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SPECIAL ARTICLE / *ARTIGO ESPECIAL*

Hospitalizations and mortality by severe acute respiratory syndrome: comparison between the pre-pandemic and pandemic periods

Internações hospitalares e mortalidade por síndrome respiratória aguda grave: comparação entre os períodos pré-pandêmico e pandêmico

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ABSTRACT: ***Objective:*** To analyze the characteristics and the factors associated with mortality of cases hospitalized for severe acute respiratory syndrome in a health region, in pre-pandemic and pandemic periods. ***Methods:*** A retrospective documentary study of epidemiological surveillance carried out with secondary data from the Influenza Epidemiological Surveillance Information System, regarding the cases of patients belonging to a health region of Minas Gerais, Brazil. ***Results:*** During the pandemic period, there was an increase in the number of hospitalizations and deaths due to severe acute respiratory syndrome, in addition to differences between sociodemographic and clinical-epidemiological characteristics. In both periods, the age and the use of invasive ventilatory support were the predictors of hospital mortality. The mortality in the pandemic period was also associated with male gender, presence of risk factors, admission to an intensive care unit, use of non-invasive ventilatory support, and infection by COVID-19. ***Conclusions:*** In 2020, the detection rate of severe acute respiratory syndrome was 21 times higher than in 2019 and new symptoms, such as anosmia and ageusia, were included in their investigation. In both periods evaluated, elderly patients and patients on invasive mechanical ventilation had a higher risk of mortality. With the pandemic, there was a greater number of hospitalizations and factors associated with mortality.

Keywords: coronavirus infections. pandemics. severe acute respiratory syndrome. health information systems. public health surveillance.

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RESUMO: ***Objetivo:*** Analisar as características e os fatores associados à mortalidade dos casos hospitalizados por Síndrome Respiratória Aguda Grave em uma regional de saúde, nos períodos pré-pandêmico e pandêmico. ***Métodos:*** Estudo retrospectivo documental de vigilância epidemiológica realizado com dados secundários provenientes do Sistema de Informação de Vigilância Epidemiológica da Gripe, referentes aos casos de pacientes pertencentes a uma regional de saúde de Minas Gerais, Brasil. ***Resultados:*** Observou-se, no período pandêmico, aumento do número de hospitalizações e óbitos por Síndrome Respiratória Aguda Grave, além de diferenças entre as características sociodemográficas e clínico-epidemiológicas. Em ambos os períodos, comportaram-se como preditores da mortalidade hospitalar a idade e o uso de suporte ventilatório invasivo. A mortalidade no período pandêmico associou-se também a sexo masculino, presença de fatores de risco, internação em unidade de terapia intensiva, uso de suporte ventilatório não invasivo e infecção por COVID-19. ***Conclusões:*** Em 2020, a taxa detecção de Síndrome Respiratória Aguda Grave foi 21 vezes maior do que em 2019 e novos sintomas, como a anosmia e ageusia, foram incluídos em sua investigação. Nos dois períodos avaliados, pacientes idosos e em ventilação mecânica invasiva apresentaram maior risco de mortalidade. Com a pandemia, houve maior número de hospitalizações e fatores associados à mortalidade.

Palavras-chave: infecções por coronavírus. pandemias. síndrome respiratória aguda grave. sistemas de informação em saúde. vigilância em saúde pública.

INTRODUCTION

In 2019, a new coronavirus with pathogenic potential in humans was detected in China, SARS-CoV-2, which causes COVID-19[1]. Despite measures to contain the transmission to other countries, the World Health Organization (WHO) declared a pandemic, calling on all countries to adopt measures in order to contain the spread, intensifying surveillance, diagnosis, and treatment of this disease[2,3].

Patients with COVID-19 can present from asymptomatic to severe cases of Severe Acute Respiratory Syndrome (SARS), requiring hospitalization and high mortality[4]. In severe cases, in addition to the signs and symptoms of the Flu-like Syndrome (FS), patients experience dyspnea/respiratory discomfort or persistent pressure or pain in the chest or oxygen saturation less than 95% (SpO_2<95%) in room air or bluish color of the lips or face[5].

In view of the uncertainty about the prognosis of patients with SARS caused by COVID-19, comparative studies with other respiratory viruses have been carried out to understand and deal with the new pathogen[6-8]. Among the health surveillance actions adopted is the notification of hospitalized cases and/or deaths from SARS in the Influenza Epidemiological Surveillance Information System (*Sistema de Informação da Vigilância Epidemiológica da Gripe* – SIVEP-Gripe), in order to support managers in decision-making[5].

Until January 20th, 2021, the state of Minas Gerais had 46,025 cases of SARS hospitalized for COVID-19 and 63,298 for other etiologies, according to an interactive panel of the Ministry of Health (Coronavirus Panel: https://covid.saude.gov.br/). Also according to data from

SIVEP-Gripe, the southeast macro-region, until epidemiological week 12 of 2021, registered a total of 79,711 cases between confirmed and deaths from COVID-19[9]. Different actions of coping with the disease by managers are observed, in the same way that inequalities are found in the access to health services by the population from different locations[10].

From the process of internalization of the virus to municipalities with small populations, there is an inverse movement in the search for health care in the municipalities that are home to micro-regions, where most services are usually concentrated[11]. A study involving some hospitals in four Brazilian states showed that hospitals listed as a reference for the care of patients with COVID-19 concentrated a greater number of hospitalizations and more severe patients, in addition to an increase in investment costs to meet demand, especially with the acquisition of mechanical fans[12].

Due to the large number of hospital admissions, the visible depletion of health resources, the dynamics of the pandemic process, and the specificities of each region, it is opportune to understand which individuals are more susceptible to moderate and severe conditions of the disease and outcomes of death, collaborating for continuous strategic actions to fight the pandemic from the micro-regional instances.

Thus, this study aimed to analyze the characteristics and factors associated with mortality in cases hospitalized for SARS in a health district in the pre-pandemic and pandemic periods.

METHODS

This is a retrospective documentary study of epidemiological surveillance, carried out with secondary data from SIVEP-Gripe, referring to cases hospitalized for SARS in patients belonging to a regional health center in Minas Gerais, Brazil.

The assessed health region belongs to the Southeast macro-region and has 31 municipalities under its jurisdiction, totaling a population of 491,257 inhabitants. According to information obtained by the Tabnet tab, from the Information Technology Department of the Unified Health System (*Departamento de Informática do Sistema Único de Saúde* – DATASUS; http://tabnet.datasus.gov.br/cgi/tabcgi.exe?ibge/cnv/poptmg.def), the 31 municipalities are divided into the micro-regions of Ubá and Muriaé, the first having 20 municipalities and a total of 316,719 inhabitants and the second, 11 municipalities and a total population of 174,538 inhabitants.

The aforementioned health region has in its health care network a total of 16 hospitals included in the National Register of Health Establishments (*Cadastro Nacional de Estabelecimentos de Saúde* – CNES) (http://cnes.datasus.gov.br/), which offer outpatient care and/or hospital of medium and high complexity by the Unified Health System (*Sistema Único de Saúde* – SUS).

Data were obtained from hospitalized SARS individual registration forms extracted from SIVEP-Gripe (https://sivepgripe.saude.gov.br/sivepgripe/login.html), from the period corresponding to epidemiological weeks 1–52 (2019 database) and 1–53 (2020 database).

All records registered in the SIVEP-Gripe referring to data from patients residing in municipalities within the jurisdiction of the assessed health region were included in the study. Duplicate records and non-hospitalized SARS cases were excluded.

The characterization variables evaluated included age, gender, education, race/color, geographic area of residence and pregnant woman.

The clinical and epidemiological variables included were: admission to the Intensive Care Unit (ICU), days of stay in the ICU, result of the reverse transcription test followed by polymerase chain reaction (RT-PCR), final classification of the case, diagnostic criteria, signs and symptoms of patients admitted to ICU beds, signs and symptoms of patients admitted to clinical beds, presence of risk factors, use of ventilatory support and case outcome. For each variable, the number of valid responses was considered, excluding omitted cases.

Collected data were tabulated in the Microsoft Excel 2016 software and processed by the IBM SPSS Statistics 23 software, considering a type I error level of 5%. The Kolmogorov-Smirnov test was used on all quantitative variables in order to verify the normality pattern. Continuous variables had a non-parametric distribution and were described as median and interval between the first and third quartiles. Absolute and relative frequencies, mean detection rate (per 100,000 inhabitants) of SARS cases by study period (pre-pandemic and pandemic) and monthly mean of SARS cases in the population studied were calculated.

To assess the presence of differences between the sociodemographic, clinical, and epidemiological characteristics of SARS cases reported in 2019–2020, the Mann-Whitney (numerical variables) and Pearson's χ^2 or Fisher's exact (categorical variables) tests were applied.

Binary logistic regression, backward stepwise (Wald) method, was used to assess the factors associated with the death of patients hospitalized for SARS in the years 2019–2020. The death variable was categorized as yes or no. The logistic regression model for cases reported in the pre-pandemic period (2019) presented a Nagelkerke R2 of 0.479 and goodness-of-fit equal to p=0.816 by the Hosmer and Lemeshow test. The model used for the cases of the pandemic period (2020) presented a Nagelkerke R2 of 0.294 and goodness-of-fit of p=0.696.

In compliance with Resolution No. 466/2012 of the National Health Council (*Conselho Nacional de Saúde* – CNS), the participants of the sample had their identification data excluded to ensure the confidentiality of information, aiming to preserve their image and identity. The study was approved by the Ethics Committee for Research with Human Beings of the proposing institution, under opinion number 4.231.826.

RESULTS

The records of 2,710 cases hospitalized for SARS registered in SIVEP-Gripe, belonging to the population of the assessed health region between 2019 — pre-pandemic period (120 cases) — and 2020 — pandemic period (2,590 cases), were evaluated.

Considering the population data from the health region, the detection rate of hospitalized patients with SARS was 24.4 cases/100 thousand inhabitants in 2019 and 527.21 cases/100 thousand inhabitants in 2020. The monthly mean hospitalizations per SARS, in 2019, was 10 cases/month, while in 2020 this average was 215.8 cases/month.

As shown in Table 1, with regard to characterization, it was observed that the medians of age of individuals reported in 2019 (20 years; 0.7–52.5 years) and 2020 (63 years; 46–76 years) presented differences; in 2019, there was a predominance of notifications from females (63.3%), while in 2020 males predominated (53.5%); the proportion of individuals who had their education classified in the "not applicable" category was higher among patients notified in 2019 (55.4%) compared to 2020 (4.3%). In both groups, most individuals reported were considered to be white, living in urban areas, and not pregnant.

Table 2 shows the comparison of the clinical and epidemiological characteristics of hospitalized SARS cases between the years 2019–2020. There was a higher proportion of patients with detectable virus results in the RT-PCR exam in 2020 (45.4%) than in 2019 (24.5%), with COVID-19 infection being the main etiology of SARS reported in 2020 (54.2%). Regardless of the period evaluated, among patients with SARS who required ICU admission, the predominant signs and symptoms were: dyspnea (96.3–75.0%), respiratory distress (86.8–68.5%), and SpO_2<95% (81.5–69.9%). Among patients who remained hospitalized only in clinical beds, cough (93.7–67.3%), dyspnea (80.9–63.6%), and respiratory distress (77.8–59.0%) were the most prevalent signs and symptoms. The presence of any risk factor among individuals hospitalized for SARS was greater in 2020 than in 2019 (65.5 *versus* 36.7%; p<0.001). However, in 2019, the proportion of individuals with chronic lung disease hospitalized for SARS was higher than that identified in 2020 (19.4 *versus* 6.5%; p=0.001). In contrast, the proportion of chronic cardiovascular disease among cases hospitalized for SARS was higher in 2020 than in 2019 (48.8 *versus* 21.4%; p<0.001). The use of invasive ventilatory support was higher among individuals hospitalized in 2019 than in 2020 (22.9 *versus* 11.2%; p=0.043). However, the proportion of deaths was higher among patients hospitalized for SARS in the pandemic period compared to the pre-pandemic period (23.4 *versus* 13.2%; p=0.023).

Table 3 presents the analysis of factors associated with mortality of patients hospitalized with SARS in the different periods observed. In the pre-pandemic, there was an association between patient mortality and age (odds ratio – OR 1.040; confidence interval – 95%CI 1.009–1.072) and the use of invasive ventilatory support, with mortality being 4.9 times higher (OR 4.950; 95%CI 1.172–20.916) among patients who required invasive ventilatory support. In 2020, there was an association between mortality of patients hospitalized for SARS and older age (OR 1.031; 95%CI 1.023–1.038), male gender (OR 1.433; 95%CI 1.122–1.830), presence of a risk factor (OR 1.448; 95%CI 1.086–1.929), ICU admission (OR 1.938; 95%CI 1.502–2.501), use of invasive (OR 7.597; 95%CI 5.097–11.324) or non-invasive ventilation devices (OR 2.265; 95%CI 1.691–3.034) and infection by COVID-19 (OR 2.553; 95%CI 1.964–3.319). It is noteworthy that the use of invasive mechanical ventilation (IMV) increased by 7.5 times the chance of patients evolving to death during this period. In addition, patients

Table 1. Characterization of patients hospitalized for Severe Acute Respiratory Syndrome reported in the Influenza Epidemiological Surveillance Information System between 2019–2020. Ubá (Health Regional), Minas Gerais, Brazil.

	2019 (n=120)	2020(n=2,590)	p-value*
Age – year med (Q_1–Q_3)	20 (0.7–52.5)	63 (46–76)	<0.001[a]
<10 years	52 (43.3)	117 (4.5)	–
10–39 years	22 (18.3)	365 (14.1)	<0.001[b]
40–59 years	24 (20.0)	632 (24.4)	<0.001[b]
≥60 years	22 (18.3)	1,476 (57.0)	<0.001[b]
Gender			
Female	76 (63.3)	1,204 (46.5)	–
Male	44 (36.7)	1,386 (53.5)	0.035[b]
Education			
No education/illiterate	2 (2.7)	113 (10.7)	–
Elementary School (grade 1–5)	15 (20.3)	374 (35.2)	0.383[c]
Middle School (grade 6–9)	3 (4.1)	133 (12.5)	1.000[c]
High School (grade 1–3)	6 (8.1)	157 (14.8)	0.476[c]
Higher Education	2 (2.7)	50 (4.7)	0.589[c]
Does not apply	41(55.4)	46 (4.3)	<0.001[c]
Race/color			
Caucasian/White	65 (56.0)	1,356 (52.8)	–
Black	12 (10.4)	313 (12.2)	0.485[b]
Yellow	–	26 (1.0)	0.627[c]
Brown	39(33.6)	849 (33.1)	0.837[b]
Geographical area of residence			
Urban	108 (93.9)	2,289 (91.4)	–
Periurban	–	27 (1.1)	0.559[b]
Rural	7 (6.1)	187 (7.5)	0.631[c]
Pregnant	1 (3.8)	25 (2.5)	0.484[c]

Source: SIVEP-Gripe. Variables presented in absolute (n) and relative (%) frequency, except in cases where another measure is presented. Values refer to the total number of valid responses. [a]Mann Whitney; [b]Pearson's χ^2 with Bonferroni correction; [c]Fisher's exact. *Significant: p<0.05.

Table 2. Clinical and epidemiological characteristics of patients hospitalized for Severe Acute Respiratory Syndrome reported in the Influenza Epidemiological Surveillance Information System between the years 2019–2020. Ubá (Regional Health), Minas Gerais, Brazil.

	2019 (n=120)	2020 (n=2,590)	p-value*
Med hospitalization days (Q_1–Q_3)	5 (2–12)	7 (3–13)	0.674[a]
ICU admission	54 (45.8)	884 (37.0)	0.056[b]
Med days of stay in the ICU (Q1–Q3)	3 (2–6)	6 (2–11)	0.369[a]
RT-PCR results			
Detectable	27 (24.5)	1,138 (45.4)	–
Undetectable	63 (57.3)	1,144 (44.2)	<0.001[b]
Inconclusive	–	7 (0.3)	1.000[c]
Not performed	6 (5.4)	34 (1.4)	<0.001[b]
Waiting for results	14 (12.7)	185 (7.4)	<0.001[b]
Final Case Classification			
SARS by Influenza	14 (13.5)	4 (0.2)	–
SARS by another respiratory virus	13 (12.5)	–	0.120[c]
SARS by another etiological agent	-	2 (0.1)	0.079[c]
Unspecified SARS	77 (74.0)	1,110 (45.6)	<0.001[c]
SARS by COVID-19	-	1,319 (54.2)	<0.001[c]
Diagnostic Criteria			
Laboratory	94 (92.2)	2,387 (99.3)	–
Clinical-epidemiological	2 (2.0)	5 (0.2)	0.027[c]
Clinical	6 (5.9)	8 (0.3)	<0.001[b]
Clinical by radiological imaging	–	5 (0.2)	1.000[c]
Sign and symptoms of patients admitted to ICU beds			
Fever	40 (75.5)	469 (54.5)	0.003[b]
Cough	44 (42.3)	526 (60.9)	<0.001[b]
Odynophagy	9 (18.5)	130 (15.4)	0.575[b]
Dyspnea	52 (96.3)	653 (75.0)	<0.001[b]
Respiratory discomfort	46 (86.8)	587 (68.5)	0.005[b]
SpO_2<95%	44 (81.5)	594 (69.9)	0.070[b]
Diarrhea	5 (9.4)	159 (18.9)	0.084[b]

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Table 2. Continuation.

	2019 (n=120)	2020 (n=2,590)	p-value*
Vomiting	9 (17.0)	104 (12.4)	0.334[b]
Abdominal pain**	–	42 (6.7)	–
Fatigue**	–	121 (19.6)	–
Anosmia**	–	52 (8.5)	–
Ageusia**	–	63 (10.3)	–
Signs and symptoms of patients admitted to clinical beds			
Fever	49 (76.6)	757 (52.0)	<0.001[b]
Cough	60 (93.7)	989 (67.3)	<0.001[b]
Odynophagy	12 (18.7)	268 (18.8)	0.997[b]
Dyspnea	51 (80.9)	935 (63.6)	0.005[b]
Respiratory discomfort	49 (77.8)	862 (59.0)	0.003[b]
SpO_2<95%	34 (53.1)	655 (44.9)	0.202[b]
Diarrhea	7 (11.1)	239 (16.7)	0.239[b]
Vomiting	7 (11.1)	212 (14.8)	0.415[b]
Abdominal pain**	–	80 (8.2)	–
Fatigue**	–	196 (20.3)	–
Anosmia**	–	101 (10.5)	–
Ageusia**	–	127 (13.1)	–
Risk factors			<0.001[b]
Yes	44 (36.7)	1,697 (65.5)	
No	76 (66.3)	893 (34.5)	
What risk factors			
Puerperal	1 (2.4)	17 (1.1)	0.374[c]
Diabetes *mellitus*	11 (25.6)	585 (36.0)	0.160[b]
Chronic cardiovascular disease	9 (21.4)	794 (48.8)	<0.001[b]
Chronic lung disease	8 (19.4)	104 (6.5)	0.001[b]
Chronic kidney disease	6 (14.3)	124 (7.8)	0.123[b]
Immunosuppression	4 (9.5)	80 (5.0)	0.272[c]
Neurological disease	3 (7.1)	114 (7.1)	0.272[c]
Chronic hematologic disease	1 (2.4)	22 (1.4)	0.454[c]

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Table 2. Continuation.

	2019 (n=120)	2020 (n=2,590)	p-value*
Chronic liver disease	1 (2.4)	15 (0.9)	0.343[c]
Obesity	1 (2.4)	48 (3.0)	1.000[c]
Down syndrome	–	12 (0.7)	–
Asthma	–	107 (6.7)	–
Use of ventilatory support			
Yes, invasive	25 (22.9)	252 (11.2)	0.043[b]
Yes, not invasive	47 (43.1)	1,052 (46.7)	<0.001[b]
No	3 (33.9)	948 (42.1)	<0.001[b]
Outcome			
Discharge/Cure	79 (86.8)	1,740 (76.6)	–
Death	12 (13.2)	53 (23.4)	0.023[b]

ICU: intensive care unit; RT-PCR: reverse transcription followed by polymerase chain reaction; SARS: Severe Acute Respiratory Syndrome; SpO_2<95%: Oxygen saturation less than 95%.
Source: SIVEP-Gripe. Variables presented in absolute (n) and relative (%) frequency, except in cases where another measure is presented. Values refer to the total number of valid responses. [a]Mann Whitney; [b]Pearson's χ^2; [c]Fisher's exact test. *Significant: p<0.05. **Signs and symptoms entered after the notification form was updated on July 27th, 2020.

Table 3. Final logistic regression model for the outcome of death among patients hospitalized for Severe Acute Respiratory Syndrome and reported in the Influenza Epidemiological Surveillance Information System by the regional health department, in the years 2019 and 2020.

	β	Wald	OR (95%CI)	p-value*
Cases of hospitalized SARS in the pre-pandemic period (2019)				
Age (years)	0.039	6.337	1.040 (1.009–1.072)	0.012
Invasive ventilatory support	1.599	4.732	4.950 (1.172–20.916)	0.030
Cases of hospitalized SARS in the pandemic period (2020)				
Age (years)	0.030	64.260	1.031(1.023–1.038)	<0.001
Male	0.360	8.332	1.433 (1.122–1.830)	0.004
Risk factor	0.370	6.382	1.448 (1.086–1.929)	0.012
ICU admission	0.662	25.871	1.938(1.502–2.501)	<0.001
Invasive ventilatory support	2.028	99.151	7.597 (5.097–11.324)	<0.001
Non-invasive ventilatory support	0.818	30.036	2.265 (1.691–3.034)	<0.001
SARS by COVID-19	0.937	49.115	2.553 (1.964–3.319)	<0.001

SARS: Severe Acute Respiratory Syndrome; ICU: intensive care unit.
Source: SIVEP-Gripe. *Significant: p<0.05.

hospitalized with SARS due to COVID-19 had a 2.5 times greater chance of dying when compared to cases of SARS due to other causes.

DISCUSSION

The study analyzed retrospective data from 2,710 patients hospitalized for SARS, reported in SIVEP-Gripe, in the pre-pandemic (2019) and pandemic (2020) periods. An increase in the number of hospitalizations and deaths due to SARS was observed during the COVID-19 pandemic, in addition to differences between the sociodemographic and clinical-epidemiological characteristics of the patients between the two periods evaluated. However, older age and the use of invasive ventilatory support were common predictors associated with in-hospital mortality in the analyzed population.

In the period prior to the pandemic, hospital admissions were of younger, female, and predominantly under 10 years of age individuals. On the other hand, in the pandemic period, there was a higher proportion of elderly and male patients. With the emergence of COVID-19, the cases that evolved with SARS involved mostly elderly patients, considered more vulnerable due to the physiological aging of their organic systems[13]. In addition, a study with patients positive for SARS-CoV-2 carried out in an American hospital showed that the higher susceptibility related to the male gender may be related to immune responses[14]. Such factors, added to the presence of some comorbidity, can lead to less favorable prognoses and outcomes[15].

To confirm the existence of a relationship between the change in the profile of patients with SARS and the appearance of COVID-19, it would be necessary to identify the etiological agent of SARS, obtained through laboratory tests[16]. Until 2019, the SARS surveillance protocol was aimed at identifying hospitalized cases and deaths related to influenza A and B viruses, respiratory syncytial virus (RSV), adenovirus, and parainfluenza 1, 2, and 3[17,18]. In 2020, the SARS surveillance protocol also included the RT-PCR test for SARS-CoV-2, considered the gold standard for the diagnosis of COVID-19, with high sensitivity[19]. With the discovery of the new coronavirus, its high transmissibility became a major challenge for health services, and more than 99% of patients with SARS underwent diagnostic tests and classified according to laboratory criteria. It is believed that the context of the pandemic has provided a collective effort to increase the number of RT-PCR exams, favoring an adequate clinical approach and better management of human and material resources.

The introduction of the SARS-CoV-2 virus in Brazil in February 2020 (9th epidemiological week) resulted in an increase in the number of hospitalizations for SARS compared to the same period in previous years[16]. In our study, we identified that the emergence of the new coronavirus was related to an approximately 21-fold increase in the SARS detection rate in 2020, compared to 2019. Similarly, an approximately 13-fold increase in the notification rates of SARS is reported in the state of Pernambuco, which was associated with

the presence of regional health in the city, the lowest municipal human development index (MHDI) and the presence of a federal highway in its territory[20].

The pandemic period also promoted, in addition to changes in the sociodemographic profile of patients with SARS, epidemiological changes in clinical characteristics. In addition to the classic symptoms observed in 2019, such as fever, cough, dyspnea, and respiratory distress, new symptoms such as anosmia and ageusia were added to SIVEP-Gripe during the pandemic period. A European study considered that these two disorders should be considered for the early detection of infection by COVID-19 and the indication for the isolation of the affected individual, as they present themselves in isolation or even before other clinical complaints[21]. The findings of a meta-analysis reinforce that anosmia and ageusia have high specificity for cases of COVID-19, while cough and fever have high sensitivity[22].

In addition to the changes in signs and symptoms, in the present study, variations were found between the risk factors presented at the different times evaluated. Chronic lung disease was the most common factor observed among patients hospitalized before the pandemic. The literature shows that children with chronic lung diseases have a higher risk of hospitalization associated with influenza[23], corroborating our study, in which the highest proportion of hospitalizations was in children under 10 years of age. In turn, cardiovascular diseases predominated in hospitalizations during the pandemic period, with a greater proportion of individuals in advanced age. Likewise, a retrospective study that included patients hospitalized with SARS due to COVID-19, with a mean age of 61 years, identified that cardiovascular diseases were associated with more severe cases, worse prognosis, and higher mortality from the disease[24].

SARS, regardless of the etiologic agent, is an indication for hospitalization in order to promote a complete assessment of the patient's clinical condition, sample collection for laboratory examination, and immediate initiation of treatment. For more severe cases, continuous and specialized care in ICU beds is indicated[25,26]. Literature findings show that significant increases in hospitalizations, ICU admissions, and use of IMV were associated with SARS in children during periods of influenza outbreak[27]. Similarly, the results of the present study reinforce this association. Furthermore, it was evident that, during the pandemic period, the proportion of patients on IMV was lower, although it was associated with a greater chance of death. This finding can be explained by the therapeutic strategy used for the treatment of SARS by COVID-19, in which hospitalized patients with SpO_2 below 93% initially receive supplementary oxygen therapy through low-flow catheters, progressing to other stages of ventilatory support in cases in which they do not respond adequately to this therapy, which is related to a worse prognosis[28].

Studies have shown several variables related to hospital mortality, such as advanced age, male gender, presence of comorbidities, differences in access to health resources, and overload of the system itself[29,30]. In 2019, the use of invasive ventilatory support and age were associated with the death of patients with SARS. Patients using IMV were 4.9 times more likely to evolve to death when compared to those who did not use it. In the

pandemic period, in turn, patients who needed to be intubated had a 7.6 times greater chance of dying. It is noteworthy that the use of IMV presupposes greater severity of patients and is indicated in cases of SARS complications. In addition, as it requires an invasive endotracheal device, IMV can be seen as a risk factor for the development of new infections and worsening of the clinical picture, as is the case with Pneumonia Associated with Mechanical Ventilation[31].

In the analysis of SARS cases during the pandemic period, in addition to the use of IMV, older age, male gender, the presence of risk factors, the need for ICU admission, the use of non-invasive ventilatory support, and the resulting SARS COVID-19 infection were associated with higher patient mortality. Similarly, an American retrospective cohort survey of patients confirmed for COVID-19 identified that male gender, increasing age, and having more than two comorbidities, in addition to dementia, were also associated with in-hospital mortality[32]. Chinese researchers corroborate the findings of the present investigation by identifying that advanced age and multimorbidities were also predictors associated with a higher risk of death in critically ill patients affected by COVID-19[30]. These findings reinforce the importance of careful monitoring of these patients in the hospital environment.

This study is limited by the fact that it was carried out with secondary data from an information system in which not all variables in the notification form are mandatory, and, therefore, some data may not be filled out properly. However, it was initially possible to remove duplicate forms for analysis, thus minimizing some biases. Another consideration is the possibility of underreporting, although the study involves compulsory notification diseases for public or private institutions. Furthermore, analyzes that use secondary data do not allow for greater clarity regarding the clinic, treatment and evolution of individual patients, although these were not the objectives of the study. A strength of the study was the evaluation of several variables in a database, allowing an overview of hospital admissions that occurred in different periods and providing opportunities for regional diagnoses that will be useful for planning actions.

Based on our results, we ratify the importance and usefulness of research using data from SIVEP-Gripe for allowing, given the information obtained, the wide and continuous dissemination of strategic information on the epidemiology of cases hospitalized for SARS, especially in the pandemic period by COVID-19.

This analysis of a secondary database allowed the characterization of hospitalizations for SARS that occurred in a pre-established territory and the main factors associated with the mortality of individuals in the pre-pandemic and pandemic periods. Elderly patients and those using IMV were more likely to evolve to death, regardless of the period evaluated. However, the emergence of the new coronavirus and COVID-19 affected the epidemiological course of hospitalized SARS cases, contributing to greater morbidity and mortality. Male patients with the presence of any risk factor who required admission to the ICU and used non-invasive ventilatory support devices also had a greater chance of dying, which was not evidenced in the pre-pandemic period. Thus, it is important to emphasize

the care and monitoring of individuals who are at higher risk of worse prognosis. In addition, the importance of accurate notification of SARS cases is highlighted, with the consequent dissemination of reliable epidemiological data, which can be used as support for the planning of actions by health professionals and managers. We ratify the usefulness of the SIVEP-Gripe data and suggest that more comprehensive studies be carried out, with a view to wide and continuous dissemination of strategic information on the epidemiology of cases hospitalized for SARS.

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