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Original Research Article

COVID-19: epidemiological data of 1263 patients from southern Minas Gerais, Brazil

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ABSTRACT

Background: COVID-19 is an easily contagious and high-speed viral disease that is directly affecting people's lives and exposing the fragility of health systems around the world, especially in Brazil. In this context, the present research sought to observe, through medical records, the conduct of positive patients with COVID-19.
Methods: The methodology used was the analysis of medical records of patients with COVID-19 in five hospitals in Minas Gerais. The following data were collected from patients who were hospitalized from March 2020 to October 2020: personal characteristics; pathological antecedents and evolution of the clinical picture.
Results: The results found describe the number of patients in each of the analysed hospitals. In addition, the predominant age, the sex of the patients in percentage, the number of patients with subarachnoid hemorrhage (SAH), chronic obstructive pulmonary disease (COPD), diabetes, dyslipidemia, altered D-dimer, anemia and hematologic change are described. Intensive care unit (ICU) and ward admissions are also addressed, as well as the type of respiratory complication, percentage of individuals who required intubation, intubation time and outcome. The results were used in statistical analysis for the association between variables with the Chi-square test to verify the significance between them. The outcome was compared with age, sex, diabetes, dyslipidemia, D-dimer biomarker, anemia, hematological changes and type of hospitalization. With the type of hospitalization, diabetes and dyslipidemia were compared.
Conclusions: Faced with all this context of public health urgency, this work helps in the standardization of variables to collaborate in the fight against this giant and persistent virus that public health is trying to fight.

Keywords: COVID-19, Epidemiology, Minas Gerais, Pandemic, D-dimer, Diabetes

INTRODUCTION

Brazil faces the COVID-19 pandemic with many lives lost (04 October 2021), with 598,152 accumulated deaths and 21,478,546 confirmed cases. Of the confirmed cases, 8,398,850 are from the Southeast – along with 283,865 deaths.[1] The unified health system (UHS), one of the largest public health systems in the world, has difficulties in controlling the disease and the tragedy that befell the country. In addition to this problem, viruses with high rates of spread can mutate, as has been shown in late 2020 and in 2021, with new variants of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) detected in the United Kingdom, South Africa, Brazil, among others.[2]

Patients with COVID-19 are the main source of infection, respiratory droplets and contact transmission are considered the main routes of transmission. As this is an

emerging infectious disease, people of all races and ages are susceptible. In addition, older adults and people with underlying diseases such as asthma, diabetes, cardiovascular disease and cancer may be more susceptible to SARS-CoV-2 – smoking and obesity also contribute to susceptibility.[2] The most common symptoms of this disease are: fever, dry cough and fatigue. Less common symptoms are: loss of taste or smell, nasal congestion, conjunctivitis, sore throat, headache, muscle or joint pain, different types of skin rash, nausea or vomiting, diarrhoea, chills or dizziness. When severe, the most common symptoms are: shortness of breath, loss of appetite, confusion, persistent pain or pressure in the chest, and high temperature (above 38°C). Other less common symptoms are irritability, confusion, reduced consciousness (may be associated with seizures), anxiety, depression, sleep disturbances, more serious and rare neurological complications such as stroke, brain inflammation, delirium, and nerve damage.[3]

Southeast is the most affected region in Brazil, with 8,398,850 confirmed cases and 283,865 deaths - of these 2,148,756 confirmed cases and 54,722 deaths are from Minas Gerais. COVID-19 in the south of Minas Gerais, Brazil.

The objective of this study was to know the epidemiological profile and the clinical outcomes in the Brazilian population in order to understand the behaviour of the SARS CoV-2 virus and, through these data, to be able to know the patients with more unfavourable outcomes in order to establish better prevention and treatment.

METHODS

As it is exclusively observational research, the methodology used in the work was a systemic analysis of data from the previously selected patients' medical records, being used for the collection mechanism, the platform adopted in the hospitals, so that any analysis carried out of the medical records dismissed the contact with the patient.

The records were from five regional hospitals in the south of Minas Gerais, and the start date of data collection was different due to the bureaucratic process to be respected in each of these institutions. Santa Casa de Misericórdia de Passos was the first institution to authorize the work to be carried out, allowing data to be collected from November 2020 to March 2021. In Varginha, medical records from three hospitals were analysed, namely: Humanitas Hospital with start of collection in January 2021 and end in March 2021; Regional Hospital starting in February 2021 and ending in April 2021; and Bom Pastor Hospital, started in January 2021 and ended in February 2021. At the Samuel Libânio Hospital in Pouso Alegre, due to the longer time spent in the authorization process, it was the last institution to be analysed, with collection starting in April 2021 and ending in June 2021.

The sampling method of the present study was by convenience. All patients with diagnosis of COVID confirmed by polymerase chain reaction (PCR) test and tomography image with a pattern suggestive of COVID were used in the study. And the sample exclusion criteria were: flu-like symptoms without computed tomography (CT) alteration; negative PCR test for COVID; and patients diagnosed with COVID, but with outpatient treatment. This analysis, however, was performed on patients over 20 years of age who met the inclusion criteria. Another factor to be considered is the time interval in which the hospitalizations of patients were analysed, with all hospitalizations being recorded in these hospitals, respecting the aforementioned criteria, which occurred at the beginning of the pandemic in March 2020 until October 31, 2020 Thus, the data collected coincide with epidemiological conditions prior to mass vaccination of the population.

The data collected referred to the characteristics of the patients; pathological personal history; type of hospitalization; treatment used against COVID-19, according to the protocol of local care; and the evolution of the clinical picture, being researched in this last part if there was a need for hemodialysis, if there were any hematological complications, respiratory complications and, in case of need for mechanical ventilation, the time used. Ultimately, the patient's outcome was also collected: cure or death.

Regarding the characteristics of the patients, the patient's gender and age were taken into account, the latter being classified into three groups: the first group between 0 and 13 years old; the second between 14 and 19; the third between 20 and 40; the fourth between 41 and 60; and finally, the group over 60 years old. Blood type, according to the ABO system and Rh factor were also consulted, but most of the medical records lacked this information.

The type of hospitalization was divided according to the internal classification of each hospital: ward and intensive care unit (ICU).

The personal pathological antecedents or previous comorbidities of the patients that were analyzed were: systemic arterial hypertension; type 1 diabetes mellitus; type 2 diabetes mellitus; dyslipidemia; chronic obstructive pulmonary disease (COPD); chronic renal failure; asthma; cancer in general; heart diseases; and a space for "others" for less common pathologies of great relevance to the study.

Regarding to the evolution of the clinical picture, the first step to be investigated was the existence of hematological complications, the options available were: anemia; leukopenia; thrombocytopenia; thrombocytosis; leucocytosis; D-dimer alteration; "other" and "none". The second stage was respiratory complications: use of non-invasive ventilation; use of mechanical ventilation (MV) for more than 10 days in prone position; use of MV for less

than 10 days without pronation; use of MV for more than 10 days without pronation; use of MV for less than 10 days with pronation; and no complications. In case of mechanical ventilation, the time of intubation was investigated separately, divided into four groups: up to 10 days; between 11 and 20 days; between 21 and 30 days; and more than 31 days of intubation. The third step was the need for hemodialysis, while the fourth was the patient's outcome.

However, due to the lack of standardization of hospitals when filling in the medical records and the difficulty in quantifying certain data, some information was collected and not used in the study. Therefore, the data that were selected to remain and that could pass a greater degree of reliability, due to the greater degree of standardization, were: patient age; patient's sex; previous diagnosis of hypertension; previous diagnosis of COPD; previous diagnosis of diabetes (without specification as to type); previous diagnosis of dyslipidemia; tocilizumab treatment; anticoagulant treatment; treatment with antivirals; corticosteroid treatment; treatment with ivermectin; fostair treatment; colchicine treatment; antibiotic treatment (divided into macrolides, beast-lactams, quinolones, glycopeptides, sulpha group, lincosamides and tazocin); D-dimer alteration; presence of hematological complications; type of hospitalization; presence of respiratory complications and, in case of MV, the intubation time.

Statistical analyzes were performed using the Chi-square method and sought the association between two variables, adopting the p value lower than 0.05, the variables are significantly associated.

RESULTS

The results found describe the main characteristics of patients hospitalized with COVID-19, pre-existing diseases, the main characteristics during the hospitalization period and the outcome. A total of 1263 patients admitted to the 5 hospitals were catalogued and investigated.

Table 1 shows the number of patients in each of the five hospitals analysed, the predominant age – being it in groups (e.g. elderly (over 60 years old)) - and the patients' gender in percentage.

Table 2 informs the number of patients in each of the five hospitals analysed, as well as the total number of patients, and the main pre-existing diseases: SAH; COPD; diabetes; dyslipidemia; altered D-dimer; anemia; and hematologic change. The number of patients with each of these diseases is informed.

During the COVID-19 patients hospitalization process, the main characteristics and outcome in the five hospitals surveyed were listed. Such information is shown in Table 3, organized by hospital, type of hospitalization (ICU or ward), type of respiratory complication, percentage of individuals who required intubation, intubation time and outcome.

In the statistical analysis performed for the association between the variables, the Chi-square test was used to verify the significance between them. In the association between age and outcome, the variation in age was significant, the higher the age, the more severe the outcome (p=0.000).

Table 1: Main characteristics of patients hospitalized with COVID-19.

Hospitals	Number of patients	Predominant age (years old)	Gender %	
			Male	Female
Bom pastor	21	Elderly (over 60)	57.14	42.86
Santa casa de passos	268	Elderly (over 60)	57.83	42.17
Humanitas	87	Adults 2 (40-60) and elderly (over 60)	59.77	40.23
Regional	69	Elderly (over 60)	47.82	52.18
Hospital das clínicas samuel libânio	818	Elderly (over 60)	54.52	45.48

Table 2: Main pre-existing diseases.

Hospitals	Patients	HAS	DPOC	DM	Dislipidemia	Altered d-dimer	Anemia	Hematologi-cal change
Bom pastor	21	13	1	10	2	4	18	19
Santa casa de passos	268	155	26	89	33	156	126	231
Humanitas	87	40	9	22	21	44	21	61
Regional	69	45	3	29	7	56	48	68
Hospital das clínicas samuel libânio	818	482	75	256	94	355	438	681
Total	1263	735	114	406	157	615	651	1060

SAH: Systemic arterial hypertension; COPD: chronic obstructive pulmonary disease; DM: diabetes mellitus.

Table 3: Main characteristics during the hospitalization period and outcome.

Hospitals	Type of hospitalization %	Type of respiratory complication %	Intubation %	Intubation time %	Outcome %
Bom pastor	ICU: 61.9 Ward: 38.1	Mechanical ventilation with pronation: 9.52 Mechanical ventilation without pronation: 33.33 NVI: 90.47	38.09	Up to 10 days: 28.57 10-20 days: 4.76 20-30 days: 4.76	Cure: 23.80 Death: 47.61 Unknown: 28.57
Santa casa de passos	ICU: 52.98 Ward: 47.02	Mechanical ventilation with pronation: 12.31 Mechanical ventilation without pronation: 12.68 NVI: 54.10	24.62	Up to 10 days: 7.08 10-20 days: 13.05 20-30 dias: 3.73 Over 30 days: 0.74	Cure: 80.22 Death: 19.40 Unknown: 0.37
Humanitas	ICU: 35.63 Ward: 64.37	Mechanical ventilation with pronation: 8.04 Mechanical ventilation without pronation: 11.49 NVI: 59.77	18.39	Up to 10 days: 16.09 10-20 days: 2.29	Cure: 94.25 Death: 5.74
Regional	ICU: 56.52 Ward: 43.48	Mechanical ventilation with pronation: 27.53 Mechanical ventilation without pronation: 8.69 NVI: 86.95	36.23	Up to 10 days: 14.49 10-20 days: 15.94 20-30 days: 5.79	Cure: 60.86 Death: 34.78 Unknown: 4.34
Hospital das clínicas samuel libânio	ICU: 27.62 Ward: 72.38	Mechanical ventilation with pronation: 5.62 Mechanical ventilation without pronation: 15.89 NVI: 58.55	24.57	Up to 10 days: 16.38 10-20 days: 4.40 20-30 days: 2.20 Over 30 days: 1.58	Cure: 69.68 Death: 30.31
Total	ICU: 35.70 Ward: 64.30	Mechanical ventilation with pronation: 8.47 Mechanical ventilation without pronation: 14.80 NVI: 59.77	25.01	Up to 10 days: 14.48 10-20 days: 6.73 20-30 days: 2.61 Over 30 days: 1.18	Cure: 72.36 Death: 26.84 Unknown: 0.79

NIV: Non-invasive ventilation.

When researching the patients' gender compared to the outcome in COVID-19, men and women have the same chances of cure and death (p=0.115).

When diabetes was evaluated, this condition was significant for more severe outcomes, such as death (p=0.002). Diabetic patients are also hospitalized in the ward and ICU, and this condition is not associated with the type of hospitalization (p=0.092).

In the association between dyslipidemic patients and the outcome, it was found that there was no relationship between these variables (p=0.067). Dyslipidemic patients were mostly hospitalized in wards, showing a lower probability of these patients being admitted to the ICU (p=0.29).

In the biochemical evaluations, the D-dimer biomarker was analysed, which in association with the patients' outcome was not significant (p=0.597). When analyzing the presence of anemia in hospitalized patients, an association was found between the presence of anemia and a higher occurrence of death (p=0.000). Hematological changes led patients to worse outcomes, such as death, significantly influencing this parameter (p=0.000).

The type of hospitalization influenced the outcome of the patients, with patients admitted to the ICU having a higher percentage of death (p=0.000).

DISCUSSION

The number of patients investigated in this research is adequate to infer the epidemiological characteristics of those infected by COVID-19 in the south of Minas Gerais, Brazil in the pre-vaccine period. The pre-vaccine period is important to know the characteristics of individuals most susceptible to aggravation during SARS CoV-2 infection.

The statistical analysis performed with the data collected in this research demonstrates that both age and previous comorbidities are determining factors in the prognosis of patients infected with SARS-CoV-2. While the patient's sex, however, was not a variant with a potential determining factor to influence the clinical evolution of the disease, diverging from other studies already published.

Regarding the age group of the patients studied, it was observed that the proportion of an unfavourable clinical course and death increases exponentially with older age. Although this research classifies the last age group of patients aged 60 years or older, not stratifying them into higher age groups, our study coincides with another research on the prognosis of these patients.[4]

Among this information, it is interesting to highlight that the group of patients between 60 and 89 years old is where most of the deaths resulting from COVID-19 are concentrated. This is explained because, in addition to the compromise of the immune system, this group of patients is more related to comorbidities such as heart disease and diabetes, which together with age are strong determinants of poor prognosis.[5]

Another significant piece of information, based on World Health Organization (WHO) data, is that in groups of individuals over 80 years of age, the number of deaths tends to drop dramatically. This data, however, should not be interpreted as a low rate of fatality of COVID-19 in these individuals, but that in this age group the number of individuals is reduced, making the number of deaths insignificant in absolute terms.[2]

A second point to be considered in this research, which differs from other studies, is that there was no significant difference in the outcome of the disease between males and females. Both presented the same chances of cure and death, considering the same age group, being a characteristic of the investigated region. The observational study carried out by Mercês et al identified that males have a more expressive chance of progressing to death due to social differences, since it is known that men seek health services less than women, which would harm not only the monitoring of COVID-19 as well as previous comorbidities; and also due to genetic and hormonal determinants, such as the greater presence of the angiotensin converting enzyme-2 (ACE-2) enzyme, to which the coronavirus binds, providing greater success in an infection.[6]

In relation to pre-existing comorbidities, diabetes mellitus is one of the most determining factors for the unfavourable outcome of these patients, being the second most common disease associated with poor prognosis, after cardiovascular diseases.[7]

In the present study, it was clear that diabetic patients are more likely to have an unfavourable outcome, with death being the most common outcome in this observed group. In addition to this information, it is worth noting that diabetic patients, as well as hypertensive patients, also have a greater susceptibility to acquire the infection by the coronavirus. One of the explanations would be drugs that inhibit angiotensin-converting enzyme and stimulate the production of ACE-2 are used in the treatment of both comorbidities.[8]

There are several important mechanisms that explain how diabetes can interfere with the course of a wide variety of infections, including COVID-19. It can be highlighted; therefore, that immunological dysregulation, alveolar and endothelial dysfunction, increased systemic coagulation, decreased T cell function and increased susceptibilities to hyperinflammation are the main mechanisms that put individuals with diabetes at greater risk of developing diabetes seriousness.[9]

In a systematic review by Arruda et al, it was shown that patients admitted to the ICU have a greater chance of having an underlying comorbidity compared to the group of patients treated in the ward. In the present study, however, it was demonstrated that when the analysis is focused solely on the diabetic patient, there was no significant difference in the type of hospitalization, ICU or ward. This type of patient was found in similar numbers in both hospitalization groups.[10]

Dyslipidemias are disorders in the metabolism of lipoproteins in blood and are classified as hyperlipidemias and hypolipidemias.[11] They are listed in the list of risk factors that increase the likelihood of complications in the course of COVID-19.12 Several studies indicate that patients with dyslipidemia infected with SARS -CoV-2 become seriously ill and can progress to a critical condition and even death. High levels of low-density lipoprotein (LDL) and triglyceride (TG) promote endothelial damage, activate macrophages that trigger the activation of a cytokine storm that triggers pulmonary embolism.[13] However, according to the data obtained in the study in question, it can be seen that the fact that the patient is dyslipidemic, alone, did not generate a greater outcome of ICU admission. It was identified that most dyslipidemic patients remained hospitalized in the ward, and the smallest part of them required ICU.

Another important fact is anemia. Anemia reduces the oxygen supply to tissue and may play an important role in the development of multiple organ failure. In this context, it is essential to understand the relationship between anemia and the progression of COVID-19.[14]

Several studies describe the worsening of the outcome of respiratory diseases in patients with anemia, which is even associated with increased mortality in patients with respiratory diseases. Patients with COVID-19 often have lower airway disease, although involvement of other organ systems is also related.[15]

The collected data by the present study, it was identified that, of the total of 1263 patients evaluated, 651 patients had anemia, and 1060 patients had some hematological alteration. These two groups had a worse clinical outcome than the others. When SARS-CoV-2 reaches the lung tissue, it triggers an intense inflammatory process, releasing exaggeratedly cytokines that result in a state of hypercoagulability through several procoagulant pathways in patients infected by the virus, causing an increase in

thrombotic events in them. Thus, D-dimer has gained importance in the evaluation of these cases as a parameter of severity and diagnosis of pulmonary thromboembolism (PTE) or microvascular thrombosis of the lungs as complications of COVID-19. However, the evolution of the patient with hypoxia and increasing levels of D-dimer justify the performance of more specific tests to indicate hypercoagulability, since only the altered D-dimer does not indicate PTE, being responsible for the alteration of the propaedeutics for full anticoagulation and highlighting a worse prognosis.[16,17]

Monitoring different laboratory patterns such as fibrinogen, activated partial thromboplastin time, prothrombin time and D-dimer can better assess the levels of hypercoagulability in hospitalized patients with COVID-19. In this work, the D-dimer was used as a parameter to verify if its increase was correlated with the most severe cases and consequently deaths. However, in view of the statistical analysis, changes in the D-dimer biomarker did not influence the severity of the outcome in patients admitted to hospitals in the south of Minas. It is important to report that this marker is a very broad endothelial marker, which can be altered in several conditions such as peripheral vascular disease, pregnancy, cancer and any type of inflammatory disease, which may have influenced this non-direct correlation of those infected with more severe conditions. So, this isolated laboratory marker does not guarantee a worse prognosis in patients with COVID-19, in order to change the workup, more detail is needed with other more specific tests.[18,19]

Hematological manifestations, such as thrombocytopenia, lymphopenia and eosinopenia, have prognostic significance in the context of COVID-19, however, few data are available on the prevalence and importance in cases of COVID-19. hematological tests to define their carriers as more susceptible to worse outcomes when infected with SARS-CoV-2.

In a systematic review carried out in Argentina with 75,607 patients to identify prognostic factors of severity and mortality in those infected with COVID-19, 3676 patients with thrombocytopenia and lymphopenia were identified. Patients with a low platelet count had a 14.3% increase in mortality, and patients who had a decreased lymphocyte count had a 17.1% increase in mortality.[21]

In the present study, patients who presented hematological alterations resulted in worse outcomes. Of a total of 1263 patients evaluated, 1060 had some hematological alteration (thrombocytopenia, lymphopenia, among others), of which 284 died.

Most SARS-CoV-2 infections are not serious, most are asymptomatic or oligosymptomatic. However, 20% of cases require hospitalization, resulting in 3% of deaths. Of these hospitalizations, 25% are still critical cases requiring intensive care and high lethality, with 60% being the mortality rate of this second group.[22,23] Thus, since this rate varies by region, due to cultural differences, different care protocols and regarding aspects of hospitalization, such as age, comorbidities, among other characteristics, this factor was integrated into our research and, as can be seen in Table 3, 64.30% were patients who stayed in the ward and 35.70% were patients admitted to the ICU. Of the patients requiring intensive hospitalization, 52.32% died, showing a worse outcome. These results corroborate a study carried out in China that showed patients admitted to the ICU with reports of myocardial injury with elevated troponin levels ranging from 22 to 31% and only from 7 to 17% in ward patients, showing a significant relationship of worse outcome. with the type of hospitalization.[24] A study was also carried out in a private hospital in Rio de Janeiro that revalidates these data, with 36% of patients admitted to the ICU with myocardial injury and elevated troponin, resulting in a worse prognosis.[25] The increase in ICU admissions It is especially worrying because, according to these published data and old data that had already been published, more than half of the hospitalizations result in deaths, a significant number that needs to be evidenced.

Faced with this pandemic scenario, health care institutions, today moves to control this emergency of great international concern, promoting safety measures, new protocols and intensifying researches focused on this topic. Research that identifies these patterns is extremely important to assist in carrying out protocols with a clearer focus on local standards and more specialized care for the population.

As for the limitations, since this was a cross-sectional cohort study, the research was conducted at a single point in time, limiting the results to the moment studied and the sample researched.

CONCLUSION

Thus, we conclude this study with results from the population of the south of Minas, also correlating the most present comorbidities in the cases that were more severe, to direct priority care and a more efficient overall outcome. Age and pre-existing comorbidities are determining factors in the prognosis of patients with COVID-19. Older age, the presence of anemia, hematological changes and diabetes mellitus are predisposing factors to greater severity and a consequent increase in deaths. Thus, individuals with these comorbidities need greater care, and it is necessary to create public policies for special care for this enrolled population.

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