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Epidemiological profile of severe acute respiratory syndrome cases in the state of Minas Gerais, Brazil, 2020 to 2021

Perfil epidemiológico dos casos de síndrome respiratória aguda grave no estado de Minas Gerais, Brasil, 2020 a 2021

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ABSTRACT

Introduction: The increase in the number of cases of severe acute respiratory syndrome (SARS) associated with Sars-CoV-2 has given rise to one of the largest public health emergencies in the world. **Objective:** To evaluate the epidemiological profile of SARS in the state of Minas Gerais, from 2020 to 2021. **Method:** A cross-sectional, descriptive, retrospective, and qualitative-quantitative research was carried out. Data were collected from the SIVEP-Gripe system and the COVID-19 Case Monitoring Panel, for the years from 2020 to 2021. The variables analyzed were: total COVID-19 cases, total SARS and SARS due to COVID-19, age, sex, race, final classification and final evolution. **Results:** The state had 315,726 SARS cases, and of these, 58.6% were caused by Sars-CoV-2. Most individuals who presented SARS were male, aged 60 years and over and brown. Among the SARS cases, 23.3% evolved to death, and of these, 77.6% were caused by COVID-19. The regions of Uberlândia, Belo Horizonte, Coronel Fabriciano, Patos de Minas, Uberaba, Ituiutaba, Leopoldina, Governador Valadares and Juiz de Fora had the highest occurrences of SARS/inhabitants. The regionals from São João del-Rei, Teófilo Otoni, Passos and Uberaba stood out for having a high lethality rate of patients who had SARS due to COVID-19. **Conclusion:** The distribution of reported SARS cases and deaths in Minas Gerais was heterogeneous, with a greater number of cases in municipalities with higher population density. The questions listed in this research pointed out the deficiencies and weaknesses in the response capacities to face the pandemic, which indicates the need for decentralizing and restructuring the health system of several municipalities in the state.

KEYWORDS: SRAG; COVID-19; Descriptive Epidemiology; Infectious Diseases Reporting; SARS-CoV-2

RESUMO

Introdução: O aumento do número de casos de síndrome respiratória aguda grave (SRAG) associado ao SARS-CoV-2 originou uma das maiores emergências mundiais de saúde pública. **Objetivo:** Avaliar o perfil epidemiológico da SRAG no estado de Minas Gerais, durante 2020 e 2021. **Método:** Realizou-se pesquisa transversal, descritiva, retrospectiva e qualiquantitativa. Os dados foram coletados do sistema SIVEP-Gripe e do Painel de Monitoramento dos Casos de COVID-19, dos anos de 2020 e 2021. As variáveis analisadas foram: total de casos de COVID-19, total de SRAG e SRAG por COVID-19, idade, sexo, raça, classificação final e evolução final. **Resultados:** O estado apresentou 315.726 casos de SRAG e, destes, 58,6% foram causados pelo SARS-CoV-2. A maioria dos indivíduos que apresentou SRAG eram do sexo masculino, faixa etária de acima dos 60 anos e raça parda. Dentre os casos de SRAG, 23,3% evoluíram para óbito, e destes 77,6% tinham como causa a COVID-19. As regionais de Uberlândia, Belo Horizonte, Coronel Fabriciano, Patos de Minas, Uberaba, Ituiutaba, Leopoldina, Governador Valadares e Juiz de Fora apresentaram as maiores ocorrências de SRAG/habitantes. As regionais São João del-Rei, Teófilo Otoni,

Passos e Uberaba destacaram-se por apresentar elevada taxa de letalidade dos pacientes que apresentaram SRAG por COVID-19. **Conclusões:** A distribuição dos casos e óbitos notificados de SRAG em Minas Gerais foi heterogênea, com número maior de casos em municípios com maior densidade demográfica. As questões elencadas nesta pesquisa apontaram as deficiências e fragilidades nas capacidades de resposta ao enfrentamento da pandemia, o que indica a necessidade de descentralização e reestruturação do sistema de saúde de diversos municípios do estado.

PALAVRAS-CHAVE: SRAG; COVID-19; Epidemiologia Descritiva; Notificação de Doenças Infecciosas; Sars-CoV-2

INTRODUCTION

Severe acute respiratory syndrome (SARS) is caused by respiratory viruses, including respiratory syncytial virus (RSV), influenza virus and adenovirus, which in many cases cause severe pneumonia. Recently, the coronavirus (SARS-CoV-2), which causes COVID-19, was detected as a causative agent of SARS[1].

The manifestation of SARS caused by SARS-CoV-2 was first reported in Wuhan, China, in December 2019. Two months later, the World Health Organization (WHO) declared a global public health emergency and of great international concern, due to the high and rapid transmissibility of the virus, which has made COVID-19 a serious pandemic[2,3].

The first coronavirus was isolated in 1937, but it became known in 2002 and 2003 for being the causative agent of SARS in humans, which presented: severe symptoms in the respiratory system, fever, cough, tiredness, loss of taste or smell, among others[2].

At the beginning of the SARS-CoV-2 pandemic, the countries that recorded the most cases of infection and deaths were China, Italy, and Spain but soon there was an increase in cases worldwide[3].

In Brazil, the first confirmed case of COVID-19 was on February 25, 2020, in the state of São Paulo, confirmed by phylogenetic analysis of the viral strains isolated in the country. Since then, the spread has been marked, as has the increase in the number of deaths, especially in some capitals, such as São Paulo, Rio de Janeiro and Fortaleza[4,5].

The COVID-19 pandemic has taken public health to extreme conditions, as it has overloaded the Unified Health System (SUS). SUS is one of the largest and most complex public health systems, as it covers everything from simple to more complicated care, guaranteeing full, universal, and free access for the entire Brazilian population. As a result of the disease, there has been a demand for COVID-19 treatment, especially as cases have worsened, requiring an increase in the number of beds and artificial respirators in the SUS and in the private healthcare network. This has shown the structural problems of health care both in Brazil and around the world[4,6].

SARS due to COVID-19 is considered serious and is related to deaths from the disease. The speed of growth in the number of cases of SARS due to COVID-19 occurred differently between Brazilian regions. At the start of the pandemic, the Southeast concentrated the largest number of cases, especially in São Paulo, Rio de Janeiro, and Minas Gerais[5].

In the case of Minas Gerais, following the occurrence of the first case of COVID-19 and subsequent cases of SARS due to COVID-19, the Minas Gerais State Department of Health began to adopt measures for the investigation and epidemiological and hospital monitoring of suspected cases. Over the course of the period, the number of cases grew exponentially and unevenly between municipalities[7].

As Minas Gerais is the Brazilian state with the largest number of municipalities, COVID-19 showed a spatial dynamic correlated to urban centers, mainly due to the spatial concentration of individuals[8].

The COVID-19 scenario, even in 2020, was not entirely satisfactory, as vaccination needed to advance further, and be accompanied by the adoption of public health measures by managers at federal, state, and municipal levels, in order to reduce mortality rates from SARS due to COVID-19 and control the spread of the disease[9].

In this context, the aim of this study was to evaluate the epidemiological profile of SARS in the state of Minas Gerais, during the period 2020 and 2021, in order to obtain information that will help organize actions aimed at controlling and preventing this disease.

METHOD

This cross-sectional, descriptive, retrospective, and qualitative study used the 28 regional offices of the Minas Gerais State Health Department as the units of analysis.

The state of Minas Gerais, located in the Southeast region of Brazil, with an estimated population of 21,411,923 inhabitants in 2021, has an area of 586,513.993 km^2 and a population density of 33.41 inhabitants per km^2[2,10].

The Minas Gerais state government has 28 Regional Health Offices, providing assistance to 14 macro-regions (Figure 1)[11].

The sample was delimited from March 2020 to November 2021, with data collected from the Influenza Epidemiological Surveillance Information System (SIVEP-Gripe) and the Minas Gerais State Health Department (COVID-19 Case Monitoring Panel), without identifying the subjects.

Estimates of the resident population in the state of Minas Gerais were consulted in the database of the Brazilian Institute of Geography and Statistics (IBGE)[12].

With regard to the month of December 2021, there was a problem of instability in the government data system, including SIVEP-Gripe, making it difficult to collect information, so this study considered the month of November 2021 for analysis.

The variables analyzed in the study were: total reported COVID-19 cases, total reported SARS and SARS due to COVID-19, regional health departments, age, gender, race, final classification of the case and final evolution of the case.

To calculate the prevalence coefficient, equation (1)[13] was used:

$$Coef.\ of\ Prevalence = \frac{number\ of\ confirmed\ cases}{estimated\ population} \times 1{,}000$$

In the case of the lethality rate, equation (2)[13] was used:

$$Fatality\ rate = \frac{number\ of\ deaths}{number\ of\ confirmed\ cases} \times 1{,}000$$

The data was entered into a Microsoft Excell® spreadsheet. They were then imported into SPSS software version 21 and analyzed using descriptive statistics, and the images were processed and produced using Qgis *software* version 3.16,13. The results were presented in the form of tables, graphs, and maps.

It should be noted that the data used in this research was public domain data and was exempt from evaluation by the Research Ethics Committee (CEP), in accordance with Resolution No. 510 of April 7, 2016, of the National Health Council (CNS).

RESULTS AND DISCUSSION

In the state of Minas Gerais, from March 2020 to December 2021, 2,208,075 confirmed cases of COVID-19 were reported, giving a prevalence coefficient of 26.27 cases/100,000 inhabitants.

In the period evaluated, the state reported 315,726 cases of SARS, 185,093 of which had SARS-CoV-2 as the causative agent, or 58.6% of the cases. Of this total, the year 2021 accounted for 71.6% of SARS notifications due to COVID-19.

In Brazil, SARS cases have been notified on SIVEP-Gripe since the intense outbreak of Influenza A and B, and with the arrival of COVID-19, the SARS surveillance protocol also began to record notified COVID-19 cases.

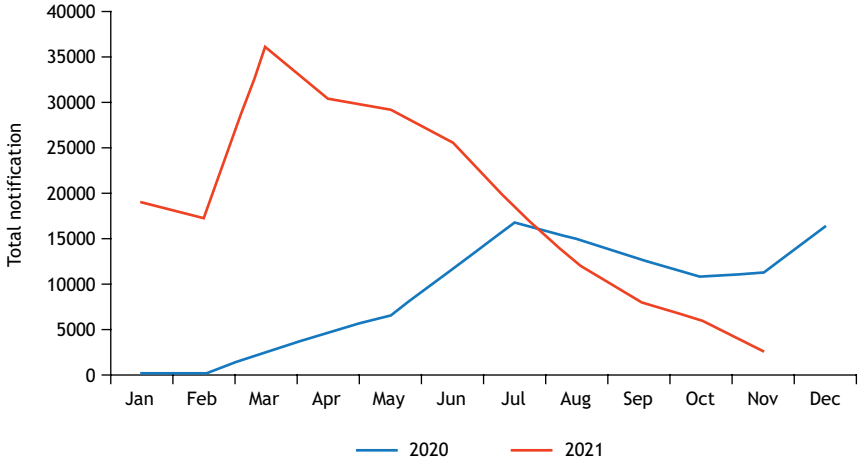
In 2019, before the COVID-19 pandemic, Minas Gerais had 3,980 cases of SARS[14]. In 2020, there was a 27.5-fold increase in the number of SARS.

Bastos et al.[15] stated that in Brazil there was an increase in the notification of SARS cases from the beginning of 2020 compared to historical data from the last 10 years. As did Frias et al.[16] who reported a 29.6-fold increase in the number of SARS cases reported in 2021, when compared to 2019 in the state of Mato Grosso do Sul.

Research carried out by Custódio et al.[17] already warned of the increase in SARS cases in Minas Gerais, as they cited in the study the detection rate of patients hospitalized for

Source: Minas Gerais[11].

Figure 1. Regional offices of the Secretary of State of Minas Gerais, Brazil, 2021.



Source: SIVEP-Gripe, 2021.

Figure 2. Monthly distribution of reported cases of SARS in the state of Minas Gerais in 2020 and 2021.

SARS of 24.4/100,000 inhabitants in 2019 and 527.21/100,000 inhabitants in 2020.

The monthly distribution of reported cases of SARS in the state of Minas Gerais in 2020 and 2021 is shown in Figure 2.

Figure 2 shows that the increase in reported cases of SARS in the state of Minas Gerais began in March 2020 with a peak in July of the same year, followed by a downward trend in subsequent months. However, from November 2020, there was an increase in reported cases of SARS, following this trend until March 2021, when there was again a peak, followed by a decrease in cases in subsequent months.

The increase in SARS cases from March 2020 is related to the onset and spread of COVID-19 cases in the state of Minas Gerais. Cases increased until July, possibly due to the difficulty encountered by health professionals in implementing effective treatment, control, and prevention of the disease, which until then had been an unknown. The slight drop in the number of SARS cases until November may be related to the adjustments made to the national health system, by increasing the capacity to provide care, the concern of the population about the disease who sought care quickly, before the case worsened, due to the implementation of isolation measures and the exhaustion of the most susceptible groups who had already contracted the disease.

Once the number of serious cases decreases, there is a tendency for managers, health professionals and the general population to relax their preventive and care measures. It is therefore believed that the peak in March is related to these factors. In addition, it may also be related to the emergence of a new variant in the country, P1, which was more transmissible and even more adept at evading the immune response.

In January 2021, a vaccination campaign against COVID-19 began in Brazil, in which the following were first vaccinated: health professionals working on the front line, the elderly in long-term care institutions, institutionalized people with disabilities (aged 18 and over) and the indigenous population[6]. The aim of vaccination against COVID-19 was to reduce the risk of infection and especially the occurrence of severe cases (SARS)[18,19,20].

In this sense, it is believed that the sharp drop in SARS cases in the state from March 2021 until November was due to the advance of vaccination in the state. Frias et al.[16] stated that the amount of SARS in individuals with COVID-19 immunized in the state of Mato Grosso do Sul was considered low.

According to the distribution of reported cases of SARS, it was noted that the majority of individuals were male (53.2%), with an age group of over 60 (50.9%) and predominantly brown (45.4%), as shown in Table 1.

The male gender has already been reported in other studies as being associated with cases of SARS, corroborating the findings of this study[21,22,23]. This may be related to the fact that males are less likely to seek medical help than females, and usually when they do, the case has already worsened.

It's important to note that the severity of COVID-19 has occurred more in elderly individuals, as the age group most affected by the disease was between 30 and 39 years old, but the highest occurrence of SARS was in individuals over 60 years old. According to Frias et al.[16], there is no predilection of the virus for age group, although middle-aged and elderly adults are the most affected and have a greater chance of developing into a severe case of the disease. The elderly are also at greater risk of worsening when their advanced age is associated with some form of comorbidity[24].

Other studies have shown that the over-60s were the age group with the highest incidence of SARS patients, particularly caused by COVID-19[1,15,17,25].

The most affected race was brown. It is believed that this is because the brown race is a characteristic of the state of Minas Gerais, since, according to IBGE data[12], the state had 49.8% of the population declared brown in 2019. But it should be noted that, due to the pandemic, social inequalities in Brazil have been highlighted, and the brown and black races have suffered more from the severity of the disease, as they are generally the races that live most in situations of social and economic vulnerability[26].

Table 1. Characterization of the variables: sex, age group, and race of individuals who presented with SARS in the state of Minas Gerais, 2020 and 2021.

Variable	N	%
Sex		
Female	147.613	46,7
Male	167.918	53,2
Not informed	195	0,1
Age group		
< 1 year	5.786	1,8
1-9 years	10.444	3,3
10-19 years	3.642	1,3
20-29 years	11.801	3,7
30-39 years	26.985	8,5
40-49 years	40.450	12,8
50-59 years	55.792	17,7
> 60 years	160.826	50,9
Race		
Yellow	3.225	1,0
White	112.178	35,5
Indigenous	212	0,2
Brown	143.380	45,4
Black	218.98	6,9
Ignored	34.833	11,0

Source: SIVEP-Gripe, 2021.

Table 2. Numerical distribution of the classification of reported SARS in the state of Minas Gerais, 2020 and 2021.

Classification of SARS	N	%
Unspecified SARS	102.745	32,5
SARS due to COVID-19	185.093	58,6
Influenza SARS	443	0,1
SARS due to another etiological agent	919	0,3
SARS due to another respiratory virus	760	0,3
Ignored	25.766	8,2
Total	315.726	100,0

Source: SIVEP-Gripe, 2021.
SARS: Severe acute respiratory syndrome.

Among the cases of SARS reported in the state of Minas Gerais, the final classification is shown in Table 2.

Table 2 shows that the classification of SARS by COVID-19 accounted for 58.6% of notified cases, followed by unspecified SARS with 32.5%. The number of records classified as ignored (8.2%) is noteworthy, highlighting flaws in the notification and recording process, which hampers correct assessment and knowledge of the real situation of cases.

In Brazil, between January 2020 and March 2021, the curve of occurrence of SARS and COVID-19 remained similar, which showed that SARS-CoV-2 may be responsible for the majority of SARS cases recorded[27]. This information is similar to the data found in this study, as the majority of SARS cases were caused by SARS-CoV-2.

Due to the high number of cases of COVID-19 and, consequently, of SARS, in mid-August 2020, the state of Minas Gerais was considered the sixth Brazilian state in absolute numbers of cases, forming part of the states that were part of the epicenter of the disease[9,16].

What's more, in the very first months of the pandemic, the state was ranked third in terms of the number of SARS cases. This is because the combination of a high number of hospitalizations for SARS and low numbers of tests resulted in more confirmed cases of COVID-19, further increasing the risk of SARS[28].

Regarding the evolution of SARS, the data is shown in Table 3.

Among the reported cases of SARS, 23.3% evolved to death and, of these, 77.6% had COVID-19 as the underlying cause.

Factors that favor death from SARS due to COVID-19 are related to comorbidities. Among the deaths of individuals with SARS due to COVID-19, only 7.8% reported having no comorbidities.

Table 4 shows the frequencies of occurrence of comorbidities in individuals who had SARS due to COVID-19 and died.

Heart disease, diabetes and obesity were the comorbidities most associated with death from SARS caused by COVID-19 in the state of Minas Gerais. Some authors have already reported higher mortality rates from SARS caused by COVID-19 in groups of patients with some type of comorbidity[17,25,29].

Table 3. Numerical distribution of the evolution of reported SARS in the state of Minas Gerais, 2020 and 2021.

Evolution of SARS	N	%
Death	73.454	23,3
Death from other causes	2.792	0,9
Recovered	202.192	64,0
Ignored	37.288	11,8
Total	315.726	100,0

Source: SIVEP-Gripe, 2021.
SARS: Severe acute respiratory syndrome.

It is important to note that mortality is higher in elderly patients and those with comorbidities[30,31]. This information corroborates the data found in this study, as 92.2% of deaths from SARS due to COVID-19 occurred in individuals with comorbidities and 70.3% in those aged 60 or over.

The spatial distribution of SARS notifications in the state of Minas Gerais according to the regional offices of the State Health Department is shown in Table 5.

Table 5 shows that the regions of Belo Horizonte (34.0%), Uberlândia (8.3%), and Divinópolis (5.5%) had the highest number of SARS cases. These cities are considered regional hubs, with a higher population density, and naturally had a higher number of reported cases of COVID-19 and SARS. It's worth noting that the information found in the system, recorded as "cases identified in various regions", was removed from this assessment, in order to give the study more reliability so as not to inflate the other health regions.

When calculating the SARS prevalence coefficient by regional office of the Minas Gerais State Health Department, the data revealed the municipalities that stood out in terms of the number of SARS/inhabitant (Figure 3).

The calculation of the prevalence coefficient highlighted the regions of Uberlândia, followed by Belo Horizonte, Coronel Fabriciano, Patos de Minas, Uberaba, Ituiutaba, Leopoldina, Governador Valadares, and Juiz de Fora with the highest occurrences of SARS/1,000 inhabitants.

The high prevalence in these regions may be related to the presence of cities that polarize regions of the state of Minas Gerais in their urban networks, exposing the idea of the principle of proximity that influences the contagion of cities through their residents. Belo Horizonte, the capital, polarizes the entire state, especially the central region. Uberlândia and Uberaba polarize the Triângulo and Alto Paranaíba regions. Juiz de Fora polarizes the South and Zona da Mata regions and Montes Claros is the city that polarizes the North[31].

The regions of Januária, Alfenas, Ponte Nova, Manhuaçu and Pedra Azul had the lowest SARS prevalence rates. With the exception of Pedra Azul, the other regions have good medical efficiency and hospital infrastructure, as well as having municipalities with a higher human development index (HDI) as their base city.

Pedra Azul has a lower HDI and is a region with a higher poverty rate, including the Jequitinhonha Valley and Mucuri Valley

Table 4. Numerical distribution of the type of comorbidity of individuals who had SARS due to COVID-19 and died in the state of Minas Gerais, 2020 and 2021.

Comorbidity	N	%*
Heart disease	23.922	42,0
Hematological	499	0,9
Hepatopathies	633	1,1
Asthma	1.726	3,0
Diabetes	16.890	29,6
Neuropathies	3.470	6,0
Pneumopathies	3.597	6,3
Immunopathies	2.014	3,5
Kidney diseases	3.704	6,5
Obesity	6.133	10,8
Down Syndrome	231	0,4

Source: SIVEP-Gripe, 2021
* total greater than 100% due to patients having more than one comorbidity.

Table 5. Spatial distribution of reported cases of SARS by regional office of the Minas Gerais State Health Department, 2020 and 2021.

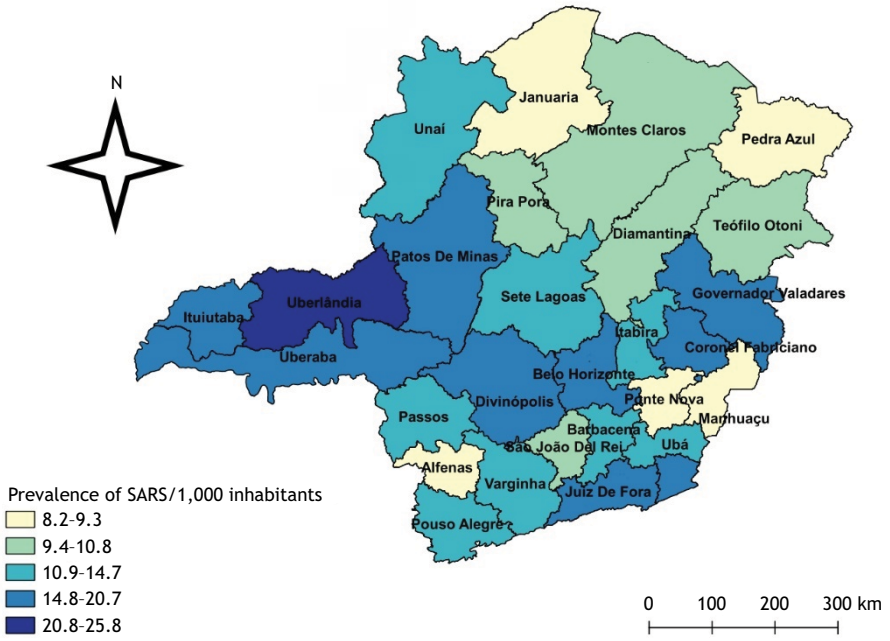
Regional	N	%
Belo Horizonte	107.605	34,0
Uberlândia	26.249	8,3
Divinópolis	17.486	5,5
Coronel Fabriciano	13.418	4,2
Juiz de Fora	12.075	3,9
Uberaba	11.622	3,7
Pouso Alegre	11.282	3,6
Varginha	11.107	3,5
Governador Valadares	10.886	3,4
Montes Claros	10.710	3,5
Sete Lagoas	7.586	2,4
Barbacena	7.006	2,2
Patos de Minas	6.873	2,2
Ubá	6.404	2,0
Steps	5.703	1,9
Itabira	5.661	1,8
Teófilo Otoni	5.275	1,7
Diamantina	4.807	1,5
Manhaçu	4.100	1,3
Alfenas	3.945	1,2
Leopoldina	3.755	1,2
Unaí	3.670	1,1
Januária	3.263	1,0
Ponte Nova	3.106	1,0
Ituiutaba	3.066	1,0
Blue Stone	2.644	0,9
São João del Rei	2.635	0,8
Pirapora	1.495	0,5
Cases identified in various regions	2.278	0,7
Total	**315.726**	**100,0**

Source: Prepared by the authors, 2022.

regions, so the low occurrence of SARS may be related to under-reporting of cases.

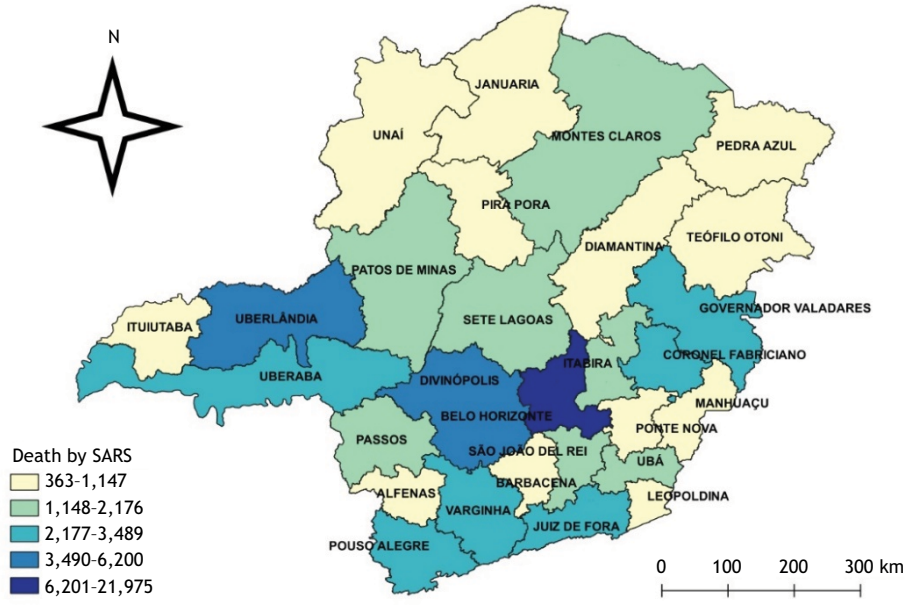
Figure 4 shows the spatial distribution of reported cases of SARS, which led to death.

Deaths from SARS were concentrated in the regions of Belo Horizonte, Uberlândia, Divinópolis, Juiz de Fora, Pouso Alegre, Coronel Fabriciano, Uberaba, Governador Valadares, and Varginha. These are the regions with the highest number of



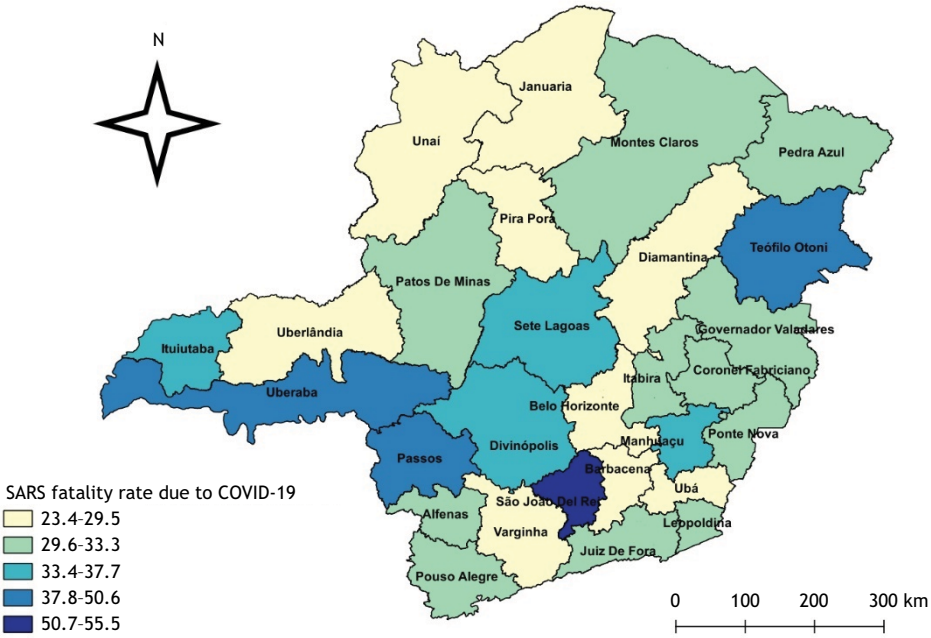
Source: Prepared by the authors, 2022.
SARS: Severe acute respiratory syndrome.

Figure 3. Prevalence coefficient of SARS by regional offices of the Minas Gerais State Health Department, 2020 and 2021.



Source: Prepared by the authors, 2022.
SARS: Severe Acute Respiratory Syndrome.

Figure 4. Spatial distribution of SARS deaths by regional offices of the Minas Gerais State Health Department, 2020 and 2021.



Source: Prepared by the authors, 2022.
SARS: Severe acute respiratory syndrome.

Figure 5. Spatial distribution of the lethality rate of SARS by COVID-19 by regional offices of the Minas Gerais State Health Department, 2020 and 2021.

SARS notifications, and, for this reason, a higher number of deaths is expected.

It's worth noting that the regions of Patos de Minas, Ituiutaba, Leopoldina, and Juiz de Fora had high SARS prevalence rates per inhabitant, but fewer deaths. This may be related to the good efficiency of these regions in terms of health care and structure.

Figure 5 shows the lethality rate of patients with SARS due to COVID-19 according to regional health departments.

Patients with SARS due to COVID-19 from the São João del-Rei, Teófilo Otoni, Passos, and Uberaba regions stood out with a high lethality rate.

Apart from Teófilo Otoni, the other regional health centers have good structures and medical care but it is suggested that the high lethality rate of patients with SARS due to COVID-19 was due to the saturation of hospital capacity by the high demand for cases during the pandemic.

Teófilo Otoni also had a high case-fatality rate for patients with SARS due to COVID-19 but the region is considered to be deprived, which indicates that most of the deaths occurred due to a lack of structure for the care of critically ill patients.

In the Belo Horizonte and Uberlândia regions, which had the most cases of SARS, there were the lowest case-fatality rates for patients with SARS due to COVID-19, which may indicate better conditions in the health system in these regions.

As well as the lethality rate indicating the severity of the disease, it can also show how government authorities are dealing with COVID-19. In all likelihood, the regions with the highest lethality rates indicate difficulties in controlling and preventing the disease[17,25,31].

It is important to note that epidemiological studies such as this are fundamental for monitoring disease situations, as they provide important information to the sectors responsible about the characterization of the disease and its transmission profile, favoring evidence-based decision-making. However, care must be taken when selecting the data source to be used to avoid spreading distorted information on the subject.

This research revealed flaws in data collection, because even using the Ministry of Health's official database, a lot of important information was not filled in on the notification form, which could jeopardize the study. It is therefore suggested that actions be taken to raise awareness among those responsible for filling in the data, in order to minimize this gap.

CONCLUSIONS

Based on the data obtained in this study, the profile of SARS cases in the state of Minas Gerais during the study period was characterized by a predominance of males, aged over 60, and of brown race.

The epidemiological characterization of the disease with SARS presentation shows that the majority of cases were caused by

COVID-19, in individuals with comorbidities, highlighting the importance of the disease.

The distribution of reported cases and deaths of SARS by regional offices of the Minas Gerais State Health Department was heterogeneous, with a higher number of cases in regional offices that have municipalities that are considered regional hubs, with a higher demographic density, naturally presenting the highest number of cases.

Some regions had low SARS prevalence coefficients, which may demonstrate efficiency in medicine and hospital infrastructure, but may also be related to underreporting of cases. On the other hand, the regions that had a high lethality rate for SARS due to COVID-19 may indicate the saturation of hospital capacity due to the high demand for cases during the pandemic, as well as a lack of structure for the care of critically ill patients.

Thus, SARS control and prevention measures, especially those related to COVID-19, must be implemented effectively if mortality is to decrease. In addition, the issues listed in this research pointed out the deficiencies, weaknesses, and diversities in regional capacities to respond to the pandemic, which indicates the need for decentralization and restructuring of the health system in several municipalities in the state of Minas Gerais.

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Authors' Contribution

Goulart LFM, Frias DFR - Conception, planning (study design), acquisition, analysis, data interpretation, and writing of the work. Oliveira LR - Acquisition, analysis, data interpretation, and writing of the work. Lima LDSC, Simonato LE - Writing the paper. All the authors approved the final version of the work.

Conflict of Interest

The authors inform that there is no potential conflict of interest with peers and institutions, political or financial in this study.