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Original Article

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Epidemiological analysis of COVID-19 in the state of Minas Gerais

Análise epidemiológica do COVID-19 no estado de Minas Gerais

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Abstract

Introduction: The Coronavirus pandemic has affected several countries in the world in a short period. It was first identified in Brazil in February 2020 and, since then, the number of cases and deaths has increased considerably. Thus, understanding the population profile of the disease in terms of locations and vulnerabilities is necessary for specific epidemiological control. **Objective:** To describe the epidemiological profile of COVID-19 in the state of Minas Gerais from March to October 2020. **Methods:** Quantitative, descriptive, documentary study with a comparative-statistical procedure. Data about confirmed cases and deaths of SARS-CoV-2 in the state were collected from epidemiological bulletins made available by the Minas Gerais State Department of Health through the Coronavirus Minas Gerais platform. **Results:** 346,310 cases of COVID-19 were registered, with a higher prevalence in females (51%) and in the age group of 30 to 39 years (24.3%). As for deaths, 8,916 were confirmed, more frequently in men (57%) and people over 60 years old (79.52%), with the most common comorbidities being heart diseases (n = 4,259 / 47.77%) and diabetes (33.28%). **Conclusions:** Prevalence of cases in females and the age group between 30 and 39 years, while deaths were more frequent in men and the age group above 60 years. Still, it was possible to visualize the relationship between public policies and the numbers of infections and deaths, reinforcing the need to adapt and direct strategies for the control of COVID-19 in the state.
Keywords: coronavírus; epidemiology; pandemic.

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Resumo

Introdução: A pandemia do Coronavírus afetou diversos países ao redor do mundo em um curto espaço de tempo. Foi identificado pela primeira vez no Brasil em fevereiro de 2020 e, desde então, o número de casos e de óbitos aumentou consideravelmente. Assim, compreender o perfil populacional da doença quanto às localidades e vulnerabilidades faz-se necessário para um controle epidemiológico mais específico. **Objetivo**: Descrever o perfil epidemiológico do COVID-19 no estado de Minas Gerais no período de março a outubro de 2020. **Métodos:** Estudo quantitativo, descritivo, de base documental com procedimento comparativo-estatístico. Os dados acerca dos casos e óbitos confirmados de SARS-CoV-2 no estado mineiro foram coletados a partir dos boletins epidemiológicos disponibilizados pela Secretaria de Estado de Saúde de Minas Gerais pela plataforma Coronavírus Minas Gerais. **Resultados:** Foram registrados 346.310 casos de COVID-19 no período, com maior prevalência no sexo feminino (51%) e na faixa etária de 30 a 39 anos (24,3%). Quanto aos óbitos, 8.916 foram confirmados, com maior frequência em homens (57%) e em pessoas com mais de 60 anos (79,52%), sendo as comorbidades mais presentes as cardiopatias (47,77%) e o diabetes (33,28%). **Conclusões:** Verificou-se prevalência de casos no sexo feminino e na faixa etária entre 30 e 39 anos, enquanto os óbitos foram mais frequentes em homens e na faixa acima de 60 anos. Ainda, foi possível visualizar a relação das políticas públicas com os números de infecções e de mortes, reforçando a necessidade de adequação e direcionamento de estratégias para o controle do COVID-19 no estado.
Palavras-chave: coronavírus; epidemiologia; pandemia.

Introduction

COVID-19 is a respiratory disease, caused by the SARS-Cov-2 virus, initially identified in Wuhan, China, in 2019[1]. Its transmission occurs through oral/fecal contagion, that is, by contact with droplets from infected individuals during speech or sneezing and with surfaces and objects contaminated by the virus[2]. It has different clinical manifestations, and the asymptomatic form is responsible for approximately 80% of cases[1].

Clinical manifestations range from milder conditions, with the presence of fever, tiredness, cough, to more critical situations such as breathing difficulties, as well as systemic symptoms similar to sepsis, which can evolve to shock and generate a multiple organ dysfunction syndrome[3]. The worsening of the disease is directly related to age and the presence of comorbidities, especially cardiac, metabolic, and respiratory diseases[4]. In these cases, patients need hospital support due to respiratory and hemodynamic complications, in which the main evolution is severe acute respiratory failure[5].

Since its emergence, the infection has spread in the short run to more than 120 countries worldwide, including Brazil. The high transmissibility of the disease, added to the large contingent of international trips made daily, enabled the spread of COVID-19 across the globe, being officially characterized, on March 11, 2021, as a pandemic, and even today it is considered a threat to global public health, especially in countries where plans to contain the transmission of the disease have not been successful[6,7].

The oceanic separation of the American continent from Asia delayed the arrival of the virus in the Americas, although the United States reported the presence of COVID-19 much earlier than South and Central Americas, given a large number of travelers it receives every day[8]. Yet, although European countries were among the first ones to be affected by the disease, in addition to having the first outbreaks by COVID-19, as occurred in

Italy and France, the United States and Brazil are today the epicenter of the new coronavirus, presenting the highest number of cases and deaths recorded worldwide[9].

In Latin America, the first case was confirmed in February 2020, when the Brazilian Ministry of Health (MS) registered the case of a 61-year-old Brazilian man, who returned from a trip to Italy, a region where an outbreak of the disease occurred at the time[10]. Since then, there has been high contamination rates in the national territory, and with one month of the first case, Brazil already registered more than 2 thousand cases and 77 deaths by COVID-19 confirmed, in addition to all the states presenting cases of the infection[2, 10].

The epidemiological control adopted by the country did not adhere to the mass testing method that was the international standard. By the end of August 2020, more than 24 million cases of COVID-19 have been confirmed worldwide. During this period, Brazil accumulated a total of 3,846,156 cases, behind the United States with 5,917,439 records[1]. In that period, Brazil tested 4,110.47/100 thousand inhabitants, with 2,218.29 tests/100 thousand inhabitants were applied by the state of Minas Gerais[11]. Today, the state of Minas Gerais is among the states of the federation that most register cases and deaths from the disease in 2021[12].

Thus, it appears that the current course of the pandemic in the country dynamically updates control parameters, epidemiological profile, locations, and aspects of vulnerability[13]. In this sense, it is necessary to understand the affected population profile and the availability of health resources to face this disease and to foster more specific epidemiological control[14].

Therefore, the present study aimed to describe the epidemiological profile of cases and confirmed deaths of COVID-19 in the state of Minas Gerais, from March to October 2020.

Methodology

This is a retrospective, descriptive, quantitative study, based on documents with a comparative statistical procedure. The sample consisted of all the confirmed cases and deaths of SARS-Cov-2 in the state of Minas Gerais, from March to October 2020.

Data collection took place in October and November 2020 through the use of epidemiological bulletins, made available by the Health Secretary of the State of Minas Gerais, at http://coronavirus.saude.mg.gov.br.

The study included the following variables: age group, sex, comorbidities, the evolution of cases, mortality rate, lethality rate, and place of residence. The latter was selected in the health macro-regions (North, Northwest, North Triangle, South Triangle, South, West, Center South, Southeast, East South, Center, Vale do Aço, East, Jequitinhonha, and Northeast).

To calculate the mortality rate of COVID-19 in the state of Minas Gerais per 100 thousand inhabitants, the number of confirmed deaths in the state divided by the total population was used and multiplied by 100 thousand inhabitants considering a projection made by the Brazilian Institute of Geography and Statistics (IBGE) for 2020. Regarding the lethality rate, the number of deaths from the disease was divided by the total number of confirmed cases multiplied by 100.

Data were managed and dissipated using simple descriptive statistics using Microsoft Office Excel 2010 software and

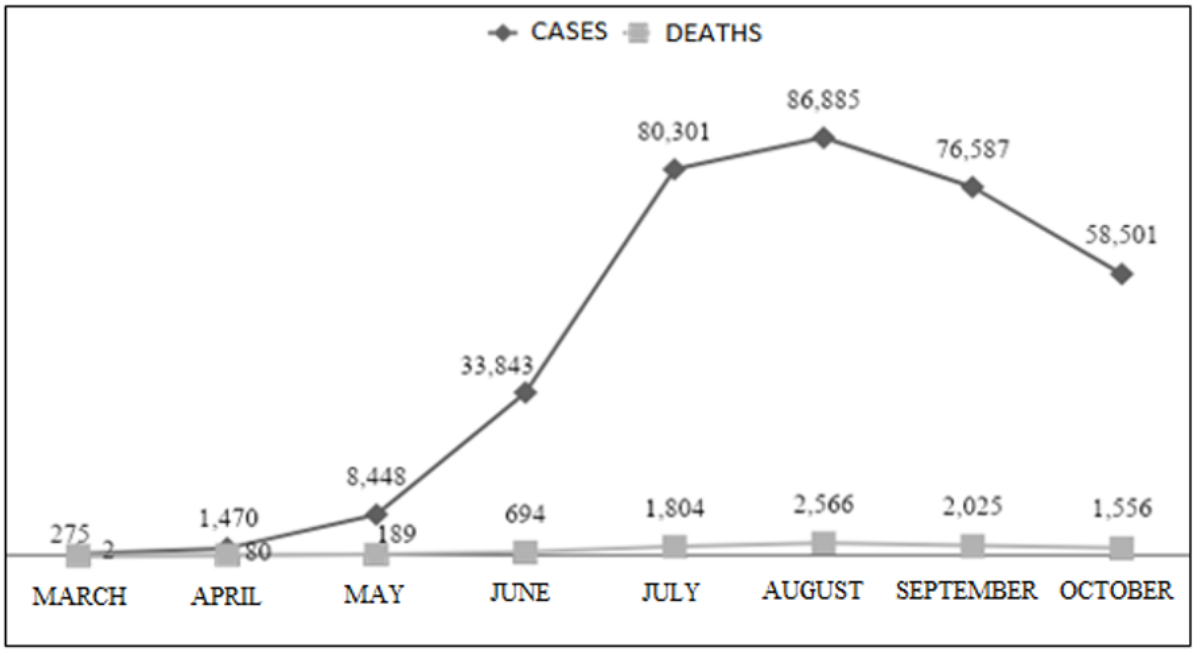
the Statistical Package for the Social Sciences (SPSS) for Windows, version 25 (Chicago, IL, USA).

According to Resolution 466/12 of the National Health Council, the present study did not require evaluation and approval by the Research Ethics Committee, once it is a study based on secondary data of public domain and access, and because there is confidentiality about the identification of patients involved.

Results

In the period analyzed, from March to October 2020, a total of 346,310 cases of COVID-19 were reported in the state of Minas Gerais, being associated with 8,916 confirmed deaths. The number of cases ranged from 275 to 86,301, with an average of 43,288.35 cases/month. There was a linear increase in the number of confirmed cases between March and August (31.495%), with a gradual decrease between August and October (32.67%). The month with the highest number of cases was August (n = 86.885 / 25.09%) and the lowest was March (n = 275 / 0.08%).

Graphic 1. The number of cases and deaths by COVID-19 in Minas Gerais according to the month of notification.
Source: Health Secretary of the State of Minas Gerais, 2020.



Concerning the deaths, a pattern similar to the confirmed cases was observed, with the month of march registering the lowest value (n = 2/0.02%), and August presenting the highest rate (n = 2,556/28.78%). Still, it was found that, from March to August, there was an increase in the number of deaths in the state, from 2 confirmed deaths in March to a total of 2,566 victims in August. However, when analyzing the total deaths from August to October, it is possible to observe that there was a relative decrease in these values (39.36%).

Table 1 shows the sociodemographic variables of the confirmed cases of COVID-19 in the state. It is possible to see that, analyzing the number of cases according to sex, there was a relative predominance in females (n=176,618/51%). In the analysis of cases by age, it was noticed that the disease was more prevalent in individuals aged between 30 and 39 years (n=84,916/24.3%), followed by patients aged 40 to 49 years (n = 68,916/19.9%) and 20 to 29 years (n=60,604/17.5%).

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Table 1. Sociodemographic and clinical data of patients with COVID-19 who did not progress to death in Minas Gerais, March to October 2020.

Variables	Total	%
Total	**346.310**	100
Gender		
Male	169.692	49,00
Female	176.618	51,00
Age Range		
0 to 9 years	10.043	2,90
10 to 19 years	15.930	4,60
20 to 29 years	60.604	17,50
30 to 39 years	84.153	24,30
40 to 49 years	68.916	19,90
50 to 59 years	50.215	14,50
60 years or more	55.063	15,90
Uninformed	1.386	0,40
Comorbidities		
Yes	24.242	7,00
No	31.168	9,00
Uninformed	290.900	84,00
Evolution		
Follow up	22.103	6,38
Cured	324.207	93,62

Source: Health Secretary of the State of Minas Gerais, 2020.

Still, it was found that 7% of the patients had some type of comorbidity. It is worth mentioning that, in 84% of the confirmed cases of COVID-19 in Minas Gerais, there was no notification as to the presence or absence of comorbidities.

According to the sociodemographic data of deaths by COVID-19 in the state of Minas Gerais, it is noted that the deaths were more prevalent in men (n=5,056/57%) and in the age group of 60 years or older (n=7,090 / 79.52%). Regarding the comorbidities of the victims, it was found that heart diseases were the most prevalent (n=4,259/47.77%), followed by diabetes (n=2,967/33.28%). In addition, it is important to emphasize that deaths can have more than one comorbidity involved (Table 2).

Table 2. Sociodemographic and clinical data of patients who died from COVID-19 in Minas Gerais, March to October 2020.

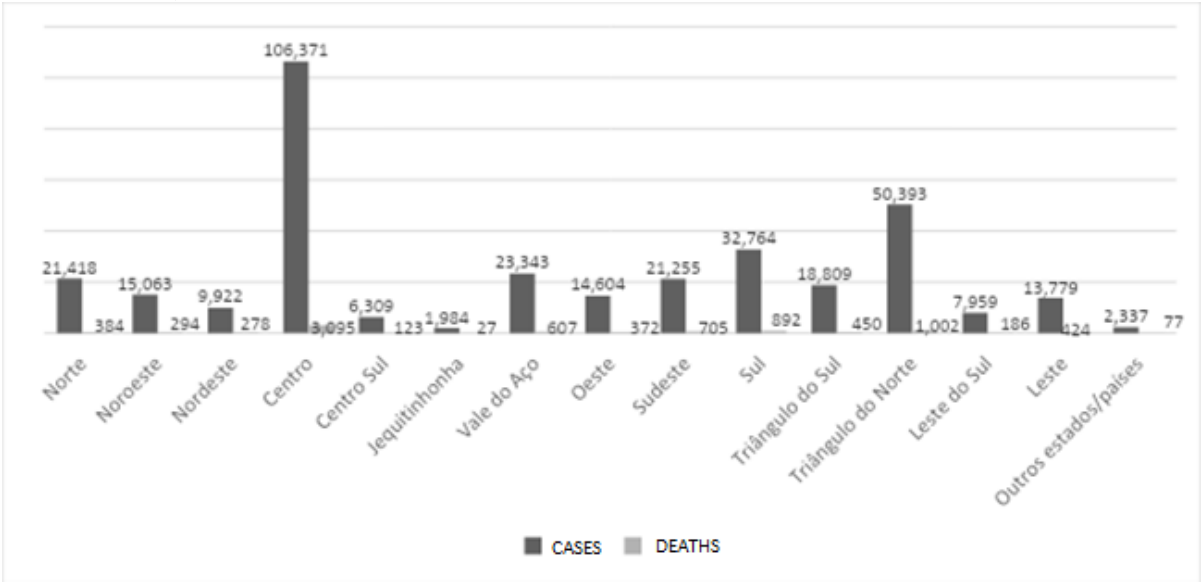
Variables	Total	%
Total	**8.916**	100
Gender		
Male	5.056	57
Female	3.860	43
Age Range		

0 to 9 years	13	0,15
10 to 19 years	11	0,12
20 to 29 years	64	0,72
30 to 39 years	211	2,37
40 to 49 years	464	5,20
50 to 59 years	1.063	11,92
60 years or more	7.090	79,52
Comorbidities		
Asthma	342	3,84
Heart Disease	4.259	47,77
Diabetes	2.967	33,28
Hematological Disease	96	1,08
Liver Disease	141	1,58
Neurological Disease	803	9,01
Kidney Disease	837	9,39
Immunodeficiency	520	5,83
Obesity	766	8,59
Pneumopathy	855	9,59
Down's syndrome	36	0,40

Source: Health Secretary of the State of Minas Gerais, 2020.

The analysis of the distribution of cases confirmed by COVID-19 according to the health macro-regions of Minas Gerais demonstrated that there is a greater number of cases in the Center (n=106,371/30.92%) and the Northern Triangle (n=50,393/14.65%). Regarding deaths by macro-region, it was found that the Center (n=3,095/35.02%) and the Northern Triangle (n=1,002/11.34%) also registered the highest values.

Graphic 2. Number of cases and deaths from COVID-19 in Minas Gerais according to the health macro-regions of Minas Gerais, from March to October 2020.



Source: Health Secretary of the State of Minas Gerais, 2020.

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The general mortality rate of the disease in the analyzed period was 41.87/100 thousand inhabitants (inhabi.). The mortality rate was higher in men than in women, and in men, the rate was 23.74/ 00 thousand inhabi., and in women, 18.13/100 thousand inhabi. The overall lethality rate of COVID-19 in that period was 2.57%. In the analysis of the lethality rate about the sexes, there was also a predominance in males, with the lethality rate in men varying from 2.98%, and in women varying from 2.18%.

Discussion

The case number variation, regarding COVID-19, in the State of Minas Gerais, followed the governmental decisions. March was the month with the lowest record since control measures had been implemented at the time and the transport of people within cities and between them was greatly reduced due to the shutdown of non-essential activies[10].

The linear growth represented in **Graphic 1**, between May and August, occurs simultaneously to the period of flexibilization of the social distancing measures and the rise in case of numbers in the smaller cities of the state. The decrease between August and October occurs due to the greater scientific knowledge about the disease and to the adopted social distancing measures[15].

Analyzing the sex variable, the data about case numbers are in concordance with literature, which presents greater prevalence among women. However, this epidemiological profile is not corroborated by studies performed in China, Italy, Spain, United Kingdom, and the United States, in which a men profile was observed for confirmed disease cases[16]. Concerning the age range, there was a resemblance with previous literature, in which it was observed a more widespread presence among individuals between 30 and 39 years old[10,16].

During the analysis of the impact of comorbidities in the COVID-19 course, it was identified in an epidemiological study that there is a directly proportional relationship between them with both risk and the disease's evolution[4]. Nevertheless, this information can't be ratified by the present study, since the greatest part of the data related to the presence or not of comorbidities wasn't informed. However, it was observed that the prevalence of comorbidities presented the same pattern of China and Italy, of a greater prevalence among heart diseases and diabetic patients[17].

On the other hand, when comparing the data referent to deaths, there can be observed a consonance with a study performed in the state of Espírito Santo, in which the average age of deaths was 66 years old, as well as the fact that men represent a bigger portion of ICU admissions[4]. Furthermore, this average age can be influenced by socioeconomic factors, being the economic disparity, the aspects of social vulnerability, and the level of literacy relevant when considering the inclusion or exclusion factors regarding mortality rate, which in some cases exceed 30 deaths per thousand inhabitants[18].

Regarding the lethality and mortality described in the state from March to August, there was a discrepancy with the pre-existing literature, in which the present study showed higher values in these variables[11]. Despite this, considering the different realities of each of Minas Gerais' health macro-region and the existing social disparities, deaths from COVID-19 in Minas remained below those of other Brazilian states.

COVID-19's dissemination profile was influenced by the globalization of the main world economic hubs and by the flow of people in these regions. During this analysis, it was perceived that the level of

industrialization was a similar factor between nations for the disease's propagation in urban centers, and this same aspect was observed in Italy, the United Kingdom, Spain, and United States[19].

The study showed that COVID-19's distribution in Minas Gerais follows the country's transmission pattern[10]. At first, there was an increase in the greatest centers that had more population and a greater economic flow, which includes bigger cities like the capital Belo Horizonte and some reference cities from other parts of the state like South, Triangle, Center e Zona da Mata. The greatest representativity of the Central region, corresponding to 30.92% occurs because of the capital and its influence as an economic region and of capitalization of sick people, being the major reference in the state.

The other macro-regions of Minas Gerais contributed to the increase in hospitalizations, deaths, and the overload of the health system. However, this reality does not grant epidemiological data the real dimension of the impact of COVID-19 on the state[5]. Even when considering the different realities of each macro-region of Minas Gerais health system and the existing social disparities that are similar to other states, the number of deaths remained below that of other Brazilian regions. In this sense, the existence of underreporting was expected considering the speed of the number of registered cases and what has been reported previously in other countries.

The presence of underreporting was perceived in the whole world, especially, in the first months of the pandemic. However, epidemiological data showed in South Korea, Germany, Italy, Sweden, and in the U.S. identified that countries that performed more tests and sought the tracking of contacts on large scale had a smaller underreporting estimative during the pandemic, as was also shown by the decrease of case numbers in nations where this strategy of viral contention was later applied[20].

On the other hand, the existence of underreporting was noticed in Brazil, especially in more peripheral areas, representing a low rate of confirmed cases when compared to other states[21]. In Minas Gerais, underreporting regarding lethality and mortality during the period of march to august was also observed, in which the present study showed higher values in these variables, being discrepant from the pre-existing literature[11]. Nonetheless, the exacerbated increase in the number of hospitalizations registered in the state of Minas Gerais for severe acute respiratory failure, the main evolution of the severe forms of COVID-19, contrasts this reality.

Conclusions

The epidemiological profile of COVID-19 confirmed cases in the State of Minas Gerais is characterized by the greater prevalence in women and the economically active age group, between 30 and 39 years old. However, the profile shifts when analyzing the disease's mortality, being more significant in men and people above 60 years old. Additionally, there's also a relation between comorbidities carriers and higher mortality rates.

The novel coronavirus pandemic in Minas showed, during the analyzed period, the impact of the containment measures and their flexibilization, and how these actions influenced the state's disease numbers. When compared to other Brazilian states, Minas Gerais presented a reduced contamination index, however, due to the difficulty of testing and tracking the cases, the data-informed in the report card were incongruous when confronted with the severe acute respiratory failure cases.

Despite the efforts, the data presented in this study reflect the necessity of the continuation of the containment measures in the state. The disease's epidemiological behavior is influenced by both the economic and the geographic flow of people, and because of this, it manifests itself with distinct characteristics in big

centers and smaller towns. Therefore, it is necessary to carry out new epidemiological studies to direct and adapt strategies for the control of SARS-CoV-2, as well as to enable the planning of actions and care to combat the disease in Minas Gerais.

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