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Description and comparison of demographic characteristics and comorbidities in SARI from COVID-19, SARI from influenza, and the Brazilian general population

SRAG por COVID-19 no Brasil: descrição e comparação de características demográficas e comorbidades com SRAG por influenza e com a população geral

IRAG por COVID-19 en Brasil: descripción y comparación de características demográficas y comorbilidades con el IRAG por influenza y con la población general

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Abstract

The study aims to describe patients hospitalized for severe acute respiratory illness (SARI) due to COVID-19 (SARI-COVID) in Brazil according to demographic characteristics and comorbidities up to the 21st Epidemiological Week of 2020. The study aimed to compare these characteristics with those of patients hospitalized for SARI due to influenza in 2019/2020 (SARI-FLU) and with the Brazilian general population. The proportions of demographic characteristics, comorbidities, and pregnant and postpartum women among patients hospitalized for SARI-COVID and SARI-FLU were obtained from the SIVEP-Gripe database, and the estimates for the Brazilian population were obtained from the population projections performed by Brazilian Institute of Geography and Statistics, Information System on Live Birth data, and nationwide surveys. Compared to the Brazilian population, patients hospitalized for SARI-COVID showed a higher proportion of males, elderly individuals and those aged 40 to 59 years, comorbidities (diabetes mellitus, cardiovascular disease, chronic kidney disease, and chronic lung diseases), and pregnant/postpartum women. Compared to the general population, Brazilians hospitalized for SARI-FLU showed higher prevalence rates of ages 0 to 4 years or over 60 years, white race/color, comorbidities (diabetes, chronic kidney disease, asthma, and other chronic lung diseases), and pregnant/postpartum women. The data suggest that these groups are evolving to more serious forms of the disease, so that longitudinal studies are extremely relevant for investigating this hypothesis and supporting appropriate public health policies.

Severe Acute Respiratory Syndrome; Coronavirus Infecction; Human Influenza; Epidemiological Monitoring

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Introduction

The first case of COVID-19 in Brazil was confirmed on February 26, 2020, in the State of São Paulo. Social distancing measures were only implemented in the state nearly a month later [1], contributing to the rapid spread of the disease in the state and in Brazil. Shortly more than a month after confirmation of the first case, all 26 states and the Federal District already had ten or more cases each, with the heaviest concentration in the Southeast region (62.5%), followed by the Northeast (15.4%), South (10.8%), Central (6.6%), and North (4.7%) [2].

Brazil's reality is heterogeneous, both in the epidemic's evolution and in access to healthcare [3], since the country has continental dimensions, with different population distribution patterns, transportation conditions (roadways, availability, and costs), income inequalities, and education [4]. By the month of May, the states of Rio de Janeiro, Amazonas, Ceará, Pará, and Pernambuco were already facing critical situations, especially in the respective state capitals and metropolitan areas, overloading the health system [5,6], while in other states the disease was spreading more slowly. The disease has gradually spread from the state capitals into the interior, a phenomenon that could impact the country's health system even more heavily, since many municipalities (counties) lack even a single hospital, and the population is forced to seek health treatment in the regional hub cities [7,8] (Ministério da Saúde. Painel coronavírus. https://covid.saude.gov.br, accessed on May/2020).

Despite the increasing number of municipalities with cases and the growing number of hospitalizations and deaths from COVID-19 in Brazil (Ministério da Saúde. Painel coronavírus. https://covid.saude.gov.br, accessed on May/2020) there is still limited information for characterizing the hospitalized cases in Brazil (as elsewhere in the world). Studies in China, Italy, and the United States have analyzed the profile of patients hospitalized for COVID-19 and found high prevalence of elderly individuals, males, and preexisting comorbidities such as hypertension and diabetes [9,10,11].

In order to monitor hospitalized COVID-19 cases in Brazil, the Ministry of Health incorporated testing for SARS-CoV-2 (the virus that causes COVID-19) into surveillance of the severe acute respiratory illness (SARI). Case notification is compulsory, and the records are stored in the SIVEP-Gripe (Influenza Epidemiological Surveillance Information System) database [12,13]. The system was created during the influenza H1N1 pandemic in 2009 and has been maintained since then to monitor SARI cases and for the surveillance of unusual events associated with this syndrome in the country.

Among the cases of hospitalization for SARI reported to the national surveillance system from 2010 to 2019, the infectious agents according to the predominant laboratory test in each season were influenza A and B viruses and respiratory syncytial virus (RSV). In the years when hospitalizations for SARI were predominantly due to RSV, children from zero to two years were by far the most heavily affected group, while in years with influenza peaks, the other age groups showed large percentages of hospitalizations, although small children were also the most affected [14]. According to a meta-analysis [15], the highest risk of hospitalization for seasonal influenza was also among the elderly and individuals with comorbidities such as diabetes, chronic lung disease, and cardiovascular disease, which highlights the relevance and timeliness of comparing hospitalizations for SARI due to influenza and COVID-19.

In this context, the current study aims to describe patients hospitalized for SARI due to COVID-19 (SARI-COVID) in Brazil, according to their demographic characteristics and comorbidities up to the 21st Epidemiological Week (EW) of 2020. The study also aims to compare these characteristics to those of patients hospitalized for SARI from influenza in 2019/2020 (SARI-FLU), due to their relevance in SARI reporting, and to the Brazilian general population, in order to identify groups potentially at increased risk of hospitalization for the disease. The analysis is intended to help orient public policies and protocols for decision-making.

Method

Data

- **Data on hospitalizations for SARI**

The SIVEP-Gripe database (https://sivepgripe.saude.gov.br/sivepgripe/login.html?0) was used to obtain data on the number of new hospitalizations in Brazil for SARI-COVID in 2020 and SARI-FLU in 2019 and 2020 (both up to the 21st EW, ending on May 23, 2020), by age bracket, race/color, sex, and major geographic region of Brazil, as well as comorbidities (diabetes, chronic kidney disease, asthma, other chronic lung diseases, and cardiovascular disease) and the proportion of pregnant and postpartum women.

SARI cases are defined as individuals that simultaneously meet four criteria: (i) fever, even if self-reported; (ii) cough or sore throat; (iii) dyspnea or O_2 saturation < 95% or respiratory discomfort; and (iv) hospitalization or evolution to death independently of previous hospitalization [16]. Once a hospitalized SARI case is identified, it is mandatory to report it, and it is recorded individually in the influenza surveillance information system (SIVEP-Gripe). In addition, a biological sample needs to be collected for laboratory analysis.

This analysis considered all the records in the SIVEP-Gripe database that met the criteria for definition of a hospitalized SARI case, ruling out the records of non-hospitalized deaths, with completion of the data field for the first symptoms and notification date corresponding to the years 2019 and 2020. Hospitalization for SARI-COVID is confirmed after a positive result on the RT-PCR molecular test for SARS-CoV-2. Analogously, hospitalization for SARI-FLU is confirmed after a positive result on a laboratory test for influenza A or B virus [1].

- **Data on the Brazilian general population**

The projection of the Brazilian population by age bracket, sex, and region of residence for the year 2020 used in the study was performed by the Brazilian Institute of Geography and Statistics (IBGE. População residente: projeção da população do Brasil e Unidades da Federação por sexo e idade para o período 2000-2030. https://datasus.saude.gov.br/populacao-residente/, accessed on 26/May/2020), and the estimate for relative proportions of the population according to color or race was obtained from the *Brazilian National Household Sample Survey* (PNAD) of 2015 (IBGE. Pesquisa Nacional por Amostra de Domicílios – PNAD 2015. https://www.ibge.gov.br/estatisticas/sociais/populacao/9127-pesquisa-nacional-por-amostra-de-domicilios.html, accessed on 01/May/2020).

Prevalence rates for diabetes mellitus, chronic kidney disease (CKD), asthma (or asthmatic bronchitis), lung diseases such as emphysema, chronic bronchitis, or chronic obstructive pulmonary disease (COPD), and cardiovascular diseases (CVD) were obtained from the *Brazilian National Health Survey* (PNS) conducted in 2013 [17]. CVD was defined in the PNS as arterial hypertension and/or heart diseases (myocardial infarction, angina, heart failure, or others). To compare the prevalence of CVD in the SIVEP-Gripe database, a composite variable was created as the sum of the prevalence rates for hypertension and heart diseases, with the confidence intervals constructed as the sum of the associated variances.

We estimated the relative proportion of pregnant or postpartum women in the general population as a ratio between the number of liveborn infants in the year 2018 in each age bracket, obtained from the Brazilian Information System on Live Births (SINASC), and the population size obtained from the population projections by age bracket for females in 2018, conducted by IBGE (População residente: projeção da população do Brasil e Unidades da Federação por sexo e idade para o período 2000-2030. https://datasus.saude.gov.br/populacao-residente/, accessed on 26/May/2020).

Data analysis

The relative proportions of demographic characteristics of patients hospitalized for SARI-COVID and SARI-FLU were calculated and compared to the proportions in the Brazilian general population using the chi-square test for homogeneity. Using these same tests, the relative proportions of patients hospitalized for SARI-COVID and SARI-FLU with comorbidities and of pregnant or postpartum women were compared to the proportions in the Brazilian general population, according to age bracket. The analyses were performed in the R software, version 3.6.3 (https://www.r-project.org/).

Results

Table 1 shows the distribution according to region of residence, sex, age bracket, and race or color of the Brazilian general population and of individuals hospitalized for SARI-COVID in 2020 and hospitalized for SARI-FLU in 2019 and 2020 up to the 21st EW of 2020. In 2019, 39,349 hospitalizations for SARI were reported, 14.7% of which (n = 5,780) for SARI-FLU. In 2020, until the 21st EW, 94,807 hospitalizations for SARI were reported, 33.7% of which (n = 31,968) for SARI-COVID, 1.5% (n = 1,463) for SARI-FLU, and 39 cases of co-infection excluded from the analysis. Nearly all of the characteristics of individuals hospitalized for SARI-COVID and SARI-FLU that were compared were significantly different from the Brazilian general population, except for those marked with an asterisk (*) in Table 1.

The Southeast region of Brazil, home to 41.8% of the country's population, accounted for approximately 2/3 of the hospitalizations for SARI-COVID and 2/5 of the hospitalizations for SARI-FLU (Table 1).

The distribution by sex of individuals hospitalized for SARI-FLU shows a similar pattern to that of the Brazilian general population (49% males), which differs from individuals hospitalized for SARI-COVID, with a predominance of males (60%) (Table 1).

Distribution of the age brackets in individuals hospitalized for SARI-COVID and SARI-FLU differed considerably and also proved dissimilar to that of the Brazilian general population. Hospitalizations for SARI-FLU occurred predominantly in individuals from zero to four years of age (23.4%) and 60 years or older (22.5%), corresponding to 6.5% and 13.8% of the Brazilian population, respectively. Meanwhile, hospitalizations for SARI-COVID were concentrated in elderly individuals (45.2%) and the 40-59-year age bracket (37.7%) (Table 1). Median age of patients hospitalized for SARI-FLU was 33 years, with interquartile range (IQR) 5-57, while median age of patients hospitalized for SARI-COVID was 57 years (IQR: 44-70).

Individuals that self-identified as white predominated among patients hospitalized for SARI-COVID (47.5%) and for SARI-FLU (57.2%), The race/color profile in individuals hospitalized for SARI-COVID was more similar to that of the Brazilian general population, when compared to patients hospitalized for SARI-FLU (Table 1). Importantly, this information was missing for 34.5% of the individuals hospitalized for SARI-COVID, as compared to 17.7% of those hospitalized for SARI-FLU.

Table 2 shows the prevalence of comorbidities in the Brazilian general population according to the PNS of 2013, and among patients hospitalized for SARI-COVID in 2020 or SARI-FLU in 2019/2020, according to age bracket.

Both patients hospitalized for SARI-COVID and for SARI-FLU showed higher prevalence rates of diabetes and CKD when compared to the general population, in all the age brackets (Table 2).

In the three age brackets analyzed, prevalence of CVD in patients hospitalized for SARI-FLU was lower than in the general population, and when considering adults, the prevalence was similar to that of the general population. Meanwhile, among patients hospitalized for SARI-COVID, the prevalence of CVD for all adults (41%) was higher than in the general population, as well as in the age bracket from 18 to 39 years (Table 2).

Patients hospitalized for SARI-COVID showed similar prevalence rates for asthma compared to those of the general population from 18 to 39 years and from 40 to 59 years of age, while among patients hospitalized for SARI-FLU, asthma prevalence was higher than in the general population

Table 1

Demographic characteristics of the Brazilian population and of patients hospitalized for severe acute respiratpory illness due to COVID-19 (SARI-COVID) in 2020 and for SARI from influenza (SARI-FLU) in 2019/2020 up to the 21st Epidemiological Week of 2020.

Variables	Projection of the Brazilian population	Hospitalized for SARI-COVID		Hospitalized for SARI-FLU	
	%	%	n	%	n
Region of Brazil					
North	8.8	11.8	3,779	6.4	462
Northeast	27.4	16.3	5,198	20.5	1,492
Southeast	41.8	64.0	20,460	38.6	2,813
South	14.2	5.4	1,730	21.9	1,596
Central	7.8	2.5	801	12.6	919
Sex					
Male	49.3	60.0	19,188	49.1 *	3,576
Female	50.7	40.0	12,774	50.9 *	3,703
Age bracket (years)					
0-4	6.5	0.8	247	23.4	1,705
5-9	6.9	0.1	49	8.3	607
10-19	15.4	0.5	166	5.8	419
20-39	32.3	15.7	5,003	19.4	1,411
40-59	25.1	37.7	12,038	20.6	1,503
60 or more	13.8	45.2	14,465	22.5	1,637
Color or race					
White	45.2	47.5	9,946	57.2	3,429
Black	8.8	6.7	1,404	4.8	286
Yellow	0.5	1.6	339	0.9	57
Brown	45.1	43.8	9,179	36.7	2,199
Indigenous	0.4	0.4	77	0.4	24

Note: population data on color or race are from the 2015 *Brazilian National Household Sample Survey* – PNAD 2015 (Instituto Brasileiro de Geografia e Estatística. Pesquisa Nacional por Amostra de Domicílios – PNAD 2015. https://www.ibge.gov.br/estatisticas/sociais/populacao/9127-pesquisa-nacional-por-amostra-de-domicilios.html, accessed on 01/May/2020) and the other population projections for 2020 are by Brazilian Institute of Geography and Statistics (População residente: projeção da população do Brasil e Unidades da Federação por sexo e idade para o período 2000-2030. https://datasus.saude.gov.br/populacao-residente/, accessed on 26/May/2020).

* The data do not reject the H0 that the proportion of characteristics among hospitalized individuals is the same as in the Brazilian general population.

in these same age brackets. Prevalence rates for other chronic lung diseases were higher than in the general population, both for patients hospitalized for SARI-COVID and for SARI-FLU (Table 2).

Table 3 shows the relative proportion of pregnant or postpartum women hospitalized for SARI-COVID in 2020 and for SARI-FLU in 2019/2020 according to age bracket, compared to the relative proportion of women with liveborn children in 2018 in the Brazilian population.

Among female patients hospitalized for SARI-FLU and SARI-COVID, the proportion of pregnant or postpartum women was significantly higher than in the general population for all the age brackets (Table 3).

Table 2

Prevalence of comorbidities in the Brazilian population according to the *Brazilian National Health Survey* (PNS 2013) and among patients hospitalized for severe acute respiratpory illness due to COVID-19 (SARI-COVID) in 2020 and for SARI from influenza (SARI-FLU) in 2019/2020 up to the 21st Epidemiological Week of 2020.

Comorbidities/Age bracket (years)	Smaple of the Brazilian population		Hospitalized for SARI-COVID		Hospitalized for SARI-FLU	
	%	95%CI	%	n	%	n
Diabetes mellitus						
18-39	1.0	0.8-1.2	8.0	406	4.4	66
40-59	7.3	6.6-7.9	21.0	2,524	15.8	237
60 or more	18.1	16.9-19.3	33.6	4,861	27.2	446
Total adults	6.2	5.9-6.6	24.7	7,791	16.2	749
Cardiovascular disease						
18-39	7.2	6.3-8.1	11.4	576	4.2	62
40-59	31.9	29.6-34.2	33.6 *	4,041	22.6	340
60 or more	62.0	58.5-65.5	57.4	8,309	45.1	739
Total adults	25.6	24.4-26.8	41.0	12,926	24.6 *	1,141
Chronic kidney disease						
18-39	0.6	0.5-0.8	1.5	75	1.4	21
40-59	1.8	1.5-2.1	2.6	311	3.2	48
60 or more	2.8	2.2-3.3	5.5	800	7.0	114
Total adults	1.4	1.3-1.6	3.8	1,186	4.0	183
Asthma						
18-39	4.6	4.2-5.1	4.5 *	230	7.7	115
40-59	3.9	3.5-4.3	3.4 *	405	5.9	89
60 or more	4.8	4.1-5.5	2.5	360	5.4 *	88
Total adults	4.4	4.1-4.7	3.2	995	6.3	292
Other chronic lung disease **	1.8	1.6- 2.0	3.9	1,218	8.3	384

* The data do not reject the H0 that the proportion of individuals with comorbidities is the same as in the general population;
** Estimate for total adults.

Table 3

Estimated proportion of pregnant or postpartum women in the Brazilian population in 2018 compared to the proportion in women hospitalized for severe acute respiratpory illness due to COVID-19 (SARI-COVID) in 2020 and for SARI from influenza (SARI-FLU) up to the 21st Epidemiological Week of 2020, according to age bracket.

Age bracket (years)	Estimates for the Brazilian population in 2018	Hospitalized for SARI-COVID in 2020		Hospitalized for SARI-FLU in 2019/2020	
	%	%	n	%	n
10-19	2.8	14.4	14	21.1	47
20-34	8.0	18.9	221	35.9	220
35-69	1.1	1.4	107	4.9	66

Discussion

The concentration of hospitalizations for SARI-COVID in the Southeast of Brazil reflects the fact that the disease first reached the country in the State of São Paulo, followed by Rio de Janeiro. Social distancing measures were not implemented evenly in the states of Brazil, Rio de Janeiro launched social distancing measures on March 13, while São Paulo only adopted them nearly a month after confirmation of the first case, which contributed to the rapid spread of the disease both in the state and in the country as a whole [1]. Some three months after identification of the first case of COVID-19 in Brazil, 26% (62,345) of the cases and 30% (4,782) of the deaths from the disease were recorded in São Paulo. The other three states of the Southeast region accounted for 14% of the cases and 20% of the deaths [18].

The higher percentage of residents in the South of Brazil among patients hospitalized for SARI-FLU (22%) when compared to residents of the South as a proportion of the total Brazilian population (14%) is consistent with the fact that the South is the only region of Brazil with a subtropical climate (as opposed to tropical), which favors the higher incidence of influenza there [19].

The median age of patients hospitalized for SARI-COVID was similar to that of patients hospitalized in Wuhan, China (56, IQR: 46-67) [9] and lower than that of patients hospitalized in New York in the United States (63, IQR: 52-75) [11] and in those admitted to intensive care units in Lombardy, Italy (63, IQR: 56-70) [10]. The differences can be explained by the age profiles of the general population in the respective countries. The Brazilian and Chinese populations have lower proportions of individuals 60 years or older (14% and 17%, respectively), compared to the United States and Italy (23% and 30%, respectively) (United Nations. World population prospects 2019. Estimates: 1950-2020. https://population.un.org/wpp/Download/Standard/Population/, accessed on 19/May/2020).

The higher proportion of male patients among patients hospitalized for COVID-19 also appeared in the above-mentioned studies in China [9] and the United States [11], with an even higher percentage in patients admitted to intensive care units in Lombardy (82%) [10]. Since males account for approximately half of the population in these countries (United Nations. World population prospects 2019. Estimates: 1950-2020. https://population.un.org/wpp/Download/Standard/Population/, accessed on 19/May/2020) the current study's findings and the available scientific literature point to male gender as associated with more serious evolution of the disease and death [20].

There is no evidence in the international literature of any race or color at greater risk of hospitalization for seasonal influenza [15]. Thus, the higher relative frequency of self-identified whites among Brazilians hospitalized for SARI-FLU may reflect the higher proportion of hospitalized patients among individuals in the South (which has a proportionally larger white population than the rest of Brazil).

The prevalence of comorbidities (diabetes, CVD, CKD, and chronic lung diseases) in patients hospitalized for SARI-COVID in Brazil was higher than the estimates in the general population, highlighting the hypothesis that this group has higher odds of hospitalization for the disease.

Prevalence of diabetes among patients hospitalized for SARI-COVID in Brazil (25%) was higher than in patients hospitalized in Wuhan (19%) [9] and in Lombardy (17%) [10], but lower than in New York (34%) [11]. The same was true for prevalence of CKD (4%, 1% [9], 3% [10], and 5% [11], respectively) and other chronic lung diseases (4%, 3% [9], 4% [10], and 5% [11], respectively).

Meanwhile, the prevalence of CVD in patients hospitalized for SARI-COVID in Brazil (41%) was higher than for hypertension (30%) plus coronary artery disease (8%) in Wuhan [9], but lower than for hypertension in patients in Lombardy (49%) [10] and New York (57%) [11].

Differences in the profile of comorbidities are also observed in the general populations of Brazil and the United States. Prevalence of diabetes in the Brazilian adult population in 2013 (6.2%, 95%CI: 5.9-6.6) was lower than in the United States (10.2%, 95%CI: 9.3-11.2) in the years 2013-2016 [21], as was the prevalence of hypertension (21.4% vs. 41.7% in 2013-2014) [22], which is consistent with the differences observed in the profiles of patients hospitalized for COVID-19 in the two countries.

As for patients hospitalized for SARI-FLU, the current study's findings are corroborated by a meta-analysis pointing to elderly age and diabetes and chronic lung disease as risk factors for hospitalization for seasonal influenza. Meanwhile, age under five years and asthma were identified as risk factors for the development of pneumonia [15]. An important difference identified in the current study was the higher prevalence of asthma among individuals hospitalized for SARI-FLU, but not for

SARI-COVID. This may be related to the pathophysiology of COVID-19, pointing to an exacerbated systemic immune response (but not necessarily local pulmonary factors) as an important factor for aggravation of the disease [23].

Despite the hypothesis raised in this study of more hospitalization of pregnant and postpartum women for SARI-COVID, the literature has not reported greater susceptibility to the infection or greater risk of serious evolution of the disease in pregnant women. Risk factors already detected in the general population, such as preexisting comorbidities and more advanced age, are factors for severity that have been identified thus far in this group. However, since the disease is still recent and incompletely understood, longitudinal studies are necessary to assess the effect of asymptomatic, mild, moderate, and severe infections on the occurrence of spontaneous abortion, intrauterine growth restriction, and congenital anomalies and the long-term health effects in the child [24]. In relation to influenza, evidence points to greater risk of hospitalization for influenza A(H1N1) among pregnant women and greater risk of death among postpartum women [15], which corroborates this study's finding.

Our study has some limitations. First, hospitalization is an event that is not based exclusively on the severity of the disease, since it also includes the health professional's clinical assessment of the potential for aggravation of the case in the short term, which can be influenced by patient characteristics such as age, presence of comorbidities, or pregnancy. However, since the current study only included cases that met all the clinical criteria for SARI, we assume that this bias was minimized.

Since in most cases the laboratory test results are only obtained after the patient has already been hospitalized, we believe that the effect of this bias is occurring in the same way for cases of SARI-FLU and SARI-COVID in the year 2020.

As for the use of the total number of live births as the denominator for estimating the proportion of pregnant or postpartum women in the general population in 2018, a limitation was the fact that we did not discount the number of children born to multiple gestations, besides not including stillbirths (which are not tabulated in the SINASC database) or pregnant women who suffered fetal losses. However, considering that the women who had liveborn children in 2018 were pregnant up to 42 weeks in the year, with late postpartum up to the 6th week after delivery (the period in which the postpartum follow-up appointment is supposed to be scheduled) [25], we believe that by using the number of live births during a year, the prevalence of pregnant and postpartum women in the general population may be overestimated. Importantly, there are discrepancies in the literature concerning the duration of the postpartum period, which may lead to non-standardized completion of this variable in the SIVEP-Gripe database [26], in addition to possible problems of underreporting of this information.

The limitations of data obtained from the SIVEP-Gripe database include possible loss of false-negatives due to the sample collection period [27], delays in test results, and the possibility of hospitalizations for COVID-19 not being recorded in the system because they did not present obvious respiratory signs to record them as SARI cases. In relation to the first two limitations, although relevant in terms of potential underreporting and delay in case confirmation, respectively, it is reasonable to assume that they do not affect the current study's analyses, since they potentially affect all the cases evenly. Meanwhile, hospitalizations for COVID-19 that do not enter the SIVEP-Gripe database because they do not present signs suggestive of SARI may be associated with distinct comorbidities.

Due to the COVID-19 epidemic, the national surveillance guidelines expanded the criterion for notification to also include cases without fever [12,13], defined as acute respiratory illness (ARI). However, in order to maintain comparability with SARI cases according to the international definition, the option in the current analysis was to maintain only the records that met all the symptomatic criteria.

Information on comorbidities in the SIVEP-Gripe database is reported by patients or family members, which can impact its accuracy. However, the data's comparability is favored by the fact that information on comorbidity in the PNS is also self-reported.

The prevalence of cardiovascular disease in the PNS is overestimated because it includes acute events such as myocardial infarction. The associated uncertainty is also overestimated because it does not discount the covariance between hypertension and heart diseases. Since the analysis of individuals hospitalized for SARI only included chronic CVD, the possible classification bias between the groups is against what we demonstrated, since the prevalence rates should be overestimated in the comparison group (general population). Despite the above-mentioned limitations, it was possible to show higher prevalence of CVD among individuals hospitalized for SARI-COVID in the age bracket from

18 to 39 years and for all adults. However, among patients hospitalized for SARI-FLU, possibly due to the above-mentioned limitation, it was not possible to show the association between CVD and hospitalization for influenza (which has been reported elsewhere in the literature) [15]. Thus, importantly, the difference between the prevalence rates of CVD in the general population and in hospitalizations for SARI must be greater in all the age groups analyzed.

Finally, another important limitation was the potential bias in the completion and recording of the case notification forms, a bias that is inherent to any study based on data from information systems without direct case-by-case follow-up in the hospital network. On the other hand, the use of data on hospitalizations for SARI-COVID obtained from the SIVEP-Gripe database allows an analysis of a larger population and is extremely relevant for monitoring the profile of severe cases of the disease in the country.

In short, the current study corroborates the literature on more advanced age, male gender, and comorbidities as factors associated with hospitalization for COVID-19, which can be considered a marker for severity of the disease.

Compared to the Brazilian general population, the high proportion of elderly patients and those 40 to 59 years of age and/or with comorbidities (diabetes, CVD, CKD, and chronic lung diseases) among patients hospitalized for SARI-COVID indicates that these patients may be presenting more serious cases of the disease. This hypothesis should be confirmed through longitudinal studies to support public health policies, for example, defining these risk groups as a priority for vaccination campaigns.

Contributors

R. P. Niquini contributed to the study's conception, data analysis and interpretation, and drafting and critical revision of the manuscript. R. M. Lana, A. G. Pacheco, O. G. Cruz, F. C. Coelho, L. M. Carvalho and D. A. M. Vilella contributed to the data interpretation and drafting and critical revision of the manuscript. M. F. C. Gomes contributed to the data collection and drafting and critical revision of the manuscript. L. S. Bastos contributed to the study's conception, data collection, processing, analysis, and interpretation, and drafting and critical revision of the manuscript.

Additional informations

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Resumo

O presente estudo tem o objetivo de descrever os pacientes hospitalizados por síndrome respiratória aguda grave (SRAG) em decorrência da COVID-19 (SRAG-COVID), no Brasil, quanto às suas características demográficas e comorbidades até a 21ª Semana Epidemiológica de 2020. Buscou-se comparar essas características com as dos hospitalizados por SRAG em decorrência da influenza em 2019/2020 (SRAG-FLU) e com a população geral brasileira. As frequências relativas das características demográficas, comorbidades e de gestantes/puérperas entre os pacientes hospitalizados por SRAG-COVID e SRAG-FLU foram obtidas por meio do Sistema de Informação de Vigilância Epidemiológica da Gripe (SIVEP-Gripe), e as estimativas para a população geral brasileira foram obtidas por meio de projeções populacionais realizadas pelo Instituto Brasileiro de Geografia e Estatística, dados do Sistema de Informações sobre Nascidos Vivos e de pesquisas de âmbito nacional. Entre os hospitalizados por SRAG-COVID, observou-se uma elevada proporção, em relação ao perfil da população geral brasileira, de indivíduos do sexo masculino, idosos ou com 40 a 59 anos, com comorbidades (diabetes mellitus, doença cardiovascular, doença renal crônica e pneumopatias crônicas) e de gestantes/puérperas. Já entre os hospitalizados por SRAG-FLU, observou-se prevalências superiores às populacionais de indivíduos de 0 a 4 anos de idade ou idosos, de raça ou cor branca, com comorbidades (diabetes mellitus, doença renal crônica, asma e outras pneumopatias crônicas) e de gestantes/puérperas. Esses grupos podem estar evoluindo para casos mais graves da doença, de forma que estudos longitudinais na área são de extrema relevância para investigar esta hipótese e melhor subsidiar políticas públicas de saúde.

Síndrome Respiratória Aguda Grave; Infecções por Coronavírus; Influenza Humana; Monitoramento Epidemiológico

Resumen

El objetivo del presente estudio es describir a los pacientes hospitalizados por infección respiratoria aguda grave (IRAG) a consecuencia de la COVID-19 (IRAG-COVID), en Brasil, respecto a sus características demográficas y comorbilidades hasta la 21ª Semana Epidemiológica de 2020. Se buscó comparar estas características con las de los hospitalizados por SRAS, a consecuencia de la influenza en 2019/2020 (IRAG-FLU) y con la población general brasileña. Las frecuencias relativas de las características demográficas, comorbilidades y de embarazadas/puérperas entre los pacientes hospitalizados por IRAG-COVID y IRAG-FLU se obtuvieron mediante el Sistema de Información de la Vigilancia Epidemiológica de la Gripe (SIVEP-Gripe), y las estimaciones para la población general brasileña se consiguieron mediante proyecciones poblacionales realizadas por el Instituto Brasileño de Geografía e Estadística, datos del Sistema de Informaciones sobre Nascidos Vivos y de investigaciones de ámbito nacional. Entre los hospitalizados por IRAG-COVID, se observó una elevada proporción, respecto al perfil de la población general brasileña, de individuos del sexo masculino, ancianos o con 40 a 59 años, con comorbilidades (diabetes mellitus, enfermedad cardiovascular, enfermedad renal crónica y neumopatías crónicas) y de embarazadas/puérperas. Ya entre los hospitalizados por IRAG-FLU, se observaron prevalencias superiores a las poblacionales de individuos de 0 a 4 años de edad o ancianos, de raza o color blanco, con comorbilidades (diabetes mellitus, enfermedad renal crónica, asma y otras neumopatías crónicas) y de embarazadas/puérperas. Estos grupos pueden estar evolucionando hacia casos más graves de la enfermedad, por ello, los estudios longitudinales en esta área son de extrema relevancia para investigar esta hipótesis y apoyar mejor las políticas públicas de salud.

Sindrome Repiratorio Agudo Grave; Infecciones por Coronavirus; Gripe Humana; Monitoreo Epidemiológico

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