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ORIGINAL ARTICLE

Evolution of mortality and lethality due to COVID-19 in the State of Roraima, Brazil, from march 2020 to july 2021

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Abstract

Introduction: the context of the Covid-19 pandemic in the Brazilian North region is worrying. There is a lack of resources for Public Health, a low human development index, and poverty indicators above the national average.

Objective: to analyze mortality and lethality from COVID-19 in the State of Roraima, Brazil.

Methods: this is an ecological time-series study of secondary data on COVID-19 in Roraima, Northern Brazil, from March 2020 to July 2021. The incidence, mortality, and lethality rates due to COVID-19 were calculated. The Prais-Winsten regression model was used to calculate the time series trends. Trends were classified as increasing, decreasing, or stationary. The trend was considered static when the p-value was not significant ($p>0.05$).

Results: in the state of Roraima, from March 2020 to July 2021, there were 123,125 cases and 1,903 accumulated deaths due to COVID-19. The first wave (March 2020 to October 2021) of COVID-19 recorded the incidence rate (2,995.30 new cases per 100,000 inhabitants - July 2020) and mortality (56.32 deaths per 100,000 inhabitants - June 2020) higher lethality. However, in the second wave (November 2020 to July 2021), the highest lethality rate was observed (3.47% - February 2021). It was observed that during the first wave, the incidence rate of COVID-19 showed increasing trends. During this period, the mortality rate had a stationary tendency ($p>0.05$) and the percentage lethality with a decreasing trend ($p<0.05$). During the second wave, there was a more aggravating scenario for lethality, which changed from a daily reduction rate of 0.90% to stationary trends.

Conclusion: the pandemic in the state of Roraima is not yet under control, so it is necessary to strengthen strategies to mitigate the spread of the pandemic in the region and prevent the formation of new waves.

Keywords: SARS-CoV-2, COVID-19, mortality, epidemiology, incidence.

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Authors summary

Why was this study done?
The primary motivation of the study was to monitor the temporal evolution of mortality and lethality of COVID-19 in the state of Roraima from March 2020 to July 2021 and describe the leading risk group.

What did the researchers do and find?
The primary motivation of the study was to monitor the temporal evolution of mortality and lethality of COVID-19 in the state of Roraima from March 2020 to July 2021 and describe the leading risk group.

What do these findings mean?
The study data indicate that the pandemic is not yet under control, demonstrating the need for constant monitoring in the region.

INTRODUCTION

Coronavirus 2019 disease (COVID-19) is an acute respiratory infection caused by a beta-coronavirus, SARS-CoV-2, identified in Chinese patients with potentially severe pneumonia in 2019. This family of viruses is commonly found in different animals, including primates, bats, cats, and camels[1]. In addition, it has high transmissibility and global distribution.

By August 2021, in the global context, there were more than 200 million confirmed cases and 4 million deaths from COVID-19. The highest incidence of cases is concentrated in the United States of America, with 35,957,692 million confirmed cases, India with 32,077,706 million, and Brazil with 20,212,642 million[2].

The Board of Directors of the Pan American Health Organization (PAHO) noted a low vaccination rate in Latin America. It stated that if current trends continue, health, social and economic disparities will grow even more significant, and it will take years for the virus. Therefore, it highlights the importance of access to vaccines, adoption of Public Health measures, and non-pharmacological preventive attitudes, such as the use of masks, hand hygiene, and physical distance, in addition to robust surveillance systems. These actions are necessary for controlling the virus, even with the expansion of vaccine coverage and reducing cases in Brazil and the world[3].

Currently, Brazil is in remission concerning the number of cases of COVID-19, mainly due to the increase in vaccination coverage in the country. This decrease was predicted by authors who suggested greater rigidity to non-drug prevention measures, in addition to the development and purchase of vaccines[4].

The context of the pandemic in the North region is worrying. There is a lack of resources for Public Health, a low Human Development Index, and poverty indicators above the national average. This profile worsened during the arrival of the COVID-19 disease when a large part of the resident population did not have access to the Unified Health System (SUS), and the few hospitals were overloaded[5].

The epidemiological bulletin of Roraima dated August 12, 2021, confirmed 121,666 positive cases of COVID-19, of which 115,982 people were considered to have recovered from the disease[6].

Amid the drop in the number of cases, hospitalizations, and deaths from COVID-19 in Roraima, it is noteworthy that viral transmission is still high. Thus, to avoid the formation of new waves of disease and daily records of cases and deaths, it is crucial to combine vaccination with masks and social distancing to maintain and obtain further illustrated advances in the direction of pandemic control[7].

The government agents have put in place several measures to reduce the effects of the pandemic experienced in several states and countries. One of them is accelerating the vaccination campaign that will reach the public aged 12 to 17 years, with and without comorbidities, from August 16, 2021[8]. Thus, it is possible to mitigate the impacts of the pandemic in the region. In 2020 Roraima was one of the states with the highest number of cases and deaths in Brazil, mainly in Boa Vista, the capital, with an increased incidence and mortality compared to other regions[9].

Regarding knowledge gaps present about the epidemiology of the SARS-CoV-2 virus, specifically in the North region, and for the characterization of the typical behavior of the disease, this study aims to analyze the mortality and lethality from COVID-19 in the State of Roraima during the pandemic established by the international Public Health authorities, considering the period from March 2020 to May 2021.

METHODS

An ecological time-series study on COVID-19 was carried out in the State of Roraima, Northern Brazil, from March 2020 to July 2021 , following the protocol of Abreu, Elmusharaf and Siqueira (2021)[10].

Data on cases and deaths of COVID-19 were obtained from a public database, made available by the Department of Health of Roraima.

The inclusion criteria for the study were all cases and deaths that occurred in the state of Roraima, from March 2020 to July 2021, which used the International Classification of Diseases, 10th edition (ICD-10), from U07.1 COVID-19 (identified virus) or U07.2 (COVID-19, unidentified virus)[11], considering laboratory or clinical, epidemiological confirmation criteria. Thus, the study population consisted of 123,125 cases and 1,903 deaths of COVID-19 in the state of Roraima.

Cases were classified according to notification date and deaths according to death date; those without such information were excluded.

The collected data were further organized into an Excel spreadsheet to analyze incidence, mortality, and lethality rates.

Incidence rates were calculated by dividing the number of cases that occurred in a period by the population multiplied by 100,000. Thus the results were expressed as the number of new cases per 100,000 inhabitants. Mortality rates were calculated by dividing the number of deaths in the period by the number of inhabitants multiplied by 100,000; the results were expressed in number of deaths per 100,000 inhabitants. The lethality was calculated as the total of deaths in the period divided by the number of cases and multiplying by 100; the results were expressed in percentage.

For the calculations, we used the estimate of the Population Projection of Federation Units by sex and age groups: 2000-2030, considering the population residing in the state of Roraima in July 2020, which consisted of 546,891 inhabitants[12].

Trend analyzes of incidence, mortality, and lethality rates were performed using the methods proposed by Antunes and Cardoso[13]. The Prais-Winsten regression model was used to calculate the time series construction rates. This method allows first-order autocorrelation corrections to be performed on values organized by time. Thus, the values of the angular coefficient (β) and respective probability (p) were estimated, considering a 95% confidence interval (95% CI).

The results of the logarithmic rates (β) of the Prais-Winsten regression allowed us to estimate the percentage change in daily change (Daily Percent Change - DPC), with the respective confidence intervals (95% CI). Rates were classified as increasing, decreasing, or stationary. The trend was considered stationary when the p-value was not significant (p>0.05).

RESULTS

The sociodemographic aspects of the state of Roraima are shown in table 1.

The state of Roraima has a territorial extension of 223,644,527 Km2, a population density of 2.01 inhabitants per Km2, an estimated population of 546,891 inhabitants, being constituted in a minority of elderly individuals.

Table 1: Sociodemographic characteristics of the state of Roraima.

Sociodemographic characteristics	Description
Number of municipalities*	15 counties
State's capital*	Boa Vista
International borders *	Venezuela and Guiana
Territorial extension*	223,644,527 km²
Demographic density*	2.01 inhabitants/km²
Population (2020)**	546,891 inhabitants
0 to 4 years	47,945
5 to 9 years	51,098
10 to 14 years	53,960
15 to 19 years	56,759
20 to 29 years	105,208
30 to 39 years	87,309
40 to 49 years	62,810
50 to 59 years	43,653
60 to 69 years	25,489
70 to 79 years	9,634
80 years or more	3,026
household income	$USD 177.76
Human Development Index (HDI), according to the last census, 2010)*	0.707
Average number of people per household***(2019)	3.5 people
Number of basic health units #	111 units

Source: *Instituto Brasileiro de Geografia e Estatística (IBGE, 2021). **DATASUS - Projeção da População das Unidades da Federação por sexo e grupos de idade: 2000-2030. *** Sistema IBGE de Recuperação Automática – SIDRA. #Cadastro Nacional de Estabelecimentos de Saúde – CNESNet – Ministério da Saúde, Brazil.

Furthermore, the average monthly household income per capita is less than a minimum wage (983 reais) (table 1).

The characterization of COVID-19 cases notified by the state of Roraima according to sex, age group, and comorbidities is illustrated in table 2. In the examined period, there were a total of 123,125 cases of COVID-19, of which 1.55% (n=1,903) evolved to death (table 2).

It was observed that 55.41% of cases (n = 68,224) were female and 44.59% (n = 54,896) were male. Furthermore, cases were predominant among young adults, especially among individuals aged between 30 and 39 years (23.36%) and between 40 and 49 years (20.08%) (Table 2).

There were 11,570 reported comorbidities or special health conditions described among the cases of COVID-19. It was highlighted that the most prevalent comorbidities were chronic heart diseases (49.50%), followed by diabetes (28.13%) and chronic respiratory diseases (28.13%) (Table 2).

The daily distribution of and deaths from COVID-19 in the state are described in figure 1.

In the daily distribution of new cases and deaths, it was observed that the highest peak of daily cases of COVID-19 occurred in June 2020, with records of 1,052 new cases described on June 24, 2020. Meanwhile, on January 26, 2021, the state reached the highest number of registered deaths per day (n=18 deaths), as seen in figure 1.

Table 2: Characterization of COVID-19 cases in the state of Roraima, Brazil, reported from March 2020 to July 2021, distributed according to evolution to death, sex, age group and comorbidities

Confirmed cases of COVID-19	Absolute frequency (n)	Relative frequency (%)
Accumulated cases	123.125	100.00
Accumulated deaths	1.903	1.55
Sex*		
Male	54.896	44.59
Female	68.224	55.41
Age group		
0 to 19 years	17.474	14.19
20 to 29 years	23.139	18.79
30 to 39 years	28.757	23.36
40 to 49 years	24.718	20.08
50 to 59 years	15.633	12.70
60 to 69 years	8.532	6.93
70 to 79 years	3.485	2.83
80 years or more	1.387	1.13
Comorbidities or health conditions**		
Chronic Heart Disease	5.727	49.50
Diabetes	3.255	28.13
Chronic Respiratory Disease	1.501	12.97
Immunosuppression	453	3.92
Pregnant	427	3.69
Kidney Diseases	193	1.67
Risk Management	7	0.06
Immune Fragility	7	0.06

Source: Data on cases and deaths were extracted from Secretaria de Saúde do Estado de Roraima.

*Sex – n= 123,120 cases – 5 were excluded for not containing information about sex. ** Comorbidities or health conditions – An individual could have more than one comorbidity.

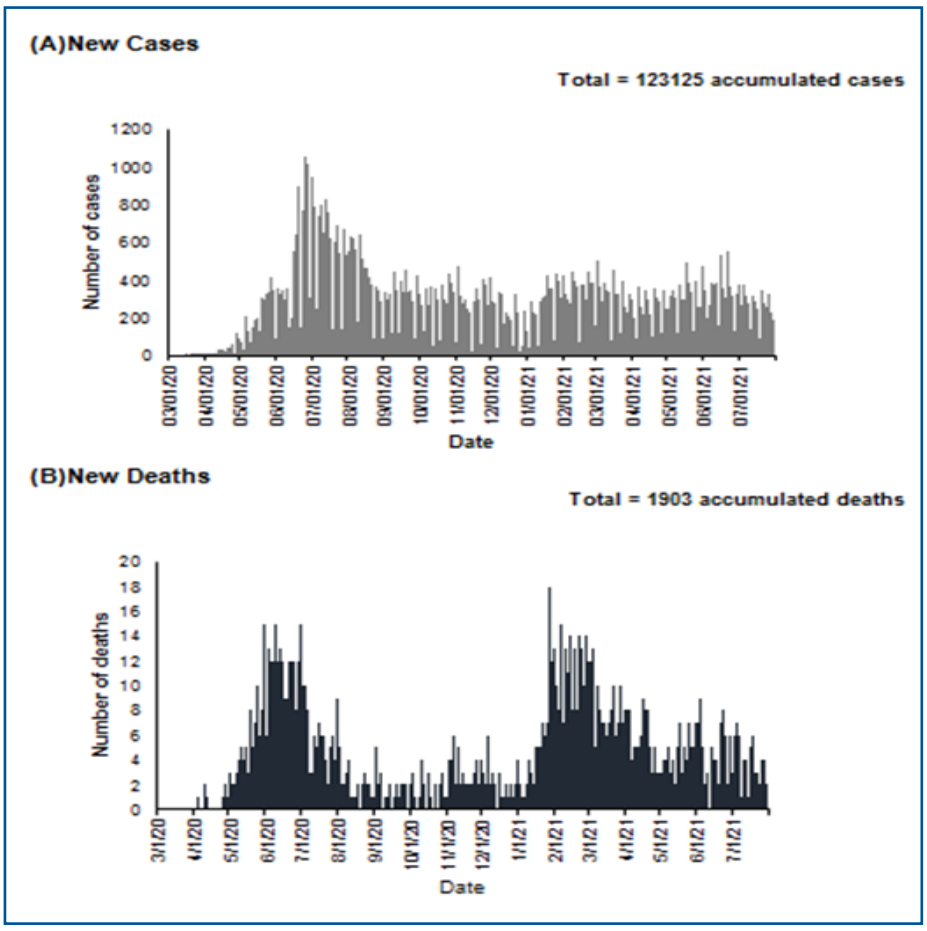

Figure 1: Number of new cases and daily deaths of COVID-19 in the state of Roraima, from March 2020 to July 2021
Source: Cases and deaths extracted from Secretaria de Saúde o Estado do Roraima.

The new cases and deaths and the respective incidence rates (per 100,000 inhabitants), mortality (per 100,000 inhabitants) and lethality (%) are described in table 3.

There was the formation of two possible waves of COVID-19 in the state of Roraima. The first wave (March 2020 to October 2020) of COVID-19 in the studied region had the highest incidence rates, verified in June (2,389.69 new cases per 100,000 inhabitants) and July 2020 (2,995.30 new cases per 100,000 inhabitants). During the first wave, the highest mortality rate of the entire period was also verified, which occurred in June 2020, with a rate of 56.32 deaths per 100,000 inhabitants. However, during the second wave (November 2020 to July 2021), the state had the highest peak of lethality, as observed in February 2021, a lethality of 3.47% (table 3).

Trend analyzes of incidence, mortality and lethality rates and their respective Percentage of daily change (DPC) were shown in table 4.

It was observed that during the first wave (March to October 2020), the incidence rate of COVID-19 in the state of Roraima showed increasing trends ($p<0.05$), with a daily growth rate of 1.68%. During this period, the mortality rate was in a stationary trend ($p>0.05$), and the percentage lethality was in a decreasing trend, registering a daily decrease rate of -0.90% ($p<0.05$) (table 4).

Table 3: Monthly number of cases, deaths, incidence and mortality rates per 100,000 inhabitants and percentage lethality of COVID-19 from March 2020 to July 2021.

Date	Cases	Deaths	Incidence (per 100.000 inhabitants)	Mortality (per 100.000 inhabitants)	Lethality (%)	Period
Mar-20	28	0	5.12	0.00	0.00	1ª wave
Apr-20	860	9	157.25	1.65	1.05	
May-20	5.551	142	1.015.01	25.96	2.56	
Jun-20	13.069	308	2.389.69	56.32	2.36	
Jul-20	16.381	145	2.995.30	26.51	0.89	

Continuation - Table 3: Monthly number of cases, deaths, incidence and mortality rates per 100,000 inhabitants and percentage lethality of COVID-19 from March 2020 to July 2021.

Aug-20	10.085	50	1.844.06	9.14	0.50	
Sept-20	8.009	31	1.464.46	5.67	0.39	
Oct-20	7.017	32	1.283.07	5.85	0.46	
Nov-20	6.275	58	1.147.40	10.61	0.92	2ª wave
Dec-20	5.004	48	914.99	8.78	0.96	
Jan-21	6.632	138	1.212.67	25.23	2.08	
Feb-21	7.491	260	1.369.74	47.54	3.47	
Mar-21	8.016	225	1.465.74	41.14	2.81	
Apr-21	6.240	138	1.141.00	25.23	2.21	
May-21	7.577	112	1.385.47	20.48	1.48	
Jun-21	8.496	111	1.553.51	20.30	1.31	
Jul-21	6.394	96	1.169.15	17.55	1.50	
TOTAL	123.125	1903	22.513.63	347.97	1.55	

Source: Cases and deaths extracted from Secretaria de Saúde o Estado de Roraima.
First Wave: March to October 2020; Second Wave: December 2020 to July 2021.

Table 4: Prais-Winsten regression estimates and percentage change in daily change (DPC) of the incidence and mortality rate per 100,000 population and mortality (%) of COVID-19 in the state of Roraima, Brazil, during the first (March to October 2020) and second waves (November 2020 to July 2021)

Period	DPC (95% CI) Incidence	p	Tendency Incidence	DPC (95% CI) Mortality	p	Tendency Mortality	DPC (95% CI) Lethality	p	Tendency Lethality
1st wave	1.68	<0.001	Crescent	-0.39	0.059	Stationary	-0.90	<0.001	Decrescent
	(1.01; 2.35)			(-0.79; 0.02)			(-1.38; -0.43)		
2nd wave	0.15	0.113	Stationary	0.12	0.208	Stationary	-0.03	0.827	Stationary
	(-0.04; 0.34)			(-0.07; 0.31)			(-0.29; 0.23)		

DPC – Daily Percent Change (%); 95% CI – Confidence Interval 95%; * Statistical difference detected by the Prais-Winsten Regression test, p<0,05. First wave: March to October 2020. Second wave: November 2020 to July 2021.
Source: Cases and deaths extracted from Secretaria de Saúde o Estado de Roraima.

During the second wave (November 2020 to July 2021), a profile with a predominance of stationary trends for incidence, mortality, and lethality rates (p>0.05) is indicated in table 4.

DISCUSSION

In the state of Roraima, 123,125 cases and 1,903 deaths were reported due to COVID-19 from March 2020 to July 2021. It was during the first wave (March to October 2020) of the disease that the region had the highest rate of high mortality, observed in June (56.32 deaths per 100,000 inhabitants), and incidence, verified in July 2020 (2,995.30 new cases per 100,000 inhabitants). However, during the second wave (November 2020 to July 2021), the highest lethality rate was evidenced, recorded in February 2021 (3.47%).

COVID-19 had its first suspected cases in residents of the state of Roraima in March 2020; it was on the 20th of that month that the first two confirmed cases of the disease in patients from the capital, Boa Vista, were notified by the State Health Department[14]. In the same month, the community transmission of the disease was announced, and 30 days later, more than 1,000 cases of COVID-19 were reported[15]. The State Government decreed an emergency in Public Health from this date due to the pandemic; the first fatal victim notification occurred on April 3, 2021.

However, an epidemiological study that analyzed the pattern of spatial and temporal dissemination of COVID-19 cases and deaths in Brazil concluded that the virus was possibly circulating in the state of Roraima earlier as happened in Amazonas State. Probably, the release of the reports took place after a large part of the population was already infected, or there were multiple introductions of the rapidly spreading virus in space[16].

After the rapid dissemination of SARS-CoV-2, COVID-19 caused cases and deaths in all municipalities in the state. According to the State Health Department, the epidemiological profile of COVID-19 in Roraima is characterized by a higher proportion of cases in female individuals (55.5%) and adults aged between 30 and 39 years (23.1 % male 24.1% female). While deaths affected more male individuals (58.9%), elderly aged 60 to 69 years (27.1%), brown individuals (64.4%), and comorbidities such as hypertension (38.4%), followed by diabetes (28.5%) and obesity (10.8%)[15].

The presence of comorbidities and biological factors such as sex and age represent risk factors associated with COVID-19 and are variables that cause significant clinical implications and are related to a worse prognosis of the

disease[17,18]. Although women are at greater risk of being infected by SARS-CoV-2 at younger ages (<35 years), they have a greater chance of recovery when compared to males. However, the chances of recovery decrease with increasing age[18].

Numerous factors may be associated with biological differences due to sex and age[17,19]. Some of these elements are related to differences in the inflammatory response developed during COVID-19. In elderly male patients, there is an increase in inflammatory markers, compared to women of the same age group, demonstrating that the hormonal influence mediates the different functional responses to the virus, especially in components of the innate immune system[20]. Furthermore, sex and age can influence the levels of angiotensin II converting enzyme - ACE2 receptors, which are binding sites that facilitate the replication of SARS-CoV-2[21,22].

Another factor contributing to the biological differences observed in patients with COVID-19 is the presence of comorbidities seen in a more significant proportion in the elderly, the most common being atherosclerotic cardiovascular disease (56.5%) and hypertension (43.5%)[23].

Regarding the increased risk of comorbidities, cardiovascular diseases have high mortality rates for patients who develop Acute Respiratory Syndrome (SARS) since SARS-CoV-2 uses ACE2 receptors to enter cells. These receptors are predominantly found in the lung and heart, so SARS-CoV-2 invades lung cells, causing respiratory symptoms. These symptoms are much more intense in patients with cardiovascular diseases, who have a greater expression of these receptors. Thus, in these individuals, COVID-19 can lead to a severe coronary syndrome, acute myocardial infarction, and heart failure[19,24].

In addition to cardiovascular diseases, metabolic diseases such as diabetes mellitus and obesity are also reported in the scientific literature as risk factors for severe COVID-19. They are associated with a high rate of hospitalization and mortality from COVID-19[25,26].

Probably the aggravating factors of COVID-19 observed in patients with diabetes mellitus come from the physiological impacts due to the effects of prolonged hyperglycemia. It induces a chronic pro-inflammatory state, causing systemic vascular damage and compromise of the immune system. Furthermore, the virus can also cause damage to the pancreas, aggravating the hyperglycemic condition[25].

Similar mechanisms are verified in obese people. These individuals are three times more likely to develop the most severe form of COVID-19. Obesity can promote a chronic pro-inflammatory condition that favors systemic damage and aggravations in the patient's prognosis. Furthermore, SARS-CoV-2 enters fatty tissue cells, which can serve as a viral reservoir[26].

Notably, the factors that impact the diseases arising from COVID-19 are far behind only biological factors. Demographic and Public Health characteristics may explain part of the differences in the evolution of the pandemic in each region. It is known that population density, degree of urbanism, socioeconomic aspects, and the capacity of the Health Systems to provide care are factors that may be associated with mortality from COVID-19[27].

The state of Roraima is located in the northern region of Brazil. This macro-region does not have the highest populations at risk for COVID-19, such as a high proportion of older adults and a high burden of patients with chronic diseases. But it has a high social vulnerability, marked by socioeconomic differences and a scarcity of hospital resources, both in the public and private sectors. Furthermore, the northern region presents inequality in the number of ICU beds and the number of human resources; there is a low number of ICU doctors per capita compared to states in other regions of the country[28].

As for the capacity of the structure of Health Systems to support the demand for the care of patients affected by COVID-19 without suffering a collapse in the health systems, Roraima presents unsatisfactory rates. In a study that created and mapped the Health Infrastructure Index (IIS) in Brazilian states, the authors found that there are regional disparities in the spatial distribution of the health system infrastructure, with the lowest indices being registered in the northern region, in states such as Amapá and Roraima, places belonging to the macro-region where COVID-19 had an impact on health and funeral systems[29].

It is noteworthy that the state of Roraima has only one reference hospital available for the care of critically ill patients who need admission to the Intensive Care Unit (ICU) and in wards for the treatment of COVID-19, which is the General Hospital of Roraima[30].

In critical moments faced by the pandemic, as verified in the current study, in July 2020 (which had the highest incidence rate of the entire period) and February 2021 (which illustrated the highest fatality rate), the state had a different rate of occupation of beds COVID-19. At the end of July 2020, Roraima had a rate of 54.8% of adult beds occupied, and Tocantins, another state in the North region, had a very high occupancy rate (83%)[31]. In early March 2021 Roraima had an occupancy rate of 80% of ICU beds, following the worrying scenario in most states that had a critical alert for the occupation of hospital beds[32].

July 2020 was the month that represented the peak of the first wave of COVID-19 in the state. This month, the highest incidence rate was described (2,995.30 new cases per 100,000 inhabitants) in the period analyzed, with significant mortality (26.51 deaths per 100,000 inhabitants), but it was in June 2020 that the highest mortality rate was described of the entire period analyzed, illustrating a rate of 56.32 deaths per 100,000 inhabitants.

According to the Ministry of Health of Brazil (2020), in mid-July 2020 (12 to July 18) the state of Roraima had the third highest mortality rate in the country (70.8 deaths per 100,000 inhabitants), being surpassed only by Ceará (78.5 deaths per 100,000 inhabitants) and Amazonas (75.5 deaths per 100,000 inhabitants). It is possible that the differences in the mortality rates described are due to the different periods evaluated.

It is noteworthy that the high incidence of cases and deaths verified in Roraima may be associated with low adherence to sanitary protocols, as well as administrative

negligence that occurred in the state, such as the lack of investment of Federal public resources that were made available for the use of needs from COVID-19[9].

At the end of the first wave, from March to October 2020, a profile of increasing trends in incidence rates was observed, which corroborated the formation of a second wave. From November 2020 to July 2021, this new wave presented a scenario marked with stationary trends in incidence, mortality, and lethality rates.

It is noteworthy that even the epidemiological indicators illustrate stationary trends, it was after a year of the pandemic that Roraima registered the highest lethality rate of the entire period analyzed, which was verified in February 2021 (3.47%), followed by significant mortality (47.54 deaths per 100,000 inhabitants). The values remained significant in March 2021, with an incidence of 1465.74 new cases per 100,000 inhabitants, mortality of 41.14 deaths per 100,000 inhabitants, and a mortality rate of 2.81%.

Brazil experienced an acceleration of the pandemic in early 2021, with the formation of a second wave of the disease, impacting changes in the epidemiological profile characterized by an increase in the number of infected adults (20-59 years), with an increase in young adult mortality. There was an increase in ICU hospitalizations and the need for Mechanical Ventilators. They are reflexes arising from the high infectivity of the P.1 variant, which, in January 2021, had a genetic sequencing frequency of 91% in samples from patients in the state of Amazonas[33,34].

According to records until February 20, there were 7 cases of COVID-19 caused by the VOC P.11 variant. This fact suggests that since February 2021, the new variant was circulating in the region and probably was responsible for the high lethality and mortality rates observed in February and March 2021.

In that period, the country faced the worst scenario brought by the pandemic; the number of cases and deaths broke daily records, accompanied by situations of collapse in health systems in most states and municipalities. It is noteworthy that the country never achieved a significant reduction in the viral transmission curve, remaining, during the pandemic, at high levels of daily incidence when compared to other countries[10,35]. This event illustrates that the pandemic is not over; a scenario that is in constant change is still being experienced. Thus it is necessary for continuous epidemiological monitoring of COVID-19 in Roraima and throughout Brazil.

Only with strategies based on science, with the engagement of government authorities, and with the population's adhesion will we be able to mitigate the impacts arising from COVID-19 and contain the advances in the mortality of the disease in the state of Roraima.

Limitations

Although we have precise data and statistically significant trends, there are always data limitations, which may be subject to underreporting in COVID-19 cases and deaths. Furthermore, some municipalities in the State of Roraima are located in places of difficult access, resulting in deficiencies in infrastructure and internet access, resulting in delays in notification.

CONCLUSION

COVID-19, from March 2020 to July 2021, affected the health of 123,125 confirmed cases of the disease, being responsible for death in 1,903 individuals. The temporal distributions of the COVID-19 epidemiological indicators illustrated the formation of two possible waves, the first wave being considered from March to October 2020 and the second wave from November 2020 to July 2021. The second wave having presented incidence, mortality, and lethality rates, with stationary trends, there was a more aggravating scenario for lethality from COVID-19. The disease lethality in the state transitioned from decreasing trends, such as a daily reduction rate of 0.90% (DPC= -0.90%), to stationary. Furthermore, one year after the pandemic, Roraima had the highest lethality rate (3.47%) of the entire period analyzed. Thus, it is evident that the pandemic in Roraima is not yet under control, so it is essential to strengthen and expand preventive non-pharmacological measures and the immunization of the population.

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Resumo

Introdução: o contexto da pandemia da Covid-19 na região Norte é preocupante, visto que há falta de recursos para a Saúde Pública, baixo índice de desenvolvimento humano e indicadores de pobreza acima da média nacional.

Objetivo: analisar a letalidade e mortalidade por COVID-19 no Estado de Roraima, Brasil.

Método: trata-se de um estudo ecológico de séries temporais de dados secundários sobre a COVID-19 no estado de Roraima, região Norte do Brasil, no período de março de 2020 a julho de 2021. Foram calculadas as taxas de incidência, mortalidade e letalidade por COVID-19. Utilizou-se o modelo de regressão de Prais-Winsten para calcular as taxas de construção de séries temporais. As taxas foram classificadas como crescentes, decrescentes ou estacionárias. A tendência foi considerada estacionária quando o p-valor não foi significativo, (p>0,05).

Resultados: no estado de Roraima, durante o período de março de 2020 a julho de 2021, houve um total de 123.125 casos e 1.903 óbitos acumulados devido a COVID-19. A primeira onda (março de 2020 a outubro de 2021) da COVID-19 foi registrada a taxa de incidência (2.995,30 novos casos por 100.000 habitantes - julho de 2020) e de mortalidade (56,32 óbitos por 100.000 habitantes - junho de 2020) letalidade mais elevada. Entretanto, foi na segunda onda (novembro de 2020 a julho de 2021) que foi observada a taxa de letalidade mais elevada (3,47% - fevereiro de 2021). Observou-se que durante a primeira onda, a taxa de incidência da COVID-19 apresentou tendências crescentes. Neste período, a taxa de mortalidade encontrava-se com tendência estacionária (p>0,05) e a letalidade percentual com tendência decrescente (p<0,05). Durante a segunda onda, observou-se um cenário mais agravante para a letalidade, que transitou de uma taxa de redução diária de 0,90%, para tendências estacionárias.

Conclusão: a pandemia no estado de Roraima ainda não está controlada, assim faz-se necessário o fortalecimento de estratégias para mitigar o avanço da pandemia na região e evitar a formação de novas ondas.

Palavras-chave: SARS-CoV-2; COVID-19; mortalidade; epidemiologia; Incidência.