (28,2)
Blank	1 (-)
Self-reported Skin Color/Race	
White	42.060 (41,2)
Black	6.861 (6,7)
Yellow	941 (0,9)
Mixed race	42.491 (41,6)
Indigenous	34 (0,1)
Unknown	9.571 (9,4)
Blank	71 (0,1)
Education	
No education/illiterate	4.289 (4,2)
1st to 5th grade	17.960 (17,6)
6th to 9th grade	7.218 (7,1)
10th to 12th grade	6.970 (6,8)
Higher education	3.233 (3,2)
Unknown	38.439 (37,7)
Blank	23.920 (23,4)

Table 2. Distribution of signs and symptoms among cases of covid-19 in aged individuals hospitalized for SARS (N=102,029). Minas Gerais, 2020-2022.

Variables	Yes	No	Unknown	Blank
	n (%)	n (%)	n (%)	n (%)
Fever	49.800 (48,8)	41.658 (40,8)	999 (1,0)	9.572 (9,4)
Cough	71.000 (69,6)	24.176 (23,7)	714 (0,7)	6.139 (6,0)
Sore Throat	12.878 (12,6)	72.226 (70,8)	1.512 (1,5)	15.413 (15,1)
Dyspnea	74.308 (72,8)	21.383 (21,0)	613 (0,6)	5.725 (5,6)
Respiratory distress	56.974 (55,8)	34.764 (34,1)	985 (1,0)	9.306 (9,1)
Oxygen saturation <95%	74.297 (72,8)	20.582 (20,2)	723 (0,7)	6.427 (6,3)
Diarrhea	14.606 (14,3)	70.825 (69,4)	1.427 (1,4)	15.171 (14,9)
Vomiting	9.892 (9,7)	74.850 (73,4)	1.492 (1,5)	15.795 (15,5)
Abdominal pain	5.130 (5,0)	73.195 (71,7)	2.036 (2,0)	21.668 (21,2)
Fatigue	24.192 (23,7)	56.799 (55,7)	1.957 (1,9)	19.081 (18,7)
Loss of smell	6.733 (6,6)	71.650 (70,2)	2.283 (2,2)	21.363 (20,9)
Loss of taste	7.555 (7,4)	70.932 (69,5)	2.324 (2,3)	21.218 (20,8)
Other	30.593 (30,0)	53.955 (52,9)	1.966 (1,9)	15.515 (15,2)

Table 3. Distribution of risk factors/comorbidities among cases of covid-19 in aged individuals hospitalized for SARS (N=102,029). Minas Gerais, 2020-2022.

Variables	Yes	No	Unknown	Blank
	n (%)	n (%)	n (%)	n (%)
Chronic cardiovascular disease	46.628 (45,7)	25.962 (25,4)	483 (0,5)	28.956 (28,4)
Chronic hematologic disease	838 (0,8)	62.267 (61,0)	1.085 (1,1)	37.839 (37,1)
Down Syndrome	210 (0,2)	62.830 (61,6)	1.066 (1,0)	37.923 (37,2)
Chronic liver disease	796 (0,8)	62.136 (60,9)	1.079 (1,1)	38.018 (37,3)
Asthma	2.920 (2,9)	60.407 (59,2)	1.044 (1,0)	37.658 (36,9)
Diabetes	31.329 (30,7)	38.187 (37,4)	657 (0,6)	31.856 (31,2)
Chronic neurological disease	6.093 (6,0)	57.952 (56,8)	1.002 (1,0)	36.982 (36,2)
Other chronic lung disease	6.734 (6,6)	57.373 (56,2)	1.006 (1,0)	36.916 (36,2)
Immunodeficiency/ immunosuppression	2.844 (2,8)	60.325 (59,1)	1.068 (1,0)	37.792 (37,0)
Chronic kidney disease	5.494 (5,4)	58.243 (57,1)	1.002 (1,0)	37.290 (36,5)
Obesity	6.630 (6,5)	56.985 (55,8)	1.371 (1,3)	37.043 (36,3)

Regarding the treatment data, it was observed that 34.0% of the aged individuals required admission to the ICU, with 2.6% of cases classified as unknown and 6.8% left blank. The majority of patients used ventilatory support, with non-invasive ventilation being the most prevalent (54.1%), but 4.2% were marked as unknown, and 7.6% were left blank. As for the performance of X-rays, 32.7% did not undergo this examination. Among those who did, 20.4% showed interstitial infiltrates. There were 10.6% marked as unknown and 24.7% left blank. Of all cases, 55.6% recovered, 41.8% resulted in death, with only 0.6% marked as unknown, and 2.0% left blank.

DISCUSSION

The present study identified the panorama of hospitalizations for covid-19 among aged residents in Minas Gerais, including geographic distribution, sociodemographic data, clinical and epidemiological characteristics, and treatment details.

The macroregions with lower incidence of cumulative cases of covid-19 in aged individuals hospitalized for SARS in Minas Gerais coincide with the areas that reported cases later in the pandemic, as they are distant from the main urban centers of the state[26]. This is exemplified by the Norte, Nordeste, and Jequitinhonha macroregions. In these regions, there is lower human development[27], resulting in a smaller proportion of aged people due to a lower life expectancy. In the present study, the highest incidences detected in the Southern, Southeastern, and Western parts of the state include more populous municipalities, a more integrated urban network with the states of São Paulo and Rio de Janeiro, higher population density, and a higher number of cases since the beginning of the pandemic[28,29], favored by intra-urban transmissions[26]. These characteristics may have contributed to the impact on the population as a whole, including the aged.

Based on the data collected in the individual registration forms, there were similar percentages of reported cases between the sexes, with a slightly higher incidence in men, which is consistent with previous studies[10-14]. The higher susceptibility of males to infection with the novel coronavirus may be explained by genetic and immunological differences that confer less resistance to the disease, as well as behavioral factors, such as adopting an unhealthy lifestyle and having lower adherence to preventive measures[30].

Regarding age groups, it was observed that younger aged individuals were affected, similar to other studies[10,12,15]. This can be explained by the need for some younger aged people to continue working to support their families during the pandemic[31].

Therefore, despite being a high-risk group[6,16], it is understood that some aged individuals needed to leave their homes for work, which increased their exposure to the disease[31].

Regarding self-reported skin color/race, individuals of mixed race and white individuals were the most prevalent in the records, with very close percentages. A study with patients from Ecuador, Germany, Italy, and Spain found a predominance of white or Caucasian race[11]. In a Brazilian study, the majority were white and mixed race[10], which aligns with the results found. Some studies do not include information on skin color/race, with a more common focus on clinical data[11,13-15].

The data on education levels show that the majority of aged individuals had completed the first cycle of elementary education (1st to 5th grade), similar to a study that described the epidemiological profile of SARS in Brazil[10]. In Thailand, higher education was associated not only with increased levels of knowledge but also with the adoption of preventive behaviors related to the disease[31]. Similarly, low education levels were associated with less knowledge about preventive measures for covid-19 among aged individuals in a municipality in the interior of Minas Gerais[32]. These findings suggest that higher levels of education can help individuals evaluate the information they receive and guide their attitudes towards preventing negative outcomes[31], such as infection with the novel coronavirus.

It was demonstrated that the main signs and symptoms recorded among the aged individuals in the current study were dyspnea, oxygen saturation below 95%, cough, and respiratory distress, in addition to fever. These findings are supported by a study conducted in Brazil that also found a predominance of these characteristics[12]. Similarly, other research studies found dyspnea, fever, and cough[11,13-15,17]. The most frequent respiratory symptoms characterize severe cases of the disease, with cough and fever being present in mild to moderate cases[4,5]. It is worth noting that the aged population generally exhibits a less coordinated and slower immune response, which can increase susceptibility to covid-19[8]. In this context, monitoring aged individuals and their clinical manifestations is crucial to provide appropriate therapeutics and prevent negative outcomes.

Regarding the presence of risk factors and comorbidities, studies have shown that comorbidities are common in aged individuals hospitalized with covid-19, with a particular emphasis on cardiovascular diseases and diabetes mellitus[12,13], which align with the findings of the current research. Due to the physiological changes that occur with the aging process and compromise the immune system, as well as the presence of chronic diseases, the aged population is more susceptible to severe forms of covid-19[8], necessitating hospitalization.

Regarding the care characteristics, the need for ventilatory support was also found in other studies[10,12-14], similar to the present research. In a similar fashion, a scoping review identified a higher proportion of aged individuals who needed to be admitted to the ICU when compared to younger individuals[9]. Some of the most frequent signs and symptoms in the present study, such as shortness of breath, oxygen saturation <95%, and respiratory distress, are consistent with severe cases of covid-19[4]. This may explain the need for ventilatory support and ICU admission. Therefore, it is necessary to continue prioritizing the dissemination of information about preventive measures for covid-19 in aged individuals, as well as strengthening actions that can improve clinical outcomes in positive cases, minimizing adverse outcomes in all healthcare settings.

In relation to radiological findings, among the aged individuals who underwent chest X-rays, interstitial infiltrate was the most common finding. Previous studies that analyzed cases of covid-19 in the aged identified bilateral lung infiltrates as the most common radiological finding, which is consistent with the results of the present research[16,33]. Regardless of the type, aged individuals showed some alterations in the radiological examination[11,12,16,33], which underscores the role of imaging tests and clinical manifestations[4,5] in directing the diagnosis and adopting therapeutic interventions for the treatment of the disease.

Out of the total cases analyzed, there was a predominance of individuals who recovered, which is consistent with previous studies[13,14]. Despite the frequent severe respiratory forms and risk factors,

aged individuals hospitalized for covid-19 survive the infection[17]. It is worth noting that since the beginning of the covid-19 pandemic, advanced age has been identified as a risk factor for negative outcomes[9,34], but it appears that a portion of cases has recovered, possibly due to the development of therapeutics and vaccines, which have shown positive results in terms of case severity and mortality rates[4].

The use of secondary data from a nationally accessible database offers the advantage of reaching a broad sample of the aged population and allows for the rapid dissemination of results that can inform new research and actions related to the care and attention of the aged with covid-19. However, limitations include the risk of underreporting of cases and data incompleteness, which can affect the accuracy and quality of information. Additionally, some information relevant to the aged population could not be collected due to the absence of such data in individual record sheets, such as aspects related to frailty, functional and cognitive status, as well as lifestyle habits like physical activity, alcohol consumption, smoking, and dietary patterns.

CONCLUSION

The present study aimed to characterize covid-19 cases in aged individuals hospitalized for SARS in Minas Gerais, Brazil. It was demonstrated that the regions located in the more populous areas of the state (South, Southeast, and West) had the highest incidence of cases. Among sociodemographic characteristics, there was a predominance of aged males, aged 60-70 years, of mixed race, with educational attainment ranging from the 1st to the 5th grade. The clinical and epidemiological profile showed that the most frequent symptoms were dyspnea, oxygen saturation <95%, cough, respiratory discomfort, and fever. Risk factors/comorbidities were reported, with a notable presence of chronic cardiovascular diseases and diabetes mellitus. Regarding healthcare data, a portion of individuals required ICU admission, with the majority requiring ventilatory support, primarily non-invasive ventilation. Among those who underwent chest X-rays, the most common finding was interstitial infiltrates. While recovery was the most frequent outcome, it is worth highlighting that approximately 42 out of every 100 aged individuals still experienced mortality.

Despite the ongoing improvement in treatments and vaccine development, it was observed that certain characteristics remain common, indicating the need for targeted actions and future research in areas most affected geographically. Emphasis should be placed not only on the at-risk group represented by the aged but also on subgroups, such as younger individuals, males, people of mixed race, those with low educational attainment, comorbidities/risk factors, and clinical manifestations consistent with severe cases. Additionally, these findings can contribute to a reflection on the healthcare provided to this population, as well as strengthening public policies to reprioritize aged care and disease management.

AUTHORSHIP

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