Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Archives of Gerontology and Geriatrics 96 (2021) 104462

Contents lists available at ScienceDirect

Archives of Gerontology and Geriatrics

journal homepage: www.elsevier.com/locate/archger

Clinical characteristics of 1544 Brazilians aged 60 years and over with laboratory evidence for SARS-CoV-2

Marcelo de Maio Nascimento [1,*]

[1] Federal University of Sao Francisco Valley: Universidade Federal do Vale do Sao Francisco, Petrolina, Pernambuco BRAZIL

ARTICLE INFO

Keywords:
SARS-CoV-2
COVID-19
Clinical characteristics
Comorbidity
Older Adult

ABSTRACT

Introduction: Infection with the new coronavirus responsible for Severe Acute Respiratory Syndrome (SARS-CoV-2) continues to spread worldwide. In Brazil, there are already more than 230 thousand dead, many of these older adults.

Objective: To present the clinical characteristics of older Brazilian adults infected by COVID-19, in the epidemiological weeks (EW) 34-52, and to verify factors responsible for the increased risk of death.

Methods: Retrospective and observational study conducted with secondary publicly available data, provided by the Brazilian Ministry of Health. 1,544 confirmed cases of registered COVID-19 infection were included between August 16 and December 26, 2020, aged 60 or older. Outcomes: Demographic data, comorbidity, symptoms for disease, clinical information: days of hospitalization, chest X-ray, type of RT-PCR.

Results: 48% of patients admitted to the ICU with evidence for SARS-CoV-2 died. Symptoms and comorbidities related to increased chance of death (OR) were immunodeficiency (188%), kidney disease (166%), neurological disease (103%), dyspnea (86%), pneumopathy (55%), O_2 saturation <95% (53%), respiratory discomfort (49%), age (36%), sore throat (31%), and sex (0.5%). There was a 5% increase in the chance of death for each year of life.

Conclusion: Heart disease and Diabetes mellitus were the most frequent comorbidities, but did not indicate an increased risk of death from SARS-CoV-2 infection. Age, sex, sore throat, dyspnea, respiratory discomfort, O_2 saturation <95%, neurological disease, pneumopathy, immunodeficiency, and kidney disease were significantly associated with risk of death from COVID-19.

1. Introduction

Currently, no country in the world has escaped the COVID-19 pandemic, and they are also experiencing enormous pressure on the functioning of the health system (Weinstein & Skinner, 2020). For this reason, every day, tens of thousands of people are infected by the virus, and hundreds of deaths are recorded (WHO, 2020). In Brazil, between March and December 2020, approximately 200 thousand people died from Severe Acute Respiratory Syndrome (SARS-CoV-2). It is known that advanced age is significantly correlated with COVID-19. Comorbidities are common among older adults (Zhang et al., 2020; Sun et al., 2020), increasing the chance of infection, worsening respiratory failure, and death (Liu et al., 2020).

Current studies have described the epidemiological, clinical, and predictive characteristics of mortality of patients hospitalized with COVID-19 in an intensive care unit (ICU) (Ruan, Yang, Wang, Jiang, & Song, 2020; Wang et al., 2020). Among the pre-existing diseases, the most common highlighted were hypertension and Diabetes mellitus, followed by chronic obstructive pulmonary disease, kidney, liver, cancer, asthma, stroke, and immunodeficiencies. A systematic review and meta-analysis on the prevalence of comorbidities and mortality in patients hospitalized for SARS-CoV-2 identified a significant number, attesting to a total of 16,222 types of comorbidities.(Espinosa et al., 2020). Considering that there are similarities among people who died of COVID-19 in the world in relation to their pre-existing diseases, this study aimed to: 1) present the clinical characteristics of older adult Brazilians infected by COVID-19, in the epidemiological weeks (EW) 34-52, and 2) to verify the predictive variables of the death of this population.

* Corresponding Author.
E-mail address: marcelo.nascimento@univasf.edu.br.

https://doi.org/10.1016/j.archger.2021.104462
Received 28 April 2021; Received in revised form 8 June 2021; Accepted 10 June 2021
Available online 16 June 2021

2. Methods

2.1. Study design and participants

This is a retrospective observational study carried out with secondary data of public access, released on the Brazilian Ministry of Health (MH) online database, Sivep-Gripe (Brasil, 2021a), which waives the approval of the Ethics Committee according to Resolution n° 466/12 and Resolution no. 510/16, Brazil (Brasil, 2021b). This information is published daily, summarizing the notifications of cases of COVID-19 in the national territory, including deaths. Inclusion criteria were: confirmed cases of SARS-CoV-2 infection, age ≥60 years, both sexes, ICU registration, with or without death, time cut from EW 34-52 (August 16 and December 26 2020). The severity of the cases was defined based on the management guideline for the diagnosis and treatment of SARS-CoV-2, issued by the Brazilian Ministry of Health (Brasil, 2021a): 1) Symptoms: dyspnea/respiratory discomfort, or persistent pressure in the chest, or O_2 saturation <95%, bluish color of the lips or face; 2) Time: acute respiratory condition characterized in the last 7 days for two or more signs and symptoms of fever (≥ 37.3°C, even if mentioned), chills, sore throat, headache, cough, runny nose, olfactory or taste disorders; and 3) Evidence: laboratory test for SARS-CoV-2 (PCR-positive). Exclusion criteria were cases with absence of one or more important records for analysis, as well as patients who had a date of registration in the same system on the same day of death.

2.2. Data collection

The information collected in the MS database comes from patients treated at hospitals and health care units. Data were recorded in a registration form consisting of 80 items (Brasil, 2021a), according to the following classification: 1) demographic data: sex, age; 2) clinical and epidemiological data: i) signs of symptoms (fever, cough, sore throat, dyspnea, respiratory discomfort, O_2 saturation <95%, diarrhea, vomiting); ii) comorbidities (chronic cardiovascular, liver, neurological, chronic kidney disease, asthma, Diabetes mellitus, pneumopathy, immunodeficiency, obesity; 3) care information: i) date of admission and stay in the ICU, ii) use of ventilatory support, iii) chest X-ray, iv) laboratory information: test type; v) evolution of the case: death or cure, and vi) date of discharge or death of the patient. We also used two types of classification to determine the severity of older adults admitted to the ICU, as follows: (1) Mild: for patients who had symptoms of respiratory infection (fever, cough, sore throat) and/or digestive symptoms (vomiting, diarrhea); and (2) Severe: for those who had oxygen saturation <95%, and/or symptoms of dyspnea, and/or respiratory discomfort. During the analysis, the cases were divided into two groups: died from COVID-19 and cured after virus infection. The information was collected between 10 and 20 February 2021.

2.3. Statistical analysis

The normality of the data was obtained by the Shapiro Wilk test. Numerical variables were presented by the median and interquartile range (IQR), and categorical variables by means of counts and percentages (%). The Mann-Whitney U test and ANOVA with Bonferroni post hoc was applied for the examination between numerical variables, while categorical variables were examined by the χ^2 or Fisher's exact test. To examine the independent variables significantly associated (clinical and epidemiological data) with the risk of death from COVID-19 (dependent variable), a bivariate analysis was performed using the χ^2 test. Next, all variables that indicated p-value <0.20 were selected and included in the construction of a multivariate binary logistic regression model with a hierarchical analysis that was adjusted for age. The order of insertion of the variables was the forward stepwise modeling strategy. The results were presented by Odds ratio (OR, 95% CI). Initially, the data were organized in an Excel spreadsheet, and the statistical analysis was performed using the SPSS program, version 24.0. The level of confidence adopted was α = 5%.

3. Results

3.1. Sample characteristics

Of the 13,913 older adults registered in the MS registry, 1,544 confirmed cases of COVID-19 were analyzed. Table 1 shows the distribution of the sample characteristics, the median age was 73.5 (IQR 60 to 105 years), of these, 819 (53%) were men and 725 (47%) women. When divided into age groups, 557 were sexagenarian (36.1%), 533 septuagenarians (34.5%), 361 octogenarians (23.4%), and 93 (6.0%) aged 90 years and over. It was found that 808 (53%) died from complications caused by COVID-19, while 736 (47%) were cured after respiratory infection. Among those who died, 34.5% (n = 254) were between 60 and 69 years, and among those cured 44.9% (n = 363) were between 60 and 69 years old. Of those who died, 55.4% (n = 408) were men and 44.6% (n = 328) women, among those cured, 50.9% (n = 411) were men and 49.1% (n = 397) women. All of these data indicated a statistically significant difference.

3.2. Comorbidities and Symptoms

In this study, 47.6% of patients admitted to the ICU died (Table 1). The most common comorbidities found in all study participants were coronary heart disease (65.0%), and Diabetes mellitus (42.9%). Regarding symptoms, the most frequent were O^2 saturation <95% (77.3%), dyspnea (75.1%), respiratory distress (70.3%) and cough (67.2%). Proportionally, heart disease and Diabetes mellitus were

Table 1
Demographic characteristics, comorbidities and symptoms of older patients with evidence for COVID-19, Brazil, EW 34-52.

Characteristic	Total(n = 1544)	Dead(n = 808)	Cured(n = 736)	p-value *
Age in years (Median, IQR)	73.5 (60-105)	75.9 (60-105)	71.4 (60-95)	**<0.001**
Age categories				**<0.001**
60-69, n (%)	557 (36.1)	194 (26.4)	363 (44.9)	
70-79, n (%)	533 (34.5)	254 (34.5)	279 (34.5)	
80-89, n (%)	361 (23.4)	225 (30.6)	136 (16.8)	
90 over, n (%)	93 (6.0)	63 (8.6)	30 (3.7)	
Sex n (%)				0.096
Male	819 (53.0)	408 (55.4)	411 (50.9)	
Female	725 (47.0)	328 (44.6)	397 (49.1)	
Comorbidities n (%)				
Heart disease	1003 (65.0)	475 (64.5)	528 (65.3)	0.740
Hematological disease	20 (1.3)	9 (1.2)	11 (1.4)	0.810
Hepatic Disease	18 (1.2)	8 (1.1)	10 (1.2)	0.759
Asthma	42 (2.7)	21 (2.9)	21 (2.6)	0.714
Diabetes mellitus	662 (42.9)	312 (42.4)	350 (43.3)	0.320
Neurological disease	96 (6.2)	57 (7.7)	39 (4.8)	0.018
Pneumopathy	147 (9.5)	92 (12.5)	55 (6.8)	**<0.001**
Immunodeficiency	58 (3.8)	24 (3.3)	34 (4.2)	0.329
Kidney disease	99 (6.4)	63 (8.6)	36 (4.5)	**<0.001**
Obesity	124 (8.0)	59 (8.0)	65 (8.0)	0.984
Symptoms n (%)				
Fever	785 (50.8)	376 (51.1)	409 (50.6)	0.879
Cough	1037 (67.2)	473 (64.3)	564 (69.8)	0.023
Sore Throat	233 (15.1)	96 (13.0)	137 (17.0)	0.033
Dyspnea	1169 (75.7)	608 (82.6)	561 (69.4)	**<0.001**
Respiratory discomfort	1086 (70.3)	575 (78.1)	511 (63.2)	**<0.001**
Diarrhea	252 (16.3)	118 (16.0)	134 (16.6)	0.783
O_2 saturation <95%	1194 (77.3)	633 (86.0)	561 (69.4)	**<0.001**
Vomit	154 (10.0)	76 (10.3)	78 (10.3)	0.672
Severity rating				
Mild	937 (60.7)	595 (73.7)	342 (46.5)	0.018
Severe	1148 (74.4)	656 (81.2)	492 (66.9)	**<0.001**

Abbreviation: IQR, interquartile range.
* p<0.05 Mann-Whitney U test.

present among older patients who died in 64.5% and 42.4%, whereas in the group of those cured, these comorbidities indicated rates of 65.3% and 43.3%, respectively. Differently statistical results were pointed out for pneumopathy and kidney disease (p = 0.001), and neurological disease (p = 0.018). Regarding symptoms, among those who died, the most common were O_2 saturation <95% (86.0%), dyspnea (82.6%), respiratory discomfort (78.1%) (p = 0.001), and cough (64.3%) (p = 0.023), among those cured, there was cough (69.8%), O_2 saturation <95% and dyspnea (69.4%), respiratory discomfort (63.2%).

The analysis of the severity of the cases of the entire population evaluated indicated that 74.4% had severe symptoms (p = 0.001), and 60.7% mild symptoms (p = 0.018). Comparatively, the rate of mild cases among dead and cured patients was 73.7% and 46.5% (p = 0.018), respectively. The severe classification was 81.2% and 66.9% (p = 0.001) among the older patients who died and cured, respectively.

Table 2 presents, in a comparative way, the comorbidities and symptoms of the evaluated population, according to age groups. Differently significant results were revealed for the comorbidities Diabetes mellitus and neurological disease (p = 0.001), obesity (p = 0.004), and for the symptom of sore throat (p =0.002). The comparative analysis of severity by age group showed low results for mild cases, the rates observed were from 16.1% to 19.2% (p = 0.001). On the other hand, the proportion of severe cases indicated high rates, the values found ranging from 80.8% to 83.9% (p = 0.001).

Table 3 presents the clinical outcomes for both groups, the median ICU stay days was 3 (0-81) (p> 0.05). A differently significant result was verified for the use of ventilatory support (p = 0.000), the most applied method was non-invasive mechanical ventilation (58.2%). Regarding the chest X-ray examination, in most cases it was not performed (60.9%), however, the inflated interstitial method was the most used (22.7%). Among the types of RT-PCR tests performed, the most frequent was the rapid antigen test (74.0%), applied in 73.3% among those who died, and 74.9% among those cured.

Finally, a multivariate binary regression was performed to verify variables responsible for the increased risk of death of the population assessed by COVID-19, among the EW 34-52 (Table 4). The model obtained was statistically significant [χ^2 (7) = 130.739; p <0.001; R2 Nagelkerke = 0.686]. The final probability model revealed ten variables: gender (OR = 1,369; 95% CI: 1066 - 1759; p = 0.014); age (OR = 1,058; 95% CI: 1,045 - 1,045; p = 0,001), sore throat (OR = 0,685; 95% CI: 0.502 - 0.934; p = 0.017), dyspnea (OR = 1.865; 95% CI: 1,389 - 2,505; p = 0,001), respiratory distress (OR = 1,492; 95% CI: 1,150 - 1,936; p = 0,003), O_2 saturation <95% (OR = 1,537; 95% CI: 1,173 - 2,015; p = 0.002), neurological disease (OR = 2,035; 95% CI: 1,306 - 3,168), pneumopathy (OR = 1,559; 95% CI: 1,025 - 2,372; p = 0.038), immunodeficiency (OR = 2,833; 95% CI: 1,628 - 4,930; p = 0.001), and kidney disease (OR = 2,262; 95% CI: 1,465 - 3,494; p = 0.001).

Table 2
Clinical and epidemiological outcomes for older patients with evidence for COVID-19, Brazil, EW 34-52.

Characteristic	60-69 year(n = 557)	70-79(n = 533)	80-89(n = 361)	90 over (n = 93)	p-value *
Comorbidities n (%)					
Heart disease	345 (61.9)[d]	359 (67.4)[c]	244 (67.6)	55 (59.1)	0.109
Hematological disease	7 (1.3)[b,c,d]	10 (1.9)[c,d]	2 (0.6)[d]	1 (1.1)	0.392
Hepatic Disease	8 (1.4)[b,c,d]	9 (1.7)[c,d]	1 (0.3)[d]	——	0.159
Asthma	17 (3.1)[b,c,d]	15 (2.8)[c,d]	7 (1.9)[d]	3 (3.2)	0.760
Diabetes mellitus	255 (45.8)[b]	242 (45.4)	140 (38.8)	25 (26.9)	0.001
Neurological disease	13 (2.3)[b]	33 (6.2)[c,d]	28 (7.8)	22 (23.7)	**<0.001**
Pneumopathy	39 (7.0)[b,c]	59 (11.1)[c,d]	41 (11.4)[d]	8 (8.6)	0.069
Immunodeficiency	27 (4.8)[b,c]	18 (3.4)[c,d]	12 (3.3)[d]	1 (1.1)	0.253
Kidney disease	28 (5.0)[b,c]	36 (6.3)[c,d]	28 (7.8)[d]	7 (7.5)	0.368
Obesity	61 (11.0)[b]	41 (7.7)[c,d]	19 (5.3)[d]	3 (3.2)	0.004
Symptoms n (%)					
Fever	324 (55.2)[b,c,d]	238 (47.1)[c,d]	153 (46.1)[d]	41 (51.9)	0.930
Cough	406 (69.2)[b]	338 (66.9)[c]	224 (67.5)	51 (64.6)	0.062
Sore Throat	112 (19.1)[b]	74 (14.7)	36 (10.8)[d]	5 (6.3)	0.002
Dyspnea	451 (76.8)[b,c]	390 (77.2)[c,d]	259 (78.0)[d]	55 (69.6)	0.108
Respiratory Discomfort	404 (68.8)[b,c]	362 (71.7)[c]	247 (74.4)	60 (75.9)	0.069
Diarrhea	101 (17.2)[b,c,d]	77 (15.2)	56 (16.9)	13 (16.5)	0.738
O_2 saturation <95%	46 (7.8)[b,d]	42 (8.3)[c]	36 (10.8)	5 (6.3)	0.108
Vomit	46 (7.8)[b,c,d]	42 (8.3)[c,d]	36 (10.8)[d]	5 (6.3)	0.763
Severity rating					
Mild	107 (19.1)[b,c,d]	86 (16.1)	61 (16.7)	18 (19.2)	**<0.001**
Severe	450 (80.9)[c,d]	447 (83.9)	300 (83.3)	75 (80.8)	**<0.001**

* p<0.05 ANOVA.
a,b,c,dp<0.05 Bonferroni post hoc.

4. Discussion

In this study, we present the clinical and epidemiological characteristics of 1544 Brazilians between 60 and 105 years old, infected by SARS-CoV-2 with proof of RT-PCR test, who died or were cured of the disease, admitted to the ICU between August 16 and December 26, 2020. Based on that, we analyzed variables associated with the increased risk of death for this population. The main conclusions were: (1) the most common comorbidities found were heart disease and Diabetes mellitus, however, the intergroup analysis indicated a statistical difference for kidney disease pneumopathy, while the most frequent symptoms were O_2 saturation <95%, dyspnea, and respiratory discomfort; (2) in the comparison by age groups, the comorbidities Diabetes mellitus, neurological disease, and obesity stood out, and in the symptoms it was sore throat; (3) severe symptoms were found in 74.4% of the older patients, and mild symptoms were present in 60.7% of the population evaluated.

Table 3
Clinical outcomes for older patients with evidence for COVID-19, Brazil, EW 34-52.

Characteristic	Total(n = 1544)	Dead(n = 808)	Cured(n = 736)	p-value*
ICU stay/days median n (IQR)	3 (0-81)	3 (0-76)	3 (0-81)	0.892
Ventilatory support				**<0.001**
Invasive mechanical ventilation	396 (25.6)	39 (4.8)	357 (48.5)	
Non-invasive mechanical ventilation	899 (58.2)	575 (71.2)	324 (44.0)	
Did not use	249 (16.1)	194 (24.0)	55 (7.5)	
Chest X-ray				0.422
Normal	35 (2.3)	14 (1.7)	21 (2.9)	
Interstitial inflated	350 (22.7)	185 (22.9)	165 (22.4)	
Consolidation	69 (4.5)	38 (4.7)	31 (4.2)	
Mixed	62 (4.0)	25 (3.1)	37 (5.0)	
Other	87 (5.6)	41 (5.1)	46 (6.3)	
Unrealized	941 (60.9)	505 (62.5)	436 (59.2)	
RT-PCR				
Nasal/throat swab	402 (26.0)	217 (26.9)	185 (25.1)	0.442
Rapid antigen test	1142 (74.0)	591 (73.3)	551 (74.9)	

Abbreviation: ICU, intensive care unit.

Table 4
Independent risk factors for patient mortality older patients with evidence for COVID-19, Brazil, EW 34-52.

Parameter	OR	Lower (95%CI)	Upper (95%CI)	p-value
Sex	1.369	1.066	1.759	0.014
Age (years)	1.058	1.045	1.071	<0.001
Sore Throat	0.685	0.502	0.934	0.017
Dyspnea	1.865	1.389	2.505	<0.001
Respiratory Discomfort	1.492	1.150	1.936	0.003
O_2 saturation <95%	1.537	1.173	2.015	0.002
Neurological disease	2.035	1.306	3.168	0.002
Pneumopathy	1.559	1.025	2.372	0.038
Immunodeficiency	2.833	1.628	4.930	<0.001
Kidney disease	2.262	1.465	3.494	<0.001

Comparing the group of dead and cured, the proportion of severe cases was 81.2% and 66.9%, of mild events was 73.7% and 46.5%, respectively; (4) ten variables were presented as responsible for the increased risk of death of patients infected with SARS-CoV-2, between 60-105 years.

This retrospective analysis is the first to summarize data on the clinical characteristics of older Brazilian patients admitted to the ICU due to COVID-19, which provided evidence about the last four months of 2020. During the period analyzed, Brazil experienced the decline of the first wave of the pandemic and the rise of the second wave. Our findings brought information about individuals, who lived across 27 states of the country, which together cover 8,516,000 km^2 (IBGE, 2020). The results were consistent with a systematic review and meta-analysis study, which showed that the higher the prevalence of comorbidities, the greater the chance of patients with COVID-19 needing intensive care (Espinosa et al., 2020), especially if the pre-existing disease is hypertension, heart disease, Diabetes mellitus (Du et al., 2020; Altunok et al., 2020), or chronic obstructive pulmonary disease (Mori et al., 2021).

Our findings pointed to heart disease and Diabetes mellitus as the most common comorbidities in the assessed population. On the other hand, the analysis of the odds ratio (OR) indicated that the comorbidities responsible for the increased risk of death were immunodeficiency (183%), kidney disease (126%), and neurological diseases (103%). The results corroborate with a representative study carried out between March and August 2020, which included 9,807 older adult Brazilians residing in a state of the federation (de Souza et al., 2020). The authors pointed out Diabetes (OR 2.33) and chronic kidney disease (OR 2.02) as factors responsible for the increased risk of death by COVID-19 among older adults.

Survival study conducted in Wuhan, China, showed that early detection and effective intervention of renal involvement is able to reduce the deaths of patients with COVID-19 (Cheng et al., 2020). There is evidence that cases confirmed laboratory by COVID-19 in which the patients had kidney disease, these have the worst clinical results than those without complications in the renal system (Guo et al., 2020; Zhou et al., 2020). In addition, patients infected with SARS-Cov-2 and with low immune system function are more predisposed to the adverse effect of increasing the risk of new infections (Lai, Shih, Ko, Tang, & Hsueh, 2020). Our findings on the severity of ICU admission events corroborate the outcomes of current studies, in these, the highest number of severe cases was observed among older patients (Altunok et al., 2020; Zhang et al., 2020), mainly, in those who died (Trecarichi et al., 2020; Sun et al., 2020). In this context, it should be considered that, in the case of the SARS-CoV2 virus, there are different adverse factors that coexist and can rapidly enhance the transition of the infection from a mild to severe state (Guo et al., 2020).

Based on the regression analysis, the present study identified an 86% increase in the chance of death (OR) for patients with dyspnea, 53% for those who had O_2 saturation <95%, 49% for respiratory distress, and 31% for those who had a sore throat. A study with older adult Brazilians identified fever, cough, headache and tiredness as the most common manifestation (de Souza et al., 2020). A meta-analysis study also identified fever, cough, fatigue and dyspnea (Yang et al., 2020), sore throat has been pointed out by studies in China (Du et al., 2020; Guo et al., 2020) and Japan (Mori et al., 2021) as a frequent symptom among patients. In the case of COVID-19, risk factors typical of age are strongly associated with severe cases (Guo et al., 2020; Zhou et al., 2020). The fact has been confirmed by the present analysis, which found an increase of 5% in the patient's chance of death for each year of life, in addition to an increase in the risk of death by 36% depending on sex, in this case men (de Souza et al., 2020; Lithander et al., 2020).

Consistent with previous reports developed in Brazil on the evolution of the pandemic (Cavalcante et al., 2020), and the death of older adults (Barbosa et al., 2020), our results also identified a large number of deaths during the analyzed period. The Ministry of Health's database accounted for 13,913 individuals admitted to the ICU aged between 60 and 105 years. However, only 11.0% of these had undergone any RT-PCR test. This was and continues to be a recurring problem in the management of the fight against the pandemic in Brazil, which does not widely test the population for SARS-Cov-2 (Bastos et al., 2020). The absence of specific tests observed in the present analysis is indicative of the difficulty that the Brazilian healthcare service faces in combating the pandemic (Bastos et al., 2020).

The lack of evidence on severe cases of COVID-19 has hindered the early identification of the disease, and contributes to the increase in the number of medical consultations and hospitalizations for COVID-19. Among the consequences of this, Brazil faces problems such as the lack of beds in ICUs, respirators, oxygen tubes (Boreskie, Boreskie, & Melady, 2020), and more recently including sedatives for patients' intubation. It is concluded that, for the analyzed period, Brazilians between 60 and 105 years old with immunodeficiency, kidney disease, neurological disease and pneumopathy had a high risk of worsening of SARS-CoV-2 infection, followed by death. The results presented can be used to prevent the older Brazilian population from fighting the coronavirus. Another point to be highlighted is the importance of the continued and controlled adoption of preventive treatment of chronic diseases in the older healthy population.

This study had several limitations. First was its retrospective design. S Second, data were collected in an electronic database that did not present patient information about radiological examinations. Therefore, this may have altered the narrative of events. In the case of COVID-19, radiological information is an important prognostic factor to obtain a quick and safe diagnosis (Lithander et al., 2020). Third, the Brazilian Ministry of Health's online system also lacks information on laboratory data. The non-inclusion of these data in the study may have restricted the understanding of the effects of the coronavirus in older Brazilian patients. Laboratory parameters are essential because they help detect the worsening of infectious processes caused by COVID-19. These include serum ferritin, IL-6, D-dimer, C-reactive protein, serum interleukin-6, blood sodium, leukocytes, lymphocyte count, and gamma glutamyl transferase (Trecarichi et al., 2020). Therefore, the interference of these markers may have underestimated the prediction of patient death (Du et al., 2020). Fourth, the number of RT-PCR test results of older patients admitted to the ICU was irregular. For this reason, only 11% of the total older adults ≥60 years old present in the database were included in the study. It is considered that this number of people is not representative for the entire older Brazilian population. Fifth, our analysis did not categorize or control for the social and economic characteristics of the assessed population. This may have influenced the risk factors presented, especially in Brazil, which is a country formed by a great ethnic and cultural diversity.

5. Conclusion

In Brazil, the presence of chronic morbidities such as immunodeficiency, kidney disease, neurological disease, and pneumopathy are associated with an increased potential risk of infection and death of

older adults due to SARS-CoV-2. The most frequent symptoms related to the risk of death in older adults were dyspnea, O_2 saturation <95%, respiratory discomfort, and sore throat. The results presented can be used to improve the treatment of older Brazilian population in the fight against coronavirus, which officially numbered approximately 19 million people.

Declaration of Competing Interest

No potential conflict of interest was reported by the author.

Declaration of Sources of Funding

None

References

Altunok, E. S., Alkan, M., Kamat, S., Demirok, B., Satici, C., Demirkol, M. A., & Turkmen, U. A. (2020). Clinical characteristics of adult patients hospitalized with laboratory-confirmed COVID-19 pneumonia. *Journal of Infection and Chemotherapy*. https://doi.org/10.1016/j.jiac.2020.10.020. xxxx.

Barbosa, I. R., Galvão, M. H. R., Souza, T. A.de, Gomes, S. M., Medeiros, A.de A., & Lima, K. C.de (2020). Incidence of and mortality from COVID-19 in the older Brazilian population and its relationship with contextual indicators: an ecological study. *Revista Brasileira de Geriatria e Gerontologia, 23*(1), Article 200171. https://doi.org/10.1590/1981-22562020023.200171

Bastos, L. S., Niquini, R. P., Lana, R. M., Villela, D. A. M., Cruz, O. G., Coelho, F. C., Gomes, …, & M. F. C.. (2020). COVID-19 e hospitalizações por SRAG no Brasil: uma comparação até a 12ª semana epidemiológica de 2020. *Cadernos de Saúde Pública, 36*(4), 1–8. https://doi.org/10.1590/0102-311x00070120

Boreskie, K. F., Boreskie, P. E., & Melady, D. (2020). Age is just a number – and so is frailty: Strategies to inform resource allocation during the COVID-19 pandemic. *CJEM, 22*(4), 411–413. https://doi.org/10.1017/cem.2020.358

Cavalcante, J. R., Cardoso-dos-Santos, A. C., Bremm, J. M., Lobo, A.de P., Macário, E. M., Oliveira, W. K.de, & França, G. V. A.de (2020). COVID-19 in Brazil: evolution of the epidemic up until epidemiological week 20 of 2020. *Epidemiologia e Serviços de Saúde, 29*(4), Article e2020376. https://doi.org/10.5123/S1679-49742020000400010

Cheng, Y., Luo, R., Wang, K., Zhang, M., Wang, Z., Dong, L., …, & Yao, Y. (2020). Kidney disease is associated with in-hospital death of patients with COVID-19. *Kidney International, 97*(5), 829–838. https://doi.org/10.1016/j.kint.2020.03.005

de Souza, C. D., de Arruda Magalhães, A. J., Lima, A. J. P. D., Nunes, D. N., de Fátima Machado Soares, É., de Castro Silva, L., Carmo, … do, & R., F. (2020). Clinical manifestations and factors associated with mortality from COVID-19 in older adults: Retrospective population-based study with 9807 older Brazilian COVID-19 patients. *Geriatrics & Gerontology International, 20*(12), 1177–1181. https://doi.org/10.1111/ggi.14061

Du, R.-H., Liang, L.-R., Yang, C.-Q., Wang, W., Cao, T.-Z., Li, M., …, & Shi, H.-Z. (2020). Predictors of mortality for patients with COVID-19 pneumonia caused by SARS-CoV-2: a prospective cohort study. *European Respiratory Journal, 55*(5), Article 2000524. https://doi.org/10.1183/13993003.00524-2020

Espinosa, O. A., Zanetti, A.dos S., Antunes, E. F., Longhi, F. G., Matos, T. A.de, & Battaglini, P. F (2020). Prevalence of comorbidities in patients and mortality cases affected by SARS-CoV2: a systematic review and meta-analysis. *Revista Do Instituto de Medicina Tropical de São Paulo, 62*(3), 257–261. https://doi.org/10.1590/s1678-9946202062043

Guo, T., Shen, Q., Guo, W., He, W., Li, J., Zhang, Y., …, & Peng, H. (2020). Clinical Characteristics of Elderly Patients with COVID-19 in Hunan Province, China: A Multicenter, Retrospective Study. *Gerontology, 66*(5), 467–475. https://doi.org/10.1159/000508734

IBGE-Brazilian Institute of Geography and Statistics. (2020). IBGE releases estimate of the population of municipalities for 2020. Retrieved May 19, 2021, from https://agenciadenoticias.ibge.gov.br/agencia-sala-de-imprensa/2013-agencia-de-noticias/releases/28668-ibge-divulga-estimativa-da-populacao-dos-municipios-para-2020#:~:text=O IBGE divulga hoje as,77%25 em relação a 2019.

Lai, C., Shih, T., Ko, W., Tang, H., & Hsueh, P. (2020). Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and coronavirus disease-2019 (COVID-19): The epidemic and the challenges. *International Journal of Antimicrobial Agents, 55*(3), Article 105924. https://doi.org/10.1016/j.ijantimicag.2020.105924

Lithander, F. E., Neumann, S., Tenison, E., Lloyd, K., Welsh, T. J., Rodrigues, J. C. L., Henderson, …, & E., J. (2020). COVID-19 in older people: a rapid clinical review. *Age and Ageing, 49*(4), 501–515. https://doi.org/10.1093/ageing/afaa093

Liu, W., Tao, Z.-W., Wang, L., Yuan, M.-L., Liu, K., Zhou, L., …, & Hu, Y. (2020). Analysis of factors associated with disease outcomes in hospitalized patients with 2019 novel coronavirus disease. *Chinese Medical Journal, 133*(9), 1032–1038. https://doi.org/10.1097/CM9.0000000000000775

Mori, H., Obinata, H., Murakami, W., Tatsuya, K., Sasaki, H., Miyake, Y., …, & Tamura, K. (2021). Comparison of COVID-19 disease between young and elderly patients: Hidden viral shedding of COVID-19. *Journal of Infection and Chemotherapy, 27*(1), 70–75. https://doi.org/10.1016/j.jiac.2020.09.003

Ruan, Q., Yang, K., Wang, W., Jiang, L., & Song, J. (2020). Clinical predictors of mortality due to COVID-19 based on an analysis of data of 150 patients from Wuhan, China. *Intensive Care Medicine, 46*(5), 846–848. https://doi.org/10.1007/s00134-020-05991-x

Sun, H., Ning, R., Tao, Y., Yu, C., Deng, X., Zhao, C., …, & Xu, D. (2020). Risk Factors for Mortality in 244 Older Adults With COVID-19 in Wuhan, China: A Retrospective Study. *Journal of the American Geriatrics Society, 68*(6), E19–E23. https://doi.org/10.1111/jgs.16533

Trecarichi, E. M., Mazzitelli, M., Serapide, F., Pelle, M. C., Tassone, B., Arrighi, E., …, & Torti, C. (2020). Clinical characteristics and predictors of mortality associated with COVID-19 in elderly patients from a long-term care facility. *Scientific Reports, 10*(1), 20834. https://doi.org/10.1038/s41598-020-77641-7

Wang, D., Hu, B., Hu, C., Zhu, F., Liu, X., Zhang, J., …, & Peng, Z. (2020). Clinical Characteristics of 138 Hospitalized Patients With 2019 Novel Coronavirus–Infected Pneumonia in Wuhan, China. *JAMA, 323*(11), 1061. https://doi.org/10.1001/jama.2020.1585

Weinstein, M., & Skinner, J. (2020). Covid-19 — Implications for the Health Care System. *New England Journal of Medicine, 383*(15), 1483–1488.

WHO-World Hearth Organization. (2020). *WHO Coronavirus Disease (COVID-19) Dashboard.*. Retrieved December 30, 2020, from https://covid19.who.int/?gclid=CjwKCAiA57D_BRAZEiwAZcfCxRHv5URZJNhYjx4_LrtXpkEGy0sFFy-p5UsgIVijjUqJdXUKStl-sRoCJvwQAvD_BwE.

Yang, J., Zheng, Y., Gou, X., Pu, K., Chen, Z., Guo, Q., …, & Zhou, Y. (2020). Prevalence of comorbidities and its effects in patients infected with SARS-CoV-2: a systematic review and meta-analysis. *International Journal of Infectious Diseases, 94*, 91–95. https://doi.org/10.1016/j.ijid.2020.03.017. April.

Zhang, J., Dong, X., Cao, Y., Yuan, Y., Yang, Y., Yan, Y., …, & Gao, Y. (2020). Clinical characteristics of 140 patients infected with SARS-CoV-2 in Wuhan. China. *Allergy, 75*(7), 1730–1741. https://doi.org/10.1111/all.14238

Zhou, F., Yu, T., Du, R., Fan, G., Liu, Y., Liu, Z., …, & Cao, B. (2020). Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *The Lancet, 395*(10229), 1054–1062. https://doi.org/10.1016/S0140-6736(20)30566-3

Brasil Ministry of Health. (2021a). Painel Coronavirus. Retrieved March 24, 2021, from https://covid.saude.gov.br/.

Brasil Ministry of Health. (2021b). National Health Council (CONEP). Retrieved February 15, 2020, from http://conselho.saude.gov.br/normativas-conep?view=default.