**ORIGINAL ARTICLE**

# HOSPITALIZATION AND MORTALITY DUE TO SEVERE ACUTE RESPIRATORY SYNDROME IN COVID-19 PANDEMIC AND ASSOCIATED FACTORS

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**Highlights:** More than half of those hospitalized for SARS had at least one risk factor for COVID-19. 2. This outcome was more prevalent in females, age 40 years or older and low schooling. 3. The mortality rate among SARS patients during the pandemic was higher among black, brown and indigenous people. 4. Low schooling is associated with mortality among those hospitalized for SARS in the pandemic. 5. The mortality rate was higher in the presence of one or more risk factors for COVID-19.

PRE-PROOF

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# HOSPITALIZATION AND MORTALITY DUE TO SEVERE ACUTE RESPIRATORY SYNDROME IN COVID-19 PANDEMIC AND ASSOCIATED FACTORS

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## ABSTRACT

Objective: to identify the risk factors associated with hospitalizations and the mortality rate due to SARS during the COVID-19 pandemic in a health region of Rio Grande do Sul. Method: Cross-sectional study carried out with data from the Information System of the Epidemiological Surveillance of Influenza of the Ministry of Health in the period from January 2020 to August 2021. The outcomes "hospitalizations due to SARS" and "mortality due to SARS" were analyzed, as well as sociodemographic and health variables for association analysis. Descriptive analysis and Cox's proportional risk model were performed to calculate the risk ratio and 95% confidence interval. Results: The prevalence of individuals hospitalized with SARS and at least one risk factor for COVID-19 was 61.0% and was higher among females, age 40 years or older and among individuals with low education. The mortality rate among those hospitalized with SARS due to COVID-19 was 10.4/1,000 and was higher among individuals of black, brown, yellow and indigenous color, with low education, and with presence of one or more risk factors for COVID-19. Conclusion: The social determination of health is explicit in this study and became more evident with the presence of a sanitary and humanitarian crisis such as COVID-19.

**Keywords:** COVID-19; Severe Acute Respiratory Syndrome; Health Information Systems; Social Determination of Health; Nursing; Epidemiology.



## INTRODUCTION

At the end of 2019, the World Health Organization (WHO) received notifications of unusual cases of pneumonia from the city of Wuhan in China, with subsequent identification of the causative agent called coronavirus, after named SARS-COV-2 and the disease called COVID-19[1]. In March 2020, the WHO declared COVID-19 as a pandemic, an infectious disease that threatens the world's population[2].

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In May 2023, the WHO declared the end of the public health emergency of international importance related to COVID-19 due to the decrease in deaths, the decline in hospitalizations and admissions to intensive care units related to the disease, as well as the increase in vaccination coverage in the population[3]. However, after five years (2025), the disease is still characterized as a pandemic and the mutations, the potential impact of the new variants on transmissibility, the severity of the disease, complications, the effectiveness of vaccines and treatments continue to be monitored.

In Brazil, the disease was recognized at the end of February 2020, after the confirmation of the first case from the European continent and, at the end of March, the Ministry of Health decreed the state of community transmission in national territory[4]. By April 2025, approximately 777,691,501 confirmed cases of COVID-19 were reported globally, including 7,093,267 deaths due to the disease that were reported to the WHO. In the national context, there were 39,251,076 confirmed cases and 715,858 cumulative deaths, an incidence rate of 18677.9/100,000 inhabitants, a lethality rate of 1.8% and a mortality rate of 340.6/100,000 inhabitants[6].

In Rio Grande do Sul, there were 3,164,296 confirmed cases until April 2025, with an incidence of 27,812.5/100,000 inhabitants, 43,227 deaths, accounting for a mortality rate of 379.9/100,000 inhabitants and lethality of 1.4%[7]. Since the implementation of the COVID-19 vaccine and the increase in vaccination coverage from mid-2021, the rate of hospitalization and mortality from COVID-19 has been falling gradually, and will become a seasonal infection that will occur mainly during the winter months, coinciding with other seasonal respiratory viruses, such as influenza[8].

COVID-19 affected different populations in various ways, most of which presented milder symptoms such as fever, tiredness and dry cough, characterizing a Influenza-Like Illness (ILI). Some presented symptoms in their most active form, such as body pain, nasal congestion, headache, loss of taste or smell, conjunctivitis, sore throat, diarrhea, skin rash or discoloration of the extremities, such as fingers or foot[9-10]. Systematic review study on the symptomatic manifestations of COVID-19 identified that fever and normal or dry cough were present in all studies, followed by symptoms such as headache, pharyngitis, dyspnea, diarrhea, myalgia, vomiting, among others[11].

It should be noted that there is around 80% recovery from COVID-19 without the need to seek medical care in a hospital, however, one in six people who were positive presented more severe symptoms corresponding to Severe Acute Respiratory Syndrome (SARS)[10]. This syndrome triggers more severe respiratory discomfort, such as dyspnea, pressure or persistent chest pain, O2 saturation below 95% in ambient air and bluish coloring (cyanosis) of the lips or face[9].

Individuals who have previous health conditions such as systemic arterial hypertension (SAH), pulmonary, cerebrovascular and renal diseases, heart disease, diabetes mellitus (DM), cancer, immunodepression, smoking, obesity and the elderly, have a higher probability of worsening the infection, which corresponds to hospitalization for SRAG[9]. Moreover, it is worth noting that COVID-19 has made social determination in health even more visible. Recent epidemiological studies have shown an increase in the number of hospitalizations and COVID-19 mortality associated with social vulnerability, the worst socioeconomic and health conditions in Brazil[12-14].

In this context, the objective of this research is to identify the risk factors associated with hospitalizations and the mortality rate due to SARS during the COVID-19 pandemic in a health region of Rio Grande do Sul.

## METHOD

This is a cross-sectional epidemiological study, whose secondary data were obtained by consulting the database of the Influenza Epidemiological Surveillance Information System (SIVEP-Gripe) of one of the health regions of Rio Grande do Sul (RS). The Ministry of Health (MS), through the Secretariat for Surveillance in Health (SVS – *Secretaria de Vigilância em Saúde* in Portuguese), develops surveillance of SRAG in Brazil since the Influenza A (H1N1) pandemic in 2009 and in 2020, COVID-19 was incorporated into the surveillance network of Influenza and other respiratory viruses[9].

The studied Regional Health is composed of 33 municipalities and approximately 230,814 people. Participants and study sample are all people hospitalized for SARS with COVID-19 in the period from January 2020 to August 2021. People whose clinical data were insufficient to cover the objectives of the research were excluded.

The outcomes of this study were "SARS hospitalizations" and "SARS mortality" reported in SIVEP-Influenza. The independent variables (exposure) were: sex (male; female), age group (0-39; 40-59; 60 years or more), skin color (white; black/brown/yellow/indigenous), schooling (up to 5$^{th}$ grade; 6$^{th}$ to 9$^{th}$ grade; high school; higher education), area of residence (urban; rural; urban/rural), year of hospitalization (2020; 2021), presence of some risk factor or comorbidity (none; one or more and none; one; two; three or more). The variable risk factor/comorbidity considered presence of the following conditions: postpartum (up to 45 days after delivery), chronic cardiovascular disease, chronic hematological disease, Down syndrome, chronic liver disease, asthma, DM, chronic neurological disease, chronic pneumonia, immunodeficiency/immunodepression, chronic kidney disease and obesity.

Data collection occurred in September 2021 through contact with the regional health coordination, when the best form and date for data collection was agreed. An anonymous data sheet in Excel (without information that allows the identification of individuals) was made available to the researchers with information about 2,543 hospitalizations. These data sheets were organized and the data coded to enable their analysis using the statistical program Stata 14.

The data analysis was carried out through descriptive and analytical statistics of variables. The quantitative variables (numerical and continuous) were described using means and standard deviation. The qualitative variables (nominal and ordinal) were described by means of proportion and 95% confidence intervals (95%CI). An analysis of the association between the outcome "hospitalized for SARS with at least one risk factor for COVID-19" and sociodemographic factors was then performed using the chi-square test to compare two groups of two independent categorical variables.

The mortality coefficient or mortality rate was calculated from the number of deaths occurred between hospitalizations for SARS in the period from January 2020 to August 2021 and the number of deaths per 1,000 inhabitants was expressed. For the mortality rate in a specific population (example: by sex or age group), the number of deaths per population was divided by the number of people in the target population15. To analyze the mortality rate, individuals who did not have information on hospitalization follow-up in the notification form

regarding the evolution of the case (cure or death) were excluded until August 2021, leaving a sample of 2,327 hospitalizations for outcome analysis mortality.

To examine the associations between risk factors and mortality, the Cox proportional risk model was used. The results of the sequential models were summarized using the risk ratio (RR) and the 95% confidence interval. In Model 1, the associations for each risk factor were verified separately without adjustment. In Model 2, the associations for each risk factor were verified by adjusting for the other variables of the model (Model 2 = all sociodemographic factors + number of risk factors or comorbidities for COVID-19). The significance for all variables was defined as p-value <0.05.

This research was evaluated and approved by the Ethics Committee of the Regional Integrated University of Upper Uruguay and the Missions under no. 4.971.960 and CAAE no 50527921.6.0000.5351 of September 2021, according to Resolution no 466/2012. The study had consent and favorable opinion Regional Health and the authors state that there are no conflicts of interest.

## RESULTS

In the study period, 2,543 people were hospitalized for SARS with COVID-19 and of these, 35.3% were notified between January and December of the year 2020 and 64.7% in the period from January to August 2021. The month with the highest number of notifications of hospitalized for SARS was in March 2021 (24.6%, n=398).

Of the total number hospitalized for SARS, most were male (57.3%), individuals aged 40 years or older (67.1%), white skin color (94%), 6th grade high school education (53.4%), residents in urban areas (86.1%) and with the presence of one or more comorbidities or risk factors for COVID-19 (61%), according to Table 1.

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Table 1 - Characterization of hospitalized by SARS in the period from January 2020 to August 2021. 11th CRS, RS, 2021 (N=2,543)

| **Variables** | **n** | **%** |
|---|---|---|
| Year | | |
| 2020 | 898 | 35.3 |
| 2021 | 1,645 | 64.7 |
| Sex | | |
| Male | 1,458 | 57.3 |
| Female | 1,085 | 42.7 |
| Age Group | | |
| 0-39 | 361 | 14.2 |
| 40-59 | 977 | 38.4 |
| 60 or more | 1,205 | 47.4 |
| Skin color* | | |
| White | 2,361 | 94.0 |
| Black/brown/yellow/indigenous | 151 | 6.0 |
| Education* | | |
| Up to 5$^{th}$ grade | 516 | 32.4 |
| 6$^{th}$ – 9$^{th}$ grade and high school | 852 | 53.4 |
| Higher education | 219 | 14.2 |
| Zone* | | |
| Urban | 2,056 | 86.1 |
| Peri-urban/Rural | 333 | 13.9 |
| Risk factor/comorbidity** | | |
| None | 991 | 39.0 |
| One or more | 1,552 | 61.0 |
| Risk factor/comorbidity** | | |
| One | 444 | 21.7 |
| Two | 370 | 18.1 |
| Three or more | 237 | 11.6 |

*Variables with losses in the sample due to lack of information on notification forms.
**A single variable with two different stratifications.

Table 2 presents results of the number of individuals hospitalized for SARS with COVID-19 with at least one risk factor for COVID-19 and associated factors. The proportion of hospitalized for SARS without risk factors for COVID-19 was 39% (n=991). The overall proportion of hospitalized patients with some risk factor for COVID-19 was 61% (n=1,552) and this prevalence was higher in 2020 compared to 2021. Sex, age and schooling were the sociodemographic factors associated with hospitalization for SARS with presence of risk factors for COVID-19. The proportion of individuals hospitalized for SARS with at least one risk factor was higher in females compared to males; higher among those hospitalized from 40 to 59 and 60 years or more compared to those from 0 to 39 years; and higher among the population with low education, compared to those with elementary, high school and higher education.

Table 2 - Proportion of individuals hospitalized for SARS with at least one risk factor for COVID-19 and associated factors, in the period from January 2020 to August 2021. 11th CRS, RS, 2021. (N= 2,543)

| **Hospitalized for SARS with at least one risk factor for COVID-19** | | | | | | |
|---|---|---|---|---|---|---|
| Variables | **Total** | | **2020** | | **2021** | |
| | n(%) | p-value* | n(%) | p-value* | n(%) | p-value* |
| **Total** | 1,552 (61.03) | | 640 (71.3) | | 912 (55.4) | |
| Sex | | **<0.001** | | **0.039** | | **<0.001** |
| Male | 836 (57.34) | | 331 (68.4) | | 505 (51.9) | |
| Female | 716 (65.99) | | 309 (74.6) | | 407 (60.7) | |
| Age | | **<0.001** | | **<0.001** | | **<0.001** |
| 0-39 | 140 (38.78) | | 50 (50.5) | | 90 (34.4) | |
| 40-59 | 494 (50.56) | | 160 (58.4) | | 334 (47.5) | |
| 60+ | 918 (76.18) | | 430 (81.9) | | 488 (71.8) | |
| Skin color | | 0.164 | | 0.509 | | 0.098 |
| White | 1,429 (60.53) | | 575( 71.6) | | 854 (54.8) | |
| Black/brown/yellow/indigen | 100 (66.23) | | | | | |
| ous | | | 51 (68.0) | | 49 (64.5) | |
| Education | | **0.048** | | **0.007** | | 0.151 |
| Up to 5th grade | 356 (68.99) | | 174 (79.5) | | 182 (61.3) | |
| 6th – 9th grade and high school | 542 (63.62) | | 187 (66.8) | | 355 (62.1) | |
| Higher education | 133 (60.73) | | 71 (70.3) | | 62 (52.5) | |
| Zone | | 0.602 | | 0.641 | | 0.950 |
| Urban | 1,272 (61.87) | | 525 (70.9) | | 747 (56.8) | |
| Peri-urban/Rural | 211 (63.36) | | 97 (72.9) | | 114 (57) | |
| Year of hospitalization | | **<0.001** | | | | |
| 2020 | 640 (71.27) | | - | - | - | - |
| 2021 | 912 (55.44) | | - | - | - | - |

* P-value: chi-square test

Table 3 presents the mortality rate and two models of Risk Ratio (RR) for death among hospitalizations due to SARS that occurred in the period from January 2020 to August 2021.

The mortality rate among those hospitalized for SARS with COVID-19 was 10.4/1,000 people/year. The risk estimates changed little after adjustment for all model variables and therefore, for brevity's sake, we summarize the results only for Model 2.

In the adjusted model, having an age of 60 years or more was a strong predictor for mortality (RR=2.11; 95%CI:1.26-3.56). Hospitalized black, brown, yellow and indigenous people had 1.63 (95%CI: 1.09-2.44) times higher risk of death compared to hospitalized white people. Low level of education was also a strong predictor - individuals with up to 5 years of schooling and 6-12 years of schooling presented respectively 2.09 (95%CI:1.43-3.06) and 1.71 (95%CI:1.19-2.47) higher risk of death compared to those hospitalized with higher education (Table 3).

Compared to those without any comorbidity or risk factor, having one or more risk factors for COVID-19 was a strong predictor of mortality even after adjustments for sociodemographic factors (RR= 2.4, 95%CI:1.55-2.95). In addition, a significant gradual association between the number of risk factors and mortality was evidenced (p 0.001 for Trend Test) (Table 3).

Table 3: Mortality Rate and Risk Ratio (RR) in the period of 20 months of follow-up of hospitalizations for SARS, by sociodemographic factors and risk factors for COVID-19. RS, 2021. (N= 2,327)

| **Variables** | **Deaths (n)** | **Mortality (Rate per 1,000 people/year)** | **Model 1* RR (95% CI)** | **Model 2** RR (95% CI)** |
|---|---|---|---|---|
| Total | 564 | 10.4 (9.6-11.3) | - | - |
| Sex | | | | |
| Male | 339 | 10.5 (9.5-11.7) | 1.00 | 1.00 |
| Female | 225 | 10.1 (8.9-11.5) | 0.95 (0.80-1.13) p= 0.565 | 0.82 (0.65-1.02) p= 0.078 |
| Age | | | | |
| 0-39 | 25 | 4.7 (3.2-6.4) | 1.00 | 1.00 |
| 40-59 | 137 | 6.4 (5.4-7.6) | 1.41 (0.93-2.15) | 1.23 (0.73-2.08) |

| | | | | |
|---|---|---|---|---|
| 60+ | 402 | 14.5 (13.1-16.0) | 3.18 (2.13-4.74) | 2.11 (1.26-3.56) |
| Testparm# | | | **p≤ 0.001** | **p≤ 0.001** |
| Skin color | | | | |
| White | 501 | 9.9 (9.1-10.9) | 1.00 | 1.00 |
| Black/brown/yellow/indigenous | 54 | 15.5 (11.9-20.3) | 1.49 (1.10-2.03) | 1.63 (1.09-2.44) |
| | | | **p= 0.010** | **p= 0.017** |
| Education | | | | |
| Higher education | 31 | 5.0 (3.5-7.1) | 1.00 | 1.00 |
| 6th – 9th grade and high school | 176 | 8.9 (7.7-10.2) | 1.81 (1.27-2.58) | 1.71 (1.19-2.47) |
| Up to 5th grade | 143 | 12.6 (10.7-14.9) | 2.55 (1.77-3.67) | 2.09 (1.43-3.06) |
| Testparm# | | | **p≤ 0.001** | **p= 0.001** |
| Zone | | | | |
| Urban | 447 | 10.1 (9.2-11.1) | 1.00 | 1.00 |
| Peri-urban/Rural | 94 | 12.4 (10.1-15.1) | 1.24 (0.99-1.54) | 1.08 (0.79-1.47) |
| | | | p= 0.061 | p= 0.626 |
| Risk factor$ | | | | |
| None | 91 | 5.3 (4.3-6.5) | 1.00 | 1.00 |
| One or more | 473 | 12.8 (11.7-13.9) | 2.50 (2.01-3.12) | 2.14 (1.55-2.95) |
| | | | **p≤ 0.001** | **p≤ 0.001** |
| Risk factor$ | | | | |
| One | 116 | 11.4 (9.5-13.7) | 2.22 (1.71-2.90) | 2.10 (1.45-3.03) |
| Two | 108 | 11.3 (9.4-13.7) | 2.22 (1.69-2.91) | 1.90 (1.31-2.75) |
| Three or more | 106 | 16.0 (13.2-19.3) | 3.19 (2.39-4.26) | 2.49 (1.66-3.74) |
| Trend test## | | | **p≤ 0.001** | **p≤ 0.001** |

*Model 1: Crude regression model - not adjusted. **Model 2: Regression model adjusted for all variables. #Testparm (wald test): categorical variables. ##Trend Test (trend test): number of risk factors entered as a continuous variable. $A single variable with two different stratifications.

## DISCUSSION

Most of those hospitalized with SARS due to COVID-19 were urban residents, male, aged 40 years or older, white skin color, low education and with presence of comorbidities or

other risk factors for COVID-19. This sociodemographic and epidemiological profile corroborates with other Brazilian studies on SARS hospitalizations with COVID-19[16-17].

The majority of those hospitalized with SARS during the pandemic were residents in urban areas, probably due to the higher population density compared to rural areas. Corroborating these findings, an epidemiological analysis conducted in the United States identified a higher rate of SARS-CoV-2 infection in the urban population and showed that COVID-19 spread more rapidly among US urban districts compared to rural districts[18].

The gender variable is an important feature in this study, with a higher prevalence of hospitalized SARS for COVID-19 among men. A review study[19] on the course and severity of COVID-19 showed a higher susceptibility of men to develop serious respiratory diseases after SARS-CoV2 infection, leading to a greater number of hospital admissions. Data from Europe and China show 50% more men hospitalized for COVID-19 than women[19]. A higher prevalence of hospitalizations and deaths from COVID-19 was also associated with the male sex in other Brazilian studies[16-17,20-21].

Studies indicate possible influence of biological factors intrinsic to sex (sex hormones), such as differences in regulation and expression of proteins - an example is the angiotensin-converting enzyme - which seem to be linked with the pathophysiology SARS-Cov-2[22-23]. Still related to biological differences, studies show variation between the immune response and susceptibility to viral infections, involving differences in quantity and activity of innate immune cells, what can lead to differences in the severity and evolution of the disease between men and women[19].

The higher hospitalization of men for SARS with COVID-19 is also related to sociocultural and behavioral factors. Comorbidities such as chronic lung disease, SAH and cardiovascular disease that are aggravating factors of COVID-19 worldwide have a higher prevalence among men than women; in addition to gender differences in risk behaviors, such as smoking and drinking[19]. Gender differences also stand out in the search for health services and adherence to treatments; women with and without chronic non-communicable diseases use more health services when compared to men[24].

However, when analyzing those hospitalized with SARS due to COVID-19 that had at least one risk factor, women prevailed. In a study conducted with deaths from COVID-19

reported in Pernambuco, when considering individuals with both risk factors for SAH and DM, there was a predominance among women[20]. This result seems to confirm the sociocultural and behavioral differences described above. Study using data from the National Household Sample Survey (PNAD) showed that the prevalence of reported chronic morbidities was higher among women compared to men[25]. According to the National Health Survey (NHS) of 2019[26], SAH for example reached 26.4% of women and 21.1% of men over 18 years of age. However, women access and use more health services[25] and adhere to more treatments, which contributes to the reduction of aggravation, mortality rate and favors higher life expectancy. There is also the hypothesis that perhaps some men do not have knowledge of the morbidities and/or risk factors they carry, since they use less health services and adhere less to preventive actions, such as routine examinations.

Most of those hospitalized for SARS with and without risk factors for COVID-19 were 40 years old or older, and the mortality rate among hospitalized for SARS was also higher among people aged 60 years or older, corroborating other Brazilian studies[16-17,21]. The worsening of infection as age increases is related to the presence of risk factors such as chronic diseases, which weakens the immune system of each individual, thus enabling the potential action of the virus[16]. According to PNS, in Brazil 52% of individuals aged 18 years or older have at least one chronic disease (physical or mental), with an increase as the population ages.

The majority of those hospitalized for SARS were white, corroborating with a national study on SARS with COVID-1916. This is an expected result since, especially the health region studied was colonized mainly by Europeans (Italians, Germans and Poles) and has a mostly white population. However, when mortality rates were evaluated, the black, brown, yellow and indigenous population had a 60% higher risk of death compared to white people. A nationwide study conducted with data from SIVEP-Gripe also showed that hospitalized brown and black patients had a significantly higher risk of mortality, compared to the white population[27]. This result also corroborates with other studies on mortality and COVID-19 carried out in different cities and regions of Brazil[21,28] and also in the United States[18].

The black population presents higher risk factors compared to the white population, for example, they have higher prevalence of chronic non-transmissible diseases[29], a fact related to the social determination of health. The black population still lives with the worst socioeconomic

conditions, unequal access to health services and poor access to the indicated optimal medical treatment[30]. In addition, data also show the discrepancy between whites and blacks vaccinated against COVID-19 in Brazil[26].

Indigenous peoples also suffer from poor access to health, with high prevalence of infectious diseases and respiratory infections. Rural and remote communities host populations in extreme poverty, social vulnerability, with worse human development index and lack access to many public policies and essential health services, including adequate treatment for COVID-19[31-32].

Still highlighting the social determination of health, the prevalence of hospitalized for SARS with at least one risk factor and the mortality rate was also significantly higher among individuals with low education. It is known that the lowest levels of education are found among the poorest population. The country's structural inequalities contributed to the increase in mortality rates among individuals living in situations of social vulnerability, low-income population, low education level, residents in urban agglomerations, indigenous people and the black population33. Other Brazilian studies have evidenced the impact of social inequality on the worsening of COVID-19 infections and mortality[17,27,34]. These epidemiological data of the COVID-19 pandemic highlight and reaffirm the historical inequities of Brazil[30], which require urgent equitable public policies.

The overall proportion of hospitalized patients with some risk factor for COVID-19 was 61%, and similar results can be observed in other studies[17,35]. The study showed that among the 342,636 deaths of people hospitalized for SARS with COVID-19 reported in 2021 in Brazil up to epidemiological week 36, 59.5% had at least one comorbidity, with heart disease, cerebrovascular disease, hypertension and diabetes being the most frequent[35]. The mortality rate among those hospitalized for SARS with COVID-19 was 10.4/1,000 people/year. In a study conducted in Pelotas and Rio Grande, the COVID-19 mortality rate for the general population was 97 and 104.7 deaths per 100,000 inhabitants, respectively[28].

Having one or more COVID-19 risk factors was a strong predictor of mortality; individuals hospitalized for SARS with one or more COVID-19 risk factors had 2.4 times higher risk of death compared to those without a risk factor. In addition, the results showed a gradual increase in the risk of death as the number of risk factors increased. In a study conducted

with individuals hospitalized for COVID-19 in hospitals in the state of Espírito Santo, hospital mortality was higher among those with greater number of comorbidities[17]. Study developed in Wuhan, China showed that mortality from COVID-19 in patients with cardiovascular diseases had a higher prevalence (22.2%) compared to the general population of the study (9.8%)[36].

Risk factors such as old age and the presence of chronic diseases - intrinsically related factors - result in lower immune system activity, higher susceptibility to infections and more serious consequences. The elderly suffer as a result of years of unhealthy behavioral habits and the presence of chronic comorbidities keep the patient in a chronic inflammatory state, making him susceptible to other inflammatory/infectious conditions with an accentuated response, such as what occurs in COVID-19[37].

It is emphasized that some limitations of this study should be considered. We analyzed the data of adults and elderly hospitalized for SARS due to COVID-19 from a health region in the state of Rio Grande do Sul, therefore, the results cannot be generalized to other regions of the country. The quality of notification forms and their heterogeneity in the Brazilian regions should also be considered, as well as the underreporting of cases. However, the strength of this study is the analysis of secondary databases, which is one of the best ways to evaluate the epidemiological situation of a particular population16 and subsidize health policies.

## CONCLUSION

It was evidenced that most of the hospitalized for SARS with COVID-19 were residents in the urban area, male, 40 years old or older, white skin color, low education and with presence of comorbidities or risk factors for COVID-19. The prevalence of individuals hospitalized for SARS with COVID-19 with at least one risk factor was higher among females, age 40 years or older and among individuals with low education. The mortality rate among those hospitalized for SARS with COVID-19 was higher among individuals of black, brown, yellow and indigenous color, with low education and presence of one or more risk factors for COVID-19.

The social determination of health is explicit in this study and became more evident with the presence of a sanitary and humanitarian crisis such as COVID-19. Identifying vulnerable population groups can subsidize the management of health systems, aiming at creating and

strengthening targeted public policies that function in a more equitable manner, meeting the principles of the UHS.

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**HOSPITALIZATION AND MORTALITY DUE TO SEVERE ACUTE RESPIRATORY SYNDROME IN COVID-19 PANDEMIC AND ASSOCIATED FACTORS**

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