Demographic Profile of Patients Infected by SARS-CoV-2 in a Municipality in the Midwest Region of Brazil in the 2020 and 2021 Biennium

ABSTRACT

Aims: This study aimed to characterize the demographic profile of patients affected by coronavirus disease 2019 (COVID-19) treated in public health facilities in Várzea Grande, Mato Grosso, during the biennium, 2020–2021.
Methodology: This retrospective cross-sectional descriptive study was conducted in Várzea Grande, between April 2020 and December 2021, utilizing data from IndicaSUS. Parameters analyzed include age range, sex, race, region of residence, lethality, and clinical outcomes (recovered and decease). Data were processed using EpiData Entry v.3.1 and EpiData Analysis v.2.2 software. A 95% confidence interval, a significance level of P =.05, and Pearson goodness-of-fit test were utilized to evaluate the fit of the multivariate models.
Results:A higher prevalence of COVID-19 hospitalization was observed among females in 2020 (53.9%) and 2021 (53.8%). Hospitalization rates by sex and race were notably higher in Brown women in 2020 (61.3%) and 2021 (65.8%), as well as in Brown men in 2020 (62.4%) and 2021 (65.1%). The West region exhibited the highest lethality rate in 2020 (3.8%) while the North and Center regions showed the highest lethality rates in 2021 (1.2%). By age group, lethality was significantly higher amongindividualsover 65 years old in both 2020 (21.4%) and 2021 (14.3% P = .000).
Conclusion: This studycharacterized the demographic profile of the population affected by COVID-19 in Várzea Grande. The findings indicatethat public health managers should implement target policies and actions to support this population, whichexperiences a high mortality rate and significant socioeconomic vulnerability.

Keywords: COVID-19; SARS-CoV-2; Social vulnerability; Demography, race factors,long COVID

1. INTRODUCTION

At the end of 2019, the World Health Organization (WHO) wasalerted to the emergence of a severe respiratory disease originating in China [1]. Chinese researchers identified the causativeagent as the novel coronavirus (SARS-CoV-2), responsible for severe acute respiratory syndrome (SARS), and named the disease as coronavirus disease 2019 (COVID-19) [2]. On January 30, 2020, the WHO declared a Public Health Emergency of International Concern, due to the increasing risk of global virus transmission [3].Shortly after, on March 11, 2020, the WHO declared the COVID-19 pandemic [2].

Among therecordedviral outbreaks in history, the SARS-CoV-2 coronavirus hadthe lowest lethality rate, approximately3%, despite infecting the highest number of individuals[4].

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Conversely, the Middle East Respiratory Syndrome and the SARS registered 35% and 10% lethality rate, respectively [5].

COVID-19 has become a significant public health issue due to the high transmission potential of SARS-CoV-2. Transmission occurs by fomites or aerosol dispersion, depending on the number of particles released into the environment from sneezing and coughing, which can last for approximately3h[6].

In response to the pandemic, Brazil implemented various social isolation strategies across multiple cities and states.These measures included suspendingschool activities, closingnon-essential businesses, and restrictingpeople's mobility [7].

Thereafter, numerous studies indicated a correlation between indicators of vulnerability, environmental factors, hygiene, and COVID-19. One of them, conducted in Fortaleza-CE, demonstrated the influence of vulnerability indicators and the relationship with COVID-19 [8]. In Maranhão, a study analyzedthe relationship between poor socioeconomic indicators and higher prevalence of COVID-19 [9]. At the national Brazilian level, a survey was conducted in patients hospitalized for COVID-19, over 50 years of age, which analyzed the effects of social vulnerability in this population [10]. Another study investigated the frequency of hospitalization at the beginning of the pandemic in the g100 municipalities and revealed that there are several locations with scarce resources, indicating the need for better planning and effective actions [11]. Moreover,in a systematic review, the authors showed the relationship between individuals living in vulnerable conditions, suggesting that these factors may contribute to the high rate of SARS-CoV-2 infection, and further research is warranted[12, 13].

The pandemic placed the world on alert as researchers continuously identified new variants of the coronavirus, which have greater virulence, speed of transmission, and reduced efficacy of immunity acquired through natural infection or vaccination [14].

The WHO has classified the variants circulating in the world as variants of concern (VOC) and variants of interest (VOI). The VOCs identified were Alpha, Beta, Gamma, Delta, Omicron [15]. On the other hand, several VOIs were identified, the most recent being JN.1 and JN.3, in December 2023, in the Northeast region of Brazil [16].In January 2024, a new subvariant of SARS-CoV-2, called JN 2.5, originated from Omicron, was identified in Mato Grosso, Midwest Region of Brazil [17].

These variants have deterred the development of treatment protocols for COVID-19 and the production of vaccines [18, 19]. The SARS-CoV-2 virus may present new variants as long as it spreads, and it is important to keep vaccination up to date to combat these variants [18]. But it is also essential to clarify that mutations can juxtapose the efficacyof vaccination,indicating the persistence of maintaining social distancing, hand hygiene, and the use of masks to reduce the transmission of SARS-CoV-2 [20].

As of May 2020, the fatality rate for COVID-19 was approximately6.9% globally [21]. In São Paulo, there was a significant increase in the severity of cases due to COVID-19 and deaths [22]. Research conducted in May 2022 showed a case fatality rate of 2.18% in Brazil due to SARS-CoV-2 infection [23]. The epidemiological week 04 bulletin of 2024, on the other hand, shows a case fatality rate that is reduced to 1.85% in Brazil, indicating a decrease in the spread of the virus throughout the country [24]. In the State of Maranhão, a study revealed a lethality rate of 2.2% up to January 4, 2023, which is higher than the Brazilian average [25].

From January 2020 to January 27, 2024, Mato Grosso had a case fatality rate of 1.69% and Várzea Grande of 2.52%, a higher rate than the national average [26]. However, limited data existregardingthe demographic profile of this impactedpopulation in this territory of the Midwest Region of Brazil. Accordingly, managers need to plan actions aimed at this population profile that is in socioeconomic vulnerability.

This study characterizes the demographic data, considered most relevant, of the population affected by SARS-CoV-2, assisted in the public health network of the municipality of Várzea Grande, in Mato Grosso, from April 2020 to December 2021.

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2. MATERIALS AND METHODS

This is a retrospective cross-sectional retrospective descriptive study**,** in which the data were provided by the Epidemiological Surveillance of the Municipal Health Department of Várzea Grande (SMS/VG) and the study period was from April 2020 to December 2021, including only patients residing in Várzea Grande.

The IndicaSUS System was used for the data source, which was used for hospital notification of SARS or COVID-19 cases. This system was defined and standardized to be used in the state of Mato Grosso through GBESES Ordinance No. 141 OF 04/17/2020, where it was established that public or private hospitals should conduct daily notification of hospitalizations due to SARS-CoV-2 infection, meeting the need to monitor and evaluate the operational conditions of health units defined to care for patients affected by SARS-CoV-2 [27].

A total of 42,469 cases treated at the city's public health services were analyzed, including the Várzea Grande Municipal Hospital and Emergency Room (HPSMVG), the Ipase Emergency Care Unit (UPA) and the Cristo Rei UPA.

2.1 LOCATION

The study was conductedin the municipality of Várzea Grande, located in the south-central mesoregion of Mato Grosso. It is the second-largest city in the state by territory, covering an area of 724,279 square km. The average income of formal workers is 2.2 minimum wages, and only 19.9% of the population is employed. Less than half of homes in the city have access to an adequate sewage system. The city's Human Development Index (HDI),which measures the quality of life of the population from a socioeconomic point of view, is 0.734.Additionally, in 2021, in the ranking of the Basic Education Development Index (2021), Várzea Grande ranks 64th in elementary education (initial years) and 29th place in elementary education (final years)among municipal public schools in the state of Mato Grosso [28].The urban area is organized in five administrative regions: North (N), South (S), East (E), West (W) and Center (C) (Figure 1).

2.2 Population/sample

According to the 2022 census conducted by IBGE, the city has a population of 299,472 people. The target audience of the study was patients of both sexes, all age groups, servedto public health units in Várzea Grande due to the diagnosis of COVID-19.

2.3 Data collection

The data were collected from a report from the IndicaSUS system, provided by SMS/VG. Between May 2022 and June 2023, researchers from the initial project used a form, created by Lima, (2023), with closed questions, to collect data. Next, the variables were organized in Excel tables (Microsoft Office®)tables to group the information, eliminating duplicates and facilitating the analysis of the variables. This made it possible to explore the demographic data, identify the areas and neighborhoods most affected by COVID-19, and categorize the data by race, sex, age group, and outcome (recovered or died) and thus calculate the case fatality rate of the disease under study. The data were assessed with the aid of the EpiData Analysis v.2.2 software.

2.4 Statistical analysesand mapping tools

The collected information was recorded in the EpiData Entry v.3.1 (www.epidata.dk) application and the data were examined with the aid of the EpiData Analysis v.2.2 (www.epidata.dk) software.

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The links between demographic parameters were examined using appropriate tests for categorical variables and normal or parametric continuous distributions, with the aid of the EpiData Analysis v.2.2 software. Pearson's correlation coefficient was used, and statistically significant correlations were defined as those with a p-value ≤5% and a95% confidence interval (CI).

The maps were realized in ArcGIS 9x (ESRI Corp), and the spatial data from IBGE (2020) adjusted adjusted to adapt to the boundaries established by the management of the Local Public Health Department. For the calculation of the neighborhood incidence were used the population data from IBGE (2010).

3. RESULTS

A total of 42,469 cases of patients with a confirmed diagnosis of COVID-19, hospitalized at the HPSMVG and at two UPAs in Várzea Grande-MT, between April 2020 and December 2021, were analyzed. The variables studied included race, sex, age group, case fatality, clinical outcome (recovered or died), and geographic distribution (regions).
Hospitalization of women due to COVID-19 was more frequent, with 53.9% in 2020 and 53.8% in 2021 (Table 1). Furthermore, we can notice greater attendance for COVID-19 in brown women in 2020

Additionally, there was a higher frequency of care among brown women, with rates in 2020 (61.3%) and 2021 (65.8%).A similar trend was observed among men, with 62.4% of brown men hospitalized in 2020 and 65.1% in 2021 (Table 1).

Table 1: Frequency of hospitalizations due to COVID-19 in the municipality of Várzea Grande-MT, categorized by racial classification and sex, in 2020 and 2021.

Year	2020		2021	
Racial classification	Female	Male	Female	Male
	n (%)	n (%)	n (%)	n (%)
Brown	4,261 (53.4)	3,713 (46.6)	10,327 (54.1)	8,778 (45.9)
Black	435 (44.3)	548 (55.7)	695 (46.1)	811 (53.9)
White	1,319 (57.5)	976 (42.5)	2,029 (57.8)	1,483 (42.2)
Yellow	132 (63.8)	75 (36.2)	144 (62.1)	88 (37.9)
Indigenous	12 (70.6)	5 (29,.4)	28 (65.1)	15 (34.9)
Not reported	795 (55.6)	635 (44.4)	2,472 (51.7)	2,307 (48.3)
Total	6,954 (53.9)	5,952 (46.1)	15,695 (53.8)	13,482 (46.2)

Source: Prepared by the authors (2023) with data provided by the Secretariat of Epidemiological Surveillance of Varzea Grande.

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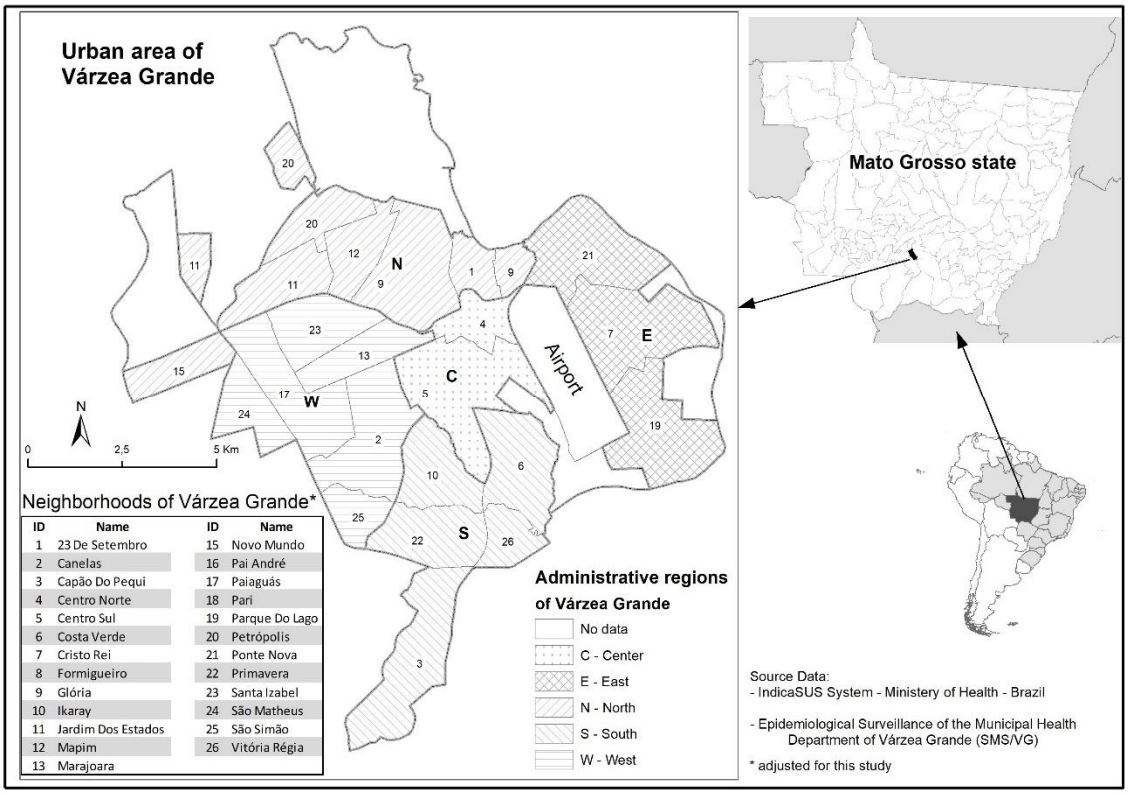

Figure1- Urban area of Várzea Grande – Mato Grosso- Brasil.

The incidence is higher in 2021 (Fig. 2), with an increase compared to the previous year in all neighborhoods. Note that the incidence distribution is heterogeneous, with no spatial gaps. The neighborhood with the highest incidence in both years is the São Simão neighborhood, which is in the West region and borders the South region of the city (Fig. 1).

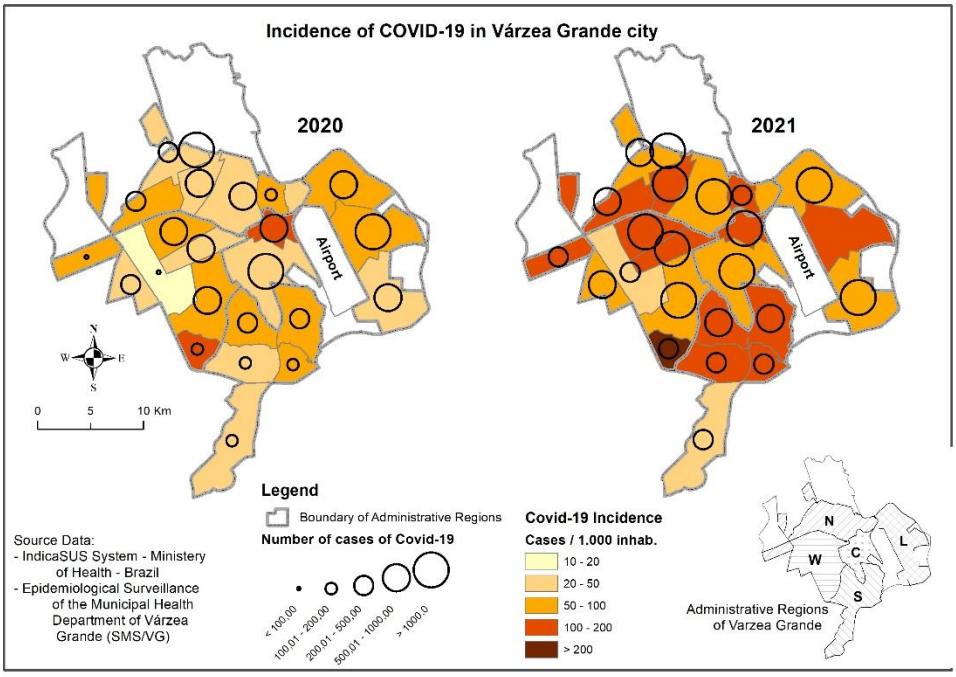

Figure 2. Lethality of COVID-19 in Várzea Grande city, Mato Grosso- Brasil, in 2020 and 2021

In 2020 and 2021, there was a higher lethality rate for people who self-declared themselves asBlack (5.6% and 7.4%), respectively. Considering the overall case sensitivity, although in 2021 there wasa higher number of deaths (851), the case fatality rate was 2.9%, while in 2020, the case fatality rate was 4.0% (Table 2 and figure 3).

Table 2: Frequency of deaths and recovered patients from COVID-19 in the municipality of Várzea Grande-MT, categorized by racial classification, in 2020 and 2021.

Year	2020		2021	
Racial classification	Deaths	Recovered	Deaths	Recovered
	n (%)	n (%)	n (%)	n (%)
Brown	357 (4.5)	7.617 (95.5)	486 (2.5)	18606 (97.5)
Black	55 (5.6)	928 (94.4)	112 (7.4)	1394 (92.6)
White	53 (2.3)	2.242 (97.7)	93 (2.6)	3419 (97.4)
Yellow	6 (2.9)	201 (97.1)	7 (3.0)	225 (97.0)
Indigenous	0 (0.0)	17 (100.0)	1 (2.3)	42 (97.7)
Not reported	42 (2.9)	1,388 (97.1)	152 (3.2)	4627 (96.8)
Total	513 (4.0)	12,393 (96.0)	851 (2.9)	28,313 (97.1)

Source: Prepared by the authors (2023) with data provided by the Secretariat of Epidemiological Surveillance of Várzea Grande. Note: in 2021, 13 deaths were excludedin the analysis, as the patients evolved to deaths from another cause, and not from COVID-19.

Proportionally, in 2020, the Western region of the municipality had the highest number of deaths, totaling 3.8% of hospitalized patients. Regarding the variable “recovered”, it was observed that the North and East regions presented the best results, totaling 97.1% and 97.0% of recovered patients, respectively (Table 3).

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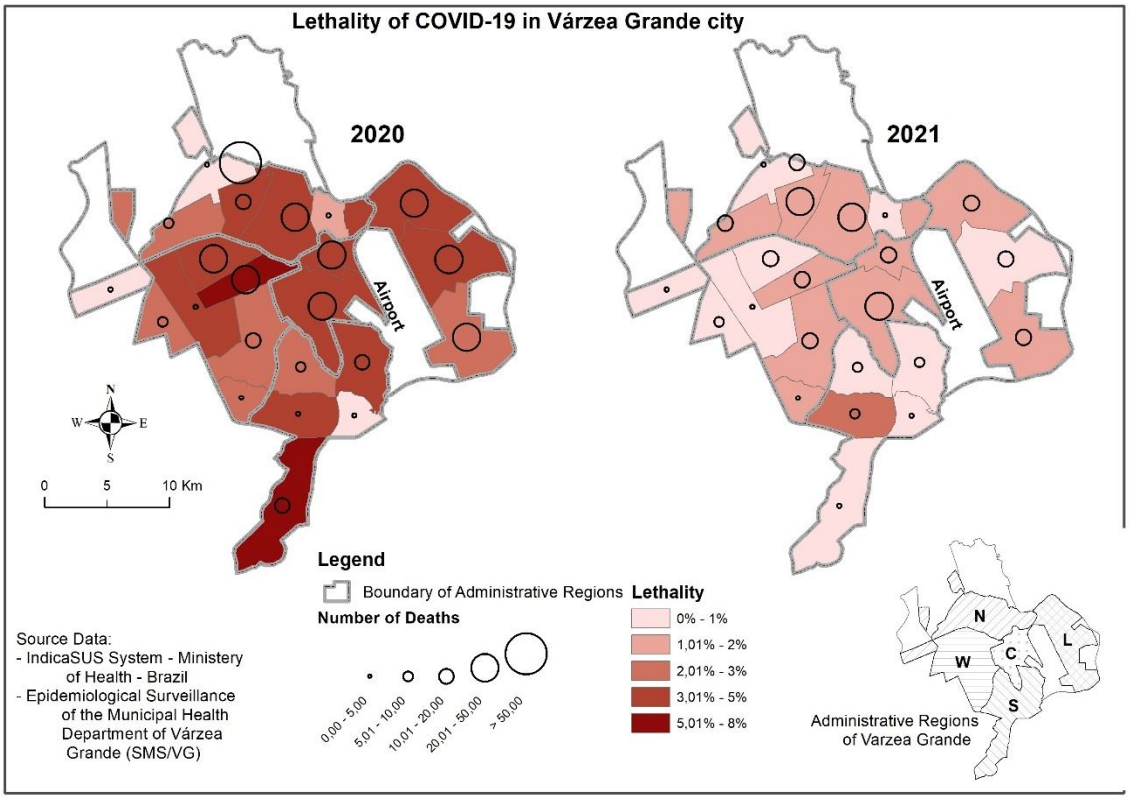

Figure3. Lethality of COVID-19 in Várzea Grande city in 2020 and 2021.

Table 3: Frequency of deaths and patients recovered from COVID-19 in the municipality of Várzea Grande-MT, categorized by region and neighborhood, in 2020 and 2021.

		2020		2021	
Region	**Neighborhood**	**Deaths**	**Recovered**	**Deaths**	**Recovered**
		n (%)	**n (%)**	**n (%)**	**n (%)**
North	23 de Setembro	2 (1.1)	186 (98.9)	0 (0.0)	267 (100.0)
	Glória	36 (4.5)	759 (95.5)	23 (1.3)	1.811 (98.7)
	Jardim dos Estados	8 (2.3)	342 (97.7)	12 (1.4)	838 (98.6)
	Mapim	19 (3.4)	547 (96.6)	22 (1.5)	1.434 (98.5)
	Novo Mundo	0 (0.0)	98 (100.0)	2 (0.8)	235 (99.2)
	Petrópolis	2 (0.7)	299 (99.3)	4 (0.5)	772 (99.5)
	Pari	1 (3.0)	32 (97.0)	0 (0.0)	33 (100.0)
	Subtotal	**68 (2.9)**	**2,263 (97.1)**	**63 (1.2)**	**5,390 (98.8)**
South	Capão do Pequi	11 (7.7)	132 (92.3)	1 (0.4)	251 (99.6)
	Costa Verde	14 (3.2)	417 (96.8)	8 (0.9)	921 (99.1)

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	Ikaray	9 (2.4)	373 (97.6)	6 (0.8)	708 (99.2)
	Primavera	4 (3.5)	111 (96.5)	8 (2.4)	325 (97.6)
	VitóriaRégia	1 (0.6)	156 (99.4)	0 (0.0)	341 (100.0)
	Distrito Pai André	6 (4.4)	129 (95.6)	7 (1.5)	445 (98.5)
	Subtotal	**45 (3.3)**	**1,318 (96.7)**	**30 (1.0)**	**2,991 (99.0)**
Center	North Central	22 (3.0)	710 (97.0)	13 (1.3)	1,004 (98.7)
	South Central	44 (3.5)	1,216 (96.5)	22 (1.1)	1,962 (98.9)
	Subtotal	**66 (3.3)**	**1,926 (96.7)**	**35 (1.2)**	**2,966 (98.8)**
East	Cristo Rei	43 (3.0)	1.379 (97.0)	18 (0.9)	2,039 (99.1)
	Parque do Lago	22 (2.8)	775 (97.2)	17 (1.0)	1,627 (99.0)
	Ponte Nova	27 (3.2)	805 (96.8)	20 (1.3)	1,496 (98.7)
	Subtotal	**92 (3.0)**	**2,959 (97.0)**	**55 (1.1)**	**5,162 (98.9)**
West	Canelas	20 (2.9)	664 (97.1)	14 (1.2)	1,147 (98.8)
	Marajoara	32 (5.1)	592 (94.9)	20 (1.2)	1,665 (98.8)
	Paiaguás	4 (4.4)	87 (95.6)	2 (0.6)	314 (99.4)
	Santa Izabel	21 (4.1)	495 (95.9)	12 (0.8)	1,437 (99.2)
	São Matheus	10 (2.9)	335 (97.1)	8 (1.0)	800 (99.0)
	São Simão	3 (2.1)	142 (97.9)	5 (1.5)	327 (98.5)
	Distrito Formigueiro	1 (33.3)	2 (66.7)	0 (0.0)	14 (100.0)
	Subtotal	**91 (3.8)**	**2,317 (96.2)**	**61 (1.1)**	**5,704 (98.9)**
	Not reported/ other cities	151 (8.6)	1,610 (91.4)	607 (9.1)	6,100 (90.9)
	TOTAL	**513 (4.0)**	**12,393 (96.0)**	**851 (2.9)**	**28,313 (97.1)**

Source: Prepared by the authors (2023) with data provided by the Secretariat of Epidemiological Surveillance of Várzea Grande.

There was a reduction in the case fatality rate of hospitalized patients due to COVID-19 in 2021. The regions with the highest rates included the North and Central regions, with 1.2% of the total number of hospitalized patients (Table 3).

Data on the frequency of deaths from COVID-19 in the municipality of Várzea Grande-MT, in 2020 and 2021 (Table 4) according to age group, shows the highest number of deaths in the age group > 65 years (21.4%) in 2020 and (14.3%) in 2021.It shows that the frequency of deaths was reduced in the youngest phase of life, between < 20 and 20–40 years.

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Table 4: Statistical description of the relationship between demographic characteristics and outcome of patients infected with SARS-CoV-2 in the municipality of Várzea Grande-MT, Brazil, in 2020 and 2021.

Year	2020			2021		
Parameter	Cases n (%)	Deaths n (%)	p-value	Cases n (%)	Deaths n (%)	p-value
Sex						
Female	7,150 (53.8)	234 (3.3)		15,695 (53.8)	391 (2.5)	0.000
Male	6,142 (46.2)	350 (5.7)	0.000	13,482 (46.2)	460 (3.4)	-
Age range (years)						
<20	834 (6.3)	10 (1.2)	-	2,800 (9.6)	4 (0.1)	-
20–40	6,137 (46.2)	32 (0.5)	0.023	13,774 (47.2)	105 (0.8)	0.000
41–65	4,969 (37.4)	252 (5.1)	0.000	10,225 (35.0)	401 (3.9)	0.000
>65	1,352 (10.2)	290 (21.4)	0.000	2,378 (8.2)	341 (14.3)	0.000
TOTAL	13,292					
Race						
Brown	7,974 (61.8)	357 (4.5)	-	19,105 (65.5)	486(2.6)	-
Yellow	207 (1.6)	6 (2.9)	1,186	232 (0.8)	7 (3.0)	0.147
White	2,295 (17.8)	53 (2.3)	0.000	3,512 (12.0)	93 (2.6)	0.015
Black	983 (7.6)	55 (5.6)	0.057	1,506 (5.2)	112 (7.4)	0.000
Indigenous	17 (0.1)	0 (0.0)	0.459	43 (0.1)	1 (2.3)	0.679
Not reported	1,430 (11.1)	42 (2.9)	0.003	4,779 (16.4)	152 (3.2)	0.015
Total	12,906* (31.3)	513 (4.4)	-	29,177 (68.7)	851 (2.9)	-

Source: Prepared by the authors (2023) with data provided by the Secretariat of Epidemiological Surveillance of Várzea Grande.

*Incompleteness of data in the total sample.

The relationship between demographic parameters and the outcome “death” (Table 4) exhibit a higher lethality among males and the age group > 65 years in the 2020–2021 biennium. Regarding race, the prevalence of deceases in the black race is 5.6% (2020) with an increase 2021 to 7.4%.

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4. DISCUSSION

This study analyzed the demographic profile of patients diagnosed with COVID-19 treated in the public health network of Várzea Grande-MT between 2020 and 2021, continuing the studies of the initial project [29]. A higher prevalence of COVID-19 hospitalizations was observed among females in both years with a notable predominanceinBrown women. Similarly, Brown men also exhibited higher hospitalization rates. Lethality was higher in neighborhoods located in the West region in 2020 and in the North and Center regions in 2021. Furthermore, patients over the age of 65 years exhibited higher lethality rates in both 2020 and 2021.

One study reported that individuals with chronic diseases and the elderly population are more susceptible to severe complications and death as a result of COVID-19 [29]. This disease has caused changes in the structure and functioning of health systems and services, demanding investments and restructuring of these services to avoid losses in the care of other health needs. Moreover, areas with higher levels of social inequality faced greater difficulties in combating COVID-19, registering a higher incidence and mortality [30,31].

Based on data released by IBGE (2022), half of the population of Várzea Grande is vulnerable. It is essential to conductfurther research to establish the demographic and/or epidemiological profile of these inhabitants, as studies show that issues of social vulnerability have a direct impact on public health and, in the context of a pandemic, the vulnerability of a city can represent a risk to global security [8].

Among the total number of cases with a positive result for COVID-19 treated in the public health network of Várzea Grande, 42,083 were analyzed, due to incomplete data, identifying the predominance of hospitalization in females in the 2020 and 2021 biennium. The predominance of females could be due to the historical trend of women seeking more active medical care, examinations, and health services compared to men [10,32].

In the ethnic-racial classification, Brown women exhibited a higher frequency of hospitalizations due to COVID-19, both in 2020 (61.3%) and 2021 (65.8%). Similarly, among males, Brown men showed a predominance of hospitalizations, with 62.4% in 2020 and 65.1% in 2021. Another study indicated that the majority of patients hospitalized in serious condition in an intensive care unit were men of White ethnicity. It is important to notethis other study also considered comorbidities, an aspect that was not analyzed in the present study [33].

When examining the total number of hospitalizations in 2020 and 2021, a higher frequency of hospitalizations was found in 2021. Research shows a drop in the number of hospitalizations (2021) of the elderly, with an increase in the frequency of hospitalization of unvaccinated young people [34]. In a similar study, they report that since June 2021, with widespread vaccination, there has been a decline in hospitalizations of patients > 60 years of age, a population at risk, indicated to receive the vaccine in this period. There was an increase in hospitalizations among individuals aged 20 to <40 years and 40 to <60 years. This highlights the essential role of vaccination in the fight against the COVID-19 pandemic [35]. Research shows the need to maintain non-pharmacological measures, such as avoiding crowds, among the other widely publicized measures in sync with vaccination campaigns, which has strong evidence that this mitigated the risks of contagion by SARS-CoV-2 [36].

In the present study, the lethality values may be related to racial ethnicity, where there was a higher lethality for people of Brown (4.5%) and Black (5.6%) ethnicity in 2020. In the following year, the highest lethality occurred in the black ethnic group (7.4%). In a systematic review and meta-analysis, people of African American, Hispanic, and Asian American origin in the United States were more likely to test positive for COVID-19 and be admitted to intensive care units compared to individuals of white origin [37]. It has been observed that socioeconomic inequalities and the quality of medical care are linked to the mortality rate and incidence of COVID-19 in ethnic and racial minority groups [38].

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Considering lethality in general, 4% of deceases were recorded in the municipality studied in 2020, with a reduction in lethality to 2.9% in the following year, although the frequency of the number of hospitalizations was higher in 2021. A similar result was identified in a study which analyzed hospital lethality in four Brazilian capitals and showed a reduction in the case fatality rate in January 2021 [34]. In the 2020–2021 biennium, 69.6% of deaths in Brown people were recorded in 2020 and 57.1% in 2021. Another study corroborates this result, which found a high prevalence of negative outcomes for individuals of Black, Yellow, Brown, and indigenous racial ethnicity, compared to the white race. These results reiterate the need to include health determinants in COVID-19 measures. In their research, the authors emphasize evidence that points to ethnicity—specifically being Black or Brown—as the second most significant risk factor for a fatal outcome. This underscores the crucial importance of considering social determinants in the public health approach [30].

When analyzing the regions where there was a higher frequency of deaths and patients recovered from COVID-19 in Várzea Grande-MT, it was found that in 2020 the Western region of the municipality had the highest number of deathsfrom hospitalized patients. Regarding the variable “recovered”, the North and East Regions showed the best results, totaling 97.1% and 97.0% of recovered patients. In one study, the flow of hospitalizations in municipalities that belong to the g100 was analyzed, characterized by having more than 80,000 inhabitants, low income, and social and economic vulnerability [11].

The HDI can also determine the success of a country's response to the COVID-19 pandemic by inferring the case fatality rate among severe cases of SARS-CoV-2 infection.In Brazil, areas with a lower HDI had a higher COVID-19 mortality rate, particularly among those who required invasive mechanical ventilation, compared to areas with a higher HDI. Brazil's vast territorial extension and cultural, social, and economic diversity reflect the variation of the HDI, so our country can be an ideal case to study the influence of the HDI on different aspects of the COVID-19 pandemic, including its impact on the mortality rate [38].

The importance of topics such as the social determinants of health and the interaction of human beings with the environment in discussions that address not only COVID-19, but also other infectious diseases, was demonstrated in a systematic review. It is important to understand the disease process as a combination of physiological, social, and environmental factors [12].

When analyzing the age group, our resultsalign with the literature, whichidentifies individuals over 60 years as a population at risk for SARS-CoV-2 infection [21, 29, 33, 39].

In addition to the already known factors that favor SARS-CoV-2 infection, studies carried out in Brazil point to another major challenge for managers and health professionals. They report cases of patients, who present symptoms up to 3 months after the acute phase of COVID-19, which remain for 2 months or more, this condition being indicated by the WHO, as long COVID. This disease is more common in women over 60 years of age. Around 200 symptoms were identified, such as: fatigue, coagulation disorders, sleep disorders, cognitive and neuroskeletal problems. These symptoms impact work capacity, reintegration into social life, and the emergence of depression and anxiety, requiring greater investment in the treatment and rehabilitation of these patients. It is essential to carry out more studies on long COVID, to investigate its prevalence, symptoms, diagnosis, duration and treatment methods. It is necessary to better understand this condition and develop practical approaches for the management of affected patients, in addition to evaluating the economic impact that long COVID could have on public administration, especially in municipalities that face structural difficulties and in the public health network [40, 41, 42].

It is important to report that in the present study we found limitations inherent to research derived from secondary data.Specifically, we used IndicaSUS, which led to incomplete information on variables such as income, number of people per household, employment, quality of life, and level of education, access to treated water, and sewage networks. This incompleteness limited our ability to analyze these factors in relation to the disease studied. Furthermore, data was observed due to incomplete registration by health professionals.

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5. CONCLUSION

This study characterized the demographic profile of the population affected by COVID-19 in Várzea Grande between 2020 and 2021, providing valuable insightsfrom health professionals and public health agencies. It highlightsthe demographic groups most impacted by the disease and reinforces the need forcontrolling the spread of SARS-CoV-2. Furthermore, it suggests that public health managers implement targeted policies and actions for populationswith high COVID-19 lethality rates and socioeconomic vulnerabilities. Finally, this study emphasizesthe need for furtherresearch to explore the relationship between the socially vulnerable populations and SARS-CoV-2 infection.

ETHICAL APPROVAL

This research was approved by the Research Ethics Committee of the Júlio Muller University Hospital-Federal University of Mato Grosso (CEP-HUJM), under protocol CAAE: 53409821.0.0000.554, opinion 5.137.046.

Disclaimer (Artificial intelligence)

Author(s) hereby declare that generative AI technologies such as Large Language Models, etc have been used during writing or editing of manuscripts. This explanation will include the name, version, model, and source of the generative AI technology and as well as all input prompts provided to the generative AI technology

1. Microsoft Copilot Grátiswas used to improve writing.

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