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BRIEF COMMUNICATION

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Chronic heart diseases as the most prevalent comorbidities among deaths by COVID-19 in Brazil

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ABSTRACT

Age, sex and presence of comorbidities are risk factors associated with COVID-19. Hypertension, diabetes and heart disease are the most common comorbidities in patients with COVID-19. The objective of this study was to estimate the prevalence of patients with comorbidities who died of COVID-19 in Brazil. Searches of data were carried out on the official pages of the 26 State health departments and the federal district. The random-effect method was used to calculate the prevalence of patients with comorbidities who died. From the beginning of the pandemic in Brazil until May 20, 2020, 276,703 cases of COVID-19 were notified in Brazil, 6.4% died, 58.6% of whom were male. The prevalence of comorbidities among deaths was 83% (95% CI: 79 - 87), with heart disease and diabetes being the most prevalent. To our knowledge, this study represents the first large analysis of cases of patients with confirmed COVID-19 in Brazil. There is a high prevalence of comorbidities (83%) among patients who died from COVID-19 in Brazil, with heart disease being the most prevalent. This is important considering the possible secondary effects produced by drugs such as hydroxychloroquine.

KEYWORDS: COVID-19. Prevalence. Deaths. Comorbidities. Brazil. Heart disease. Diabetes.

INTRODUCTION

The coronavirus disease 2019 (COVID-19) pandemic has infected more than seven million people worldwide in 216 countries, and, until Jun 16, 2020, it had caused over four hundred thousand deaths[1]. Its etiological agent is the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), transmitted by contact with an infected person or contaminated fluids[2,3].

A multicenter cohort study showed that gender and advanced age are significantly correlated with COVID-19 and these findings are consistent with the higher incidence among older people and men[4]. Another study observed that the presence of any comorbidity increases the patient's risk of developing respiratory distress, possibly leading to an intensive care unit (ICU) hospitalization and/or death[5,6]. Cardiovascular diseases, diabetes, hypertension, and chronic obstructive pulmonary disease are among the most prevalent comorbidities in COVID-19 cases[7].

In Brazil, the first confirmed case of COVID-19 was reported on February 26, 2020[8], and the first known death was reported 20 days later, on March 17. Until

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June 21, the country had confirmed 1,073,376 cases and 50,182 deaths, with an incidence of 5.08 cases per million inhabitants.

This study aimed to estimate the prevalence of patients with comorbidities that died of COVID-19 in the Brazilian Federative Units.

METHODS

Data were extracted from the bulletin on the epidemiological situation of COVID-19, made available by each of the 26 Brazilian States and the Federal District, on their official websites. The obtained data were evaluated according to the following variables: confirmed cases, ICU hospitalizations and deaths. The epidemiological and clinical profiles of the death's cases were also described, considering sex, age, and the presence and type of comorbidities, respectively.

Because not all States reported the presence of comorbidities in fatal cases, the random-effects model to estimate the pooled prevalence of comorbidities in deaths and their respective confidence intervals (CI) of 95%, was used. The heterogeneity of prevalence was analyzed by State using the Higgins test (I^2), which presents the percentage of variation across them. These analyses were performed using the Stata statistical software, version 12 (Stata Corp LLC, Texas, USA).

RESULTS

Data collection from the official websites of each State Health Department took place from the beginning of the pandemic in Brazil to May 20, 2020. During this period, we found 276,703 reported cases of COVID-19, among which 11,278 (4.8%) were admitted to ICU, and 17,752 (6.4%) cases resulted in deaths.

When analyzing ICU hospitalization percentage by State, Rio de Janeiro (23.3%) and Minas Gerais (19.6%) were the States with the highest prevalences. (Table 1) The States with the highest death percentages were: Rio de Janeiro (10.7%), Para (9.4%), Sao Paulo (7.8%), Pernambuco (8.1%), Amazonas (6.9%) and Parana (5.2%). Table 1 shows the percentages for each State.

Regarding the epidemiological profile of fatal cases, 22 States segregated a total of 7,531 cases by sex, of which 58.6% were male and 41.4% female. The age of the death cases was reported only in epidemiological bulletins of 25 States. From 17,752 cases of death, only in 14,728 (83%) the age was reported, the population over 60 years old was the most affected (71.4%) (Table 1). Conversely, the clinical profile was only reported in 2,116 deaths (12%) from 15 States, 1,768 of which presented comorbidities, resulting in an 83% prevalence (95% CI: 79 – 87) (Table 1).

The clinical descriptions of the comorbidities in the death cases were extracted from the epidemiological bulletins of each State, which reported diseases grouped according to: Chronic Heart Diseases, Diabetes, Chronic Lung Diseases (including Chronic Obstructive Pulmonary Disease and asthma), Chronic Kidney Diseases, Stroke, Hypertension, Obesity, Immunosuppressive Diseases, Chronic Liver Diseases, Cancer, Digestive System Diseases, Pneumonia, Hematological diseases, Tuberculosis, Metabolic Diseases (different than diabetes), Smoking habit, Others (not specified).

Among the cases of death, that showed one or more previous diseases, a total of 14,737 comorbidities were recorded. The most prevalent comorbidities found were: 35% chronic heart diseases, 28.7% diabetes, 8.2% chronic lung diseases (including asthma and Chronic Obstructive Pulmonary Disease), 5.9% kidney diseases, 5.3% stroke, 5.1% hypertension, 4.4% obesity, and 3.8% immunosuppressive diseases (Table 2).

DISCUSSION

To our knowledge, this study represents the first large analysis of cases of sequentially patients with confirmed COVID-19 in Brazil. By June 21, 2020, Brazil was the second country in number of confirmed cases of COVID-19, reporting over a million cases of confirmed COVID-19 and our analysis included approximately a quarter of these cases. As in different parts of the world, a higher prevalence in men and people aged 60 years or in elderly people were found among deaths by COVID-19[9-11].

We found that 4.8% of COVID-19 patients were admitted to ICU, a percentage comparable with a previous study conducted in the United States of America (USA) that analyzed 74,439 COVID-19 patients, among whom 1.4% required ICU[12]. Data collected from 138 patients in China showed that 26% were admitted to ICUs[13]. Thus, States such as Rio de Janeiro and Minas Gerais, with the highest hospitalization percentages in the country (23.3% and 19.6%, respectively), should strengthen measures to avoid the collapse of their hospitals intensive care units.

By June 21, 2020, Brazil has exceeded 50,000 deaths, a mark, so far, reached by only two countries worldwide. Considering that, Rio de Janeiro, Para, Sao Paulo, Pernambuco, and Amazonas, which present higher percentages than that calculated for the overall country, represent a great national concern. When dealing with the COVID-19 pandemic, mortality, as well as establishing priorities for controlling it, is the most important concern.

Table 1 - Distribution of epidemiological and clinical variables from confirmed and deaths cases of COVID-19, according to the State of Brazil, until May 20, 2020.

State	Confirmed	ICUs N	ICUs %	Deaths N	Deaths %	Deaths by age	Deaths > 60 years N	Deaths > 60 years %	Prevalence of comorbidities among deaths	95% CI
AC	2,234	16	0.7	67	3.0	67	42	62.7	76	65 - 85
AL	4,031	N.S.	N.S.	221	5.5	221	145	65.6	N.S.	N.S.
AP	4,310	80	1.9	136	3.2	0	0	0.0	N.S.	N.S.
AM	20,913	190	0.9	1,433	6.9	0	0	0.0	N.S.	N.S.
BA	8,881	N.S.	N.S.	312	3.5	312	210	67.3	86	82 - 89
CE	28,092	646	2.3	1,312	4.7	750	378	28.8	N.S.	N.S.
DF	4,618	121	2.6	66	1.4	62	48	72.7	89	80 - 95
ES	4,412	N.S.	N.S.	172	3.9	172	128	74.4	N.S.	N.S.
GO	1,114	87	7.8	51	4.6	51	37	72.5	65	51 - 76
MA	15,114	N.S.	N.S.	634	4.2	634	476	75.1	86	83 - 89
MT	1,695	48	2.8	32	1.9	32	18	56.3	91	76 - 97
MS	693	11	1.6	17	2.5	17	13	76.5	94	73 - 99
MG	5,286	1,038	19.6	177	3.3	177	133	75.1	90	84 - 93
PA	18,929	304	1.6	1,778	9.4	1,778	1,247	70.1	N.S.	N.S.
PB	5,838	N.S.	N.S.	230	3.9	230	145	63.0	N.S.	N.S.
PR	2,616	78	3.0	137	5.2	137	94	68.6	66	57 - 73
PE	22,560	229	1.0	1,834	8.1	1,834	1,316	71.8	N.S.	N.S.
PI	2,852	139	4.9	91	3.2	91	67	73.6	90	82 - 95
RJ	30,372	7,084	23.3	3,237	10.7	3,237	2,333	72.1	N.S.	N.S.
RN	3,796	137	3.6	170	4.5	169	110	64.7	81	74 -86
RS	4,972	233	4.7	139	2.8	139	118	84.9	94	88 - 97
RO	2,499	N.S.	N.S.	90	3.6	43	28	31.1	82	73 - 89
RR	3,296	N.S.	N.S.	64	1.9	64	36	56.3	47	35 - 59
SC	5,499	107	1.9	94	1.7	94	67	71.3	N.S.	N.S.
SP	65,995	521	0.8	5,147	7.8	4,343	3,315	64.4	N.S.	N.S.
SE	4,277	178	4.2	69	1.6	74	47	68.1	93	84 - 97
TO	1,809	31	1.7	42	2.3	42	5	11.9	N.S.	N.S.
Total	**276,703**	**11,278**	**4.1**	**17,752**	**6.4**	14,770	10,551	71.4	83	79 - 87

Source: The epidemiological and clinical profiles of confirmed and deaths cases of COVID-19 were obtained through the bulletin information on the epidemiological situation of COVID-19, which each Brazilian State makes available on its official websites. ICUs = Patients admitted to intensive care units; 95% CI = 95% confidence interval; N.S. = Not specified. AC (Acre); AL (Alagoas); AP (Amapa); AM (Amazonas); BA (Bahia); CE (Ceara); DF (Distrito Federal); ES (Espirito Santo); GO (Goias); MA (Maranhao); MT (Mato Grosso); MS (Mato Grosso do Sul); MG (Minas Gerais); PA (Para); PB (Paraiba); PR (Parana); PE (Pernambuco); PI (Piaui); RJ (Rio de Janeiro); RN (Rio Grande do Norte); RS (Rio Grande do Sul); RO (Rondonia); RR (Roraima); SC (Santa Catarina); SP (Sao Paulo). SE (Sergipe); TO (Tocantins).

The capacity of the healthcare system thus becomes a major issue, especially considering that the number of confirmed cases in communities is rapidly increasing, as is the case in Brazil.

The pooled prevalence of comorbidities in deaths by COVID-19 in Brazil was 83% (95% CI: 79 – 87). Previous studies conducted in Korea (90.7%) and China (68.2%) warned about a higher prevalence of severe acute respiratory syndrome caused by SARS-CoV-2 among patients with comorbidities[11,14]. They also point hypertension, cardiovascular diseases, and diabetes as the main comorbidities among deaths by the disease. Several studies suggest that hypertension is the most common comorbidity in COVID-19 patients[15]. Likewise, a meta-analysis carried out recently by our team showed that hypertension is the most prevalent comorbidity among deaths from COVID-19 followed by diabetes and chronic heart diseases ranking third[16]. Now, in Brazil we found that the main comorbidities among deaths are chronic heart diseases and diabetes. The third most common comorbidity were the chronic lung diseases, followed by chronic kidney diseases, stroke, hypertension, obesity and immunosuppressive diseases which may include HIV infection and organ transplant patients.

Table 2 - Percentage of comorbidities reported among deaths due to COVID-19 from May 9 to 20, 2020 in Brazil.

Comorbidities	Total	%
Chronic Heart Diseases	5,170	**35.1**
Diabetes	4,233	**28.7**
Chronic Lung Diseases	848	8.2
Chronic Kidney Diseases	871	5.9
Stroke	786	5.3
Hypertension	753	5.1
Obesity	654	4.4
Immunosuppressive Diseases	567	3.8
Chronic Liver Diseases	157	1.1
Cancer	85	0.6
Digestive System Diseases	3	0.02
Pneumonia	7	0.0
Hematological diseases	24	0.2
Tuberculosis	4	0.03
Metabolic Diseases	50	0.3
Smoking habit	8	0.1
Others	162	1.1
Total	**14,737**	**100**

Source: Clinical profiles of confirmed and deaths cases by COVID-19. were obtained through the bulletin information about the epidemiological situation of COVID-19, which each Brazilian state makes available on its official websites.

The epidemiological bulletins of each State do not specify what were the chronic heart diseases of patients who died from COVID-19, although this group may include patients with coronary heart disease, arrhythmias, infarction, patients with pacemakers and others. Our results showed that this group of comorbidities was the most important in the population studied, and this is an important finding, because the Ministry of Health defends the use of hydroxychloroquine for treating COVID-19. A recent study claims that some cardiac manifestations, such as cardiac arrhythmias, and even conduction disorders without repercussion, may represent the initial manifestations of toxicity related to chloroquine or hydroxychloroquine[17]. Therefore, the use of these drugs can lead to serious complications and even death in patients with previous heart disease. On the other hand, the use of these drugs as post exposure prophylaxis (PEP), has also proved unsuccessful[18].

Some difficulties to develop this study were found. Firstly, not every Health Department updates their epidemiological bulletins daily, so the updating of data on a daily basis was unfeasible. Secondly, the epidemiological bulletins were not standardized, not all of them provide epidemiological data such as age, nor clinical data such as the presence of comorbidities, which impaired the collection of complete data. Thirdly, many epidemiological bulletins provide information only as graphics and the absolute numbers were lacking, hampering data replication. Finally, each Secretariat reported different age groups, which impaired the comparisons among them.

We concluded that there is a high prevalence of comorbidities among deaths by COVID-19, affecting mainly men aged over 60 years. The group of chronic heart diseases and diabetes were the main comorbidities among these patients and this is relevant considering the possible adverse effects produced by drugs such as hydroxychloroquine. On the other hand, we recommend conducting studies based on medical records analyzes, with the purpose of knowing specifically the proportion of each heart disease in patients affected by COVID-19.

Acknowledging such factors may help to better defining the risks of death among these COVID-19 patients, enabling a more targeted and specific approach to avoid probable deaths. In a scenario without effective antivirals or vaccines available, governments should apply continuous countermeasures for different pandemic situations to reduce mortality, especially in States with high percentages of ICU hospitalization and deaths.

AUTHORS' CONTRIBUTIONS

JP, AJSA, GTS, BTA, MSMA and FGL contributed to data collection and analysis, and drafting the first version of the manuscript; ADSZ and OAE contributed to study conception and design, data analysis and interpretation, and writing the final version of the manuscript. All authors approved the final version of the manuscript and declared themselves responsible for all aspects of the work, guaranteeing their accuracy and integrity.

CONFLICT OF INTERESTS

The authors declare no conflict of interests.

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