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ORIGINAL ARTICLE

Trends in COVID-19 lethality and mortality rates in the State of Pernambuco, Brazil: a time series analysis from April 2020 to June 2021

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Abstract

Introduction: continual mutations of the sars-cov-2 virus, with the possibility of reinfection or reactivation of the virus, can lead to a further spread of the virus and consequently new infection periods. The state of pernambuco, brazil, has faced many adversities amidst the pandemic, requiring studies and new spatiotemporal techniques to understand the pandemic development and planning actions to reverse the current situation.

Objective: the aim was to evaluate the mortality and lethality trends of covid-19 from april 2020 to june 2021 in the state of pernambuco, brazil, with the division into two periods according to the waves of infection to date (1st period and 2nd period).

Methods: an ecological time-series study was carried out with population data from the pernambuco state health department. We collected the number of confirmed cases and deaths for covid-19. The trends were analyzed according to the prais-winsten regression model in two moments from march 2020 to september 2020 and the second from october 2021 to june 2022. Differences were considered significant when $p<0.05$.

Results: the state of pernambuco had 581,594 confirmed cases of covid-19, where 51,370 were severe cases, and 530,224 were mild cases, in addition to 18,444 deaths. Given the trends analyzed, mortality was increasing in the second period (april/2020 to june/2021), while lethality decreased in the first period and was stationary in the second period.

Conclusion: this study found an increasing trend in mortality of covid-19 in the state of pernambuco, brazil in the second period, highlighting an urgent need to develop surveillance measures as well as public policies for vulnerable populations, in addition to continuing preventive measures.

Keywords: COVID-19; lethality; mortality; epidemiology.

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Authors summary

Why was this study done?
This study was carried out to monitor and highlight the series-time evolution of the incidence, mortality, and lethality of COVID-19 in the state of Pernambuco from March 2020 to June 2021.

What did the researchers do and find?
A time series analysis was performed with data on cases and deaths reported by DATASUS in the state of Pernambuco. It was found that there was an increasing mortality trend in the second epidemiological wave, in addition to identifying the month of March 2021 as the peak of trends.

What do these findings mean?
These findings mean that the state of Pernambuco during the period evaluated has suffered casualties, and great efforts are needed to control the spread of Sars-Cov-2 throughout the state until we can see a decreasing trend in incidence, mortality, and case fatality, and consequently, COVID-19 is no longer a threat to public health.

INTRODUCTION

The world has been currently experiencing the deadliest pandemic of the modern era. On March 11, 2020, the world health organization (WHO) declared a pandemic state due to the viral respiratory infection, coronavirus disease 2019 (COVID-19), caused by the new severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)[1]. Since then, the WHO has encouraged measures to contain the spread of the virus, as it is public health emergency impacting social, political, and economic structures worldwide[2].

To effectively address the pandemic, it is necessary to comprehensively analyze the health crisis scenario, which collapsed in several global regions, especially in Brazil[3]. This collapse is most likely due to the negligence and low investments of authorities within the public health sector and the extreme vulnerability and socioeconomic inequality present in the health systems of Latin American countries. Nowadays, the pandemic finds itself in a humanitarian crisis, evidenced by the high rates of lethality and mortality in these countries[4,5].

By October 2021, 241 million COVID -19 cases were reported globally, of which 21 million have occurred in Brazil, representing around 8,7% of global cases. Thus, Brazil is the most affected country in Latin America and the third on the global rank. This country is facing a health system crisis, totalizing over 603,000 COVID-19-related deaths, which highlights the worrisome situation brought about by the pandemic[6]. Thus, Brazil, which is divided into 26 States and 5 Macroeconomic Regions (North, Northeast, Central-West, Southeast, and South), has faced high COVID-19 lethality and mortality rates in 20 of its States, computing 12.2% of global deaths[6].

As COVID-19 spreads across the country, in Pernambuco, the first peak of cases resulted in 171,016 cases and over 8,933 deaths from April to October 2020, characterizing the first wave. As the virus accumulates mutations proportionally to its infectivity, biomolecular researchers are trying to determine SARS-CoV-2 mutagenic capacity and develop therapeutic and immunizing agents against the disease[6,7]. Among recovered patients and the vaccinated population, the possibility of reinfection or reactivation of SARS-CoV-2 is a reality, especially within the surge of new variants, which can lead to further dissemination of the virus in a short period and, consequently, new waves[8-10].

Over time, the development of the second wave (November to June 2021) leads to even higher numbers of COVID-19 cases and deaths compared to the first wave, given the prerogative of the fatigue of the pandemic situation and consequently the failure of preventive measures. In addition, the lack of sufficient health literacy is critical among the most socio-economically vulnerable communities[10,11].

The state of Pernambuco, located in the Northeast region of Brazil, has the seventh-largest urban agglomeration in the country and is the second-most populous state in the North and Northeast regions. Pernambuco has faced many adversities amidst the pandemic, especially with the spread of the virus to the rural area, requiring studies and new spatiotemporal techniques to understand the evolution of the pandemic and action plans to reverse the current situation[12,13].

On March 12, 2020, the first case of COVID-19 was reported in Pernambuco, which was the third state to present a COVID-19 case in Brazil[14]. After that, Pernambuco decreed preventive measures and suspended events involving more than 50 people. As of May 16, the state issued a 15-day lockdown in the metropolitan region of Recife and the mandatory use of a mask, suspending all non-essential activities[15,16].

As the population of the state is fully immunized, despite the speed of vaccination being small, new epidemiological studies associated with sociodemographic, economic, and environmental factors are needed, as well as strategies with an emphasis on non-pharmacological preventive measures and class protection policies for workers, who were affected in the pandemic, are essential[17,18].

Thus, there is an immediate need for new epidemiological studies of COVID-19, especially at the State level, to highlight the first and second waves. Therefore, this study aimed to evaluate the COVID-19 mortality and lethality trends from April 2020 to June 2021 in the State of Pernambuco, Brazil, according to two periods (the 1st and 2nd Waves).

METHODS

This is an ecological study, using a time-series analysis of official public data available on the website of the Health Department of the State of Pernambuco, Brazil (https://dados.seplag.pe.gov.br/apps/corona_dados.html).

The database was updated on July 20, 2021,

considering COVID-19 cases and deaths from April 2020 to June 2021. Data on Pernambuco cases and deaths of COVID-19 were reported by the municipalities of the State of Pernambuco.

All notifications of cases and deaths referred to COVID-19 were considered, using the International Classification of Diseases, 10th edition (ICD-10), of "U07.1 COVID-19, virus identified " or "U07.2 COVID-19, virus not-identified"[12] associated with the diagnosis of the disease, according to clinical, laboratory, or epidemiological confirmation.

Two researchers independently obtained the data to minimize collection bias and guarantee the quality and reliability of the data.

The collected data were organized in a spreadsheet using Microsoft® Excel 2016.

The effective reproductive number (Rt) was estimated using R studio software EpiEstim package19, version 2.2.4, a previously time-varying reproduction number for epidemics model developed by Thompson and colleagues[20]. In this model, a mean serial interval of 2.97 days with a mean standard deviation of 3.29 days was used, as referred to in the literature[21,22].

Three trends were used in this work: (1) the incidence, which is the number of new cases of a given disease during a given period in a specified population, (2) the mortality which is all deaths reported in a given population; and (3) the case fatality or lethality, which is the proportion of individuals diagnosed with a disease who die from that disease and is, therefore, a measure of severity among detected cases1.

The incidence (cases/population x 100,000) and mortality (deaths/population x 100,000) rates, expressed per 100,000 inhabitants, and case-fatality (total deaths / total cases x 100), expressed as a percentage, were calculated using Mortality rates from April 2020 to June 2021, stratified by gender and age, were also calculated. According to the populational projection of the Federation Units for the year 2020, the State of Pernambuco had 9.616.621 inhabitants (DATASUS, 2021). The population stratified by age and sex used in the calculation was described in figure 1.

Age group	POPULATION		
	Total	Male	Female
0 - 19 years old	2.999.750	1.527.285	1.472.465
20 - 29 years old	1.546.138	765.600	780.538
30 - 39 years old	1.576.112	769.040	807.072
40 - 49 years old	1.332.853	639.104	693.749
50 - 59 years old	1.010.253	468.627	541.626
60 - 69 years old	659.883	292.266	367.617
70 - 79 years old	360.018	146.281	213.737
80 years old or more	165.597	58.081	107.516
Total	9.650.604	4.666.284	4.984.320

Source: Resident population of the state of Pernambuco in the year 2020

Figure 1: Resident Population of the State of Pernambuco, Brazil, by age group and sex

To perform the trend analysis, the period was divided into the first wave (1st Wave - April to October 2020) and the second wave (2nd Wave - November 2020 to June 2021). To define the end of the 1st Wave, the month with the lowest mortality rate was considered, which suggested the end of a 1st Wave in the curve.

The trends were analyzed according to the methodological guidelines by Antunes and Cardoso23. As a population model, the Prais-Winsten regression was used to build time series for mortality rates, which allowed the first-order autocorrelation to be adjusted in the analysis of organized time-series values. The following values were estimated: The values probability (p), and Daily Percent Change - DPC, considering a 95% level significance, according to equations (1), (2), and (3).

$$DCP=(10^{\beta}-1)\times 100\%. \quad (1)$$

$$(IC95\%)\_ul=(10^{\beta_{max}}-1)\times 100\%. \quad (2)$$

$$(IC95\%)\_ll=(10^{\beta_{min}}-1)\times 100\%. \quad (3)$$

Where β is the error type I. The indexes ul mean the upper limit, and ll is the lower limit of the confidence level.

Statistical analyzes were performed using the STATA 14.0 software[24].

RESULTS

In the state of Pernambuco, there were 556,292 cases (100%) of COVID-19 in the period between April 1, 2020, and June 31, 2021, where 17,736 deaths were observed. It was observed that May 2021 had the highest number of cases during the period, totaling 78,016(14.02%) disease involvement, while the highest number of deaths was seen in May 2020, comprising 3,257(25.01%) deaths.

Table 1: The number of COVID-19 cases and deaths, per month, in the State of Pernambuco, Brazil, from April 2020 to June 2021

Month/Year	Cases		Deaths	
	N	%	N	%
April/2020	13,224	2.37	1,103	6.21
May/2020	25,118	4.51	3,259	18.37
June/2020	25,381	4.56	1,674	9.43
July/2020	38,228	6.87	1,252	7.05
Aug/2020	28,859	5.18	885	4.98
Sept/2020	19,270	3.46	452	2.54
Oct/2020	20,914	3.75	354	1.99
Nov/2020	32,588	5.85	538	3.03
Dez/2020	44,378	7.97	766	4.31
Jan/2021	38,717	6.95	762	4.29
Feb/2021	30,144	5.41	670	3.77
Mar/2021	58,477	10.51	1,549	8.73
Apr/2021	56,391	10.13	1,775	10.00
May/2021	78,016	14.02	1,758	9.91
Jun/2021	51,548	9.26	1,182	6.66
TOTAL	556,292	100.00	17,736	100.00

Source: Data obtained from the Pernambuco State Health Department.

The effective reproductive number (Rt) during the first wave (April 2020 to October 2021) and second wave (November 2020 to June 2021) was described in figure 1.

Besides, the COVID-19 pandemic in Pernambuco was found to sustain Rt values above 1.0 for most of the study period while presenting lower rates from August to November 2020. Remarkably, there is a sharp peak in March and May 2020 (Rt values greater than 1.3), followed by oscillation and Rt greater than one at the end of June 2021.

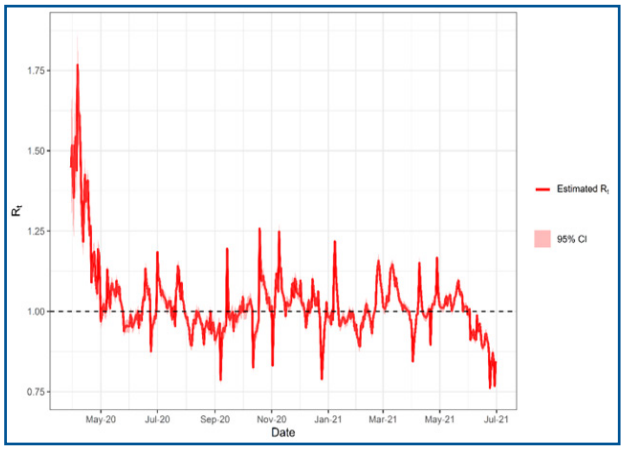


Figure 1: CI = Confident Interval. Rt estimated during 2020, April 2nd to 2021, June 31st period

Furthermore, the incidence rate in the state of Pernambuco was the highest in May 2021, with a rate of 808.41 per 100,000 inhabitants. In the 1st Wave, the highest incidence rate observed was in July 2020, with a rate of 396.12 per 100,000 inhabitants. In October 2020, a lower rate (216.71) marked the end of the 1st Wave and the beginning of the 2nd Wave.

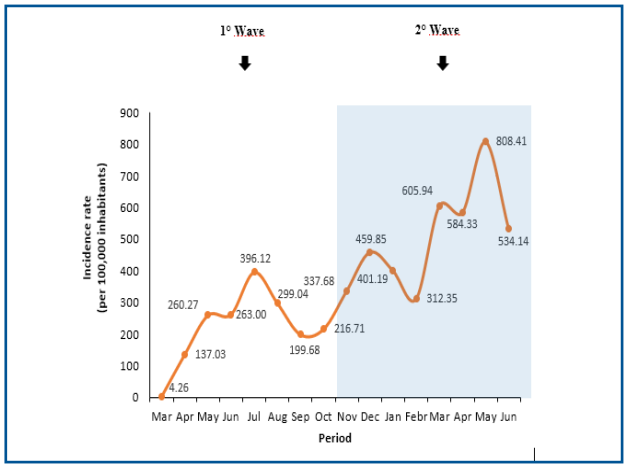


Figure 2: Incidence rate per 100,000 inhabitants of COVID-19, from April 2020 to June 2021, in the state of Pernambuco, Brazil

The incidence rate per 100,000 population in Pernambuco, Brazil, showed an increasing trend for both the possible 1st Wave and the possible 2nd Wave ($p < 0.05$). As well, an increasing trend was observed for the entire period ($p < 0.05$) (table 2).

Mortality rates for the state of Pernambuco, Brazil, are depicted in figure 3.

Table 2: Prais-Winsten and estimated Daily Percent Change (DPC) regression of incidence rates per 100,000 inhabitants of COVID-19 in the state of Pernambuco, Brazil, in the period from April 2020 to June 2021

Month/Year	DPC (IC 95%) Incidence	p	Incidence Trend	Period
Apr/2020 to Oct/2020	1.92 (1.08: 2.77)	<0.001	Increasing	1º Wave
Nov/2020 to Jun/2021	0.33 (0.14: 0.52)	0.001	Increasing	2º Wave
Apr/2020 to June/2021	0.73 (0.54: 0.92)	<0.001	Increasing	Full Period

DPC – Daily Percent Change (%); 95% CI - 95% Confidence Interval; p – p-value: probability of statistical significance. *Means statistical difference - Prais-Winsten regression test, p < 0.05.
Source: Cases, Deaths, and Population extracted from the Pernambuco State Health Department.

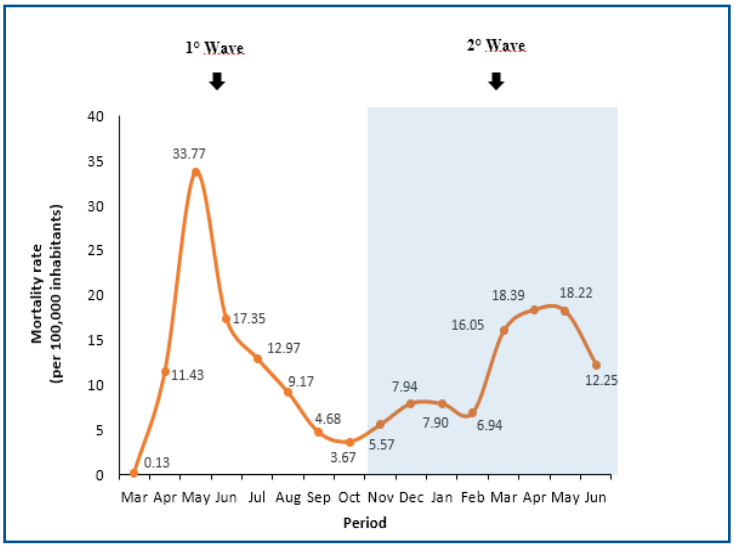


Figure 3: Comparison of the mortality rate (per 100 thousand inhabitants) of COVID-19 from April 2020 to June 2021 in the state of Pernambuco, Brazil

The peak mortality rate in Pernambuco, Brazil, was observed during the 1st Wave, in May 2020, with a rate of 33.77 per 100,000 inhabitants, and the lowest mortality rate was observed in October 2020, with a rate of 3.67 per 100,000 inhabitants.

When analyzing the trends in mortality rates, during a possible first wave, a stationary trend in mortality (p> 0.05) was observed. On the other hand, during a possible second period, there was an increasing trend in mortality (p < 0, 05) (table 3).

The COVID-19 fatality rate in the state of Pernambuco, Brazil, is shown in figure 4.

Table 3 - Prais-Winsten regression and the estimated Daily Percent Change (DPC) of COVID-19 mortality rates (per 100,000 inhabitants) in the state of Pernambuco from April 2020 to June 2021

Month/Year	DPC (IC 95%) Mortality	p	Trend in Mortality	Period
April/2020 to October/2020	0.73 (-0.68:2.16)	0,31	Stationary	1º Wave
November/2020 to June/2021	0.48 (0.34:0.63)	<0.001	Increasing	2º Wave
April/2020 to June/2021	0.25 (-0.01:0.50)	0,06	Stationary	Full Period

DPC – Daily Percent Change (%); 95% CI – 95% Confidence Interval; p – p-value: the probability of statistical significance. *Means statistical difference – Prais-Winsten regression test, p < 0.05.
Source: Cases, Deaths, and Population extracted from the Pernambuco State Health Department.

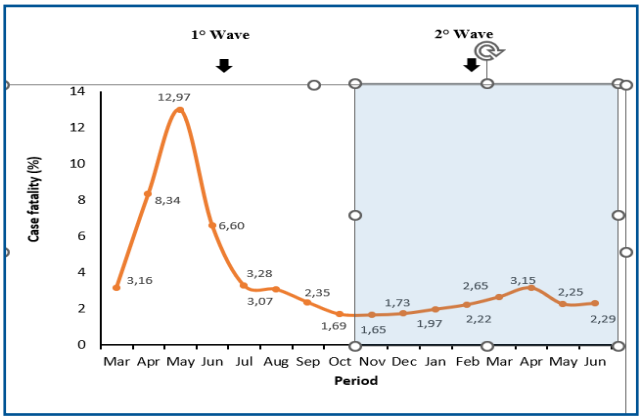


Figure 4: Comparison of COVID-19 Case fatality (%) from April 2020 to June 2021 in Pernambuco, Brazil

The highest lethality rate was observed in May 2020 (12.97%) in the possible 1st Wave, while the lowest lethality rate was observed in November 2020 (1.65%) in the possible 2nd Wave.

When analyzing the trends in lethality (%), it was verified a decreasing trend for both the possible 1st Wave and for the entire period analyzed ($p<0.05$). In contrast, a steady trend was observed for the possible 2nd Wave ($p>0.05$) (table 4).

Table 4: Prais-Winsten regression and the estimated Dialy Percent Change (DPC) of COVID-19 lethality (%) in the state of Pernambuco, Brazil, from April 2020 to June 2021

Month/year	DPC (IC 95%) Lethality	p	Trend in Lethality	Period
April/2020 to October/2020	-0.82 (-1.08:-0.56)	<0.001	Decreasing	1º Wave
November/2020 to June/2021	0.17 (-0.01:0.35)	0,064	Stationary	2º Wave
April/2020 to June/2021	-0.29 (-0.39:-0.20)	<0.001	Decreasing	Full period

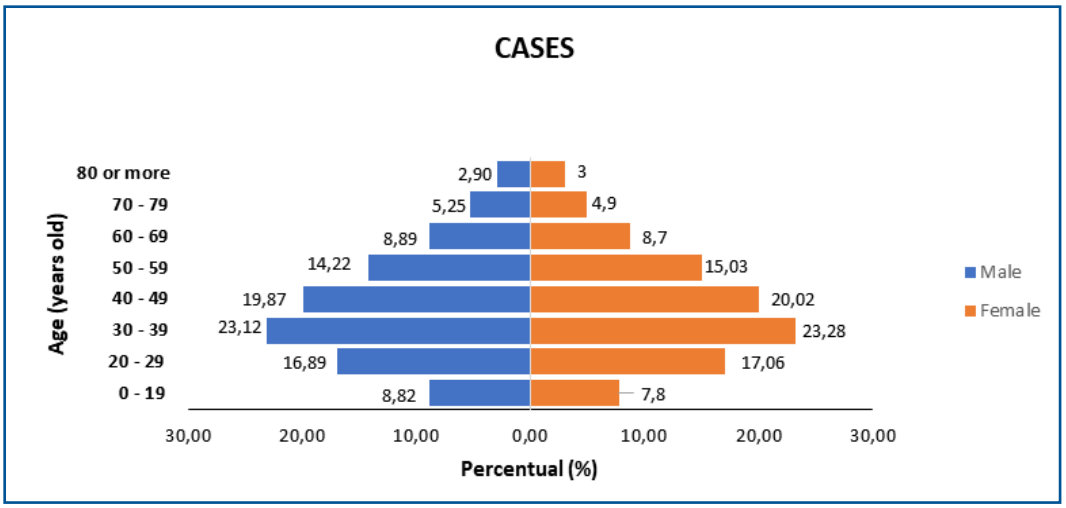
DPC – Daily Percent Change (%); 95% CI – 95% Confidence Interval; p – p-value: the probability of statistical significance. * Means statistical difference – Prais-Winsten regression test, $p < 0.05$.

Source: Cases, Deaths, and Population extracted from the Pernambuco State Health Department.

The total number of COVID-19 cases and deaths by gender and age groups in Pernambuco, Brazil, was also analyzed and split into graphs A and B (figure 5).

Regarding the disposition of cases by age and gender (graph A), a predominance of the percentage of cases between 30 and 39 years old was observed in both sexes (23.06% males and 23.03% females). Considering the number of deaths (graph B), the highest percentage of deaths was shown in the >80 age group in females (26.59%), while, in males, it was in the age group of 70 to 79 years old (24.69%).

(A)



(B)

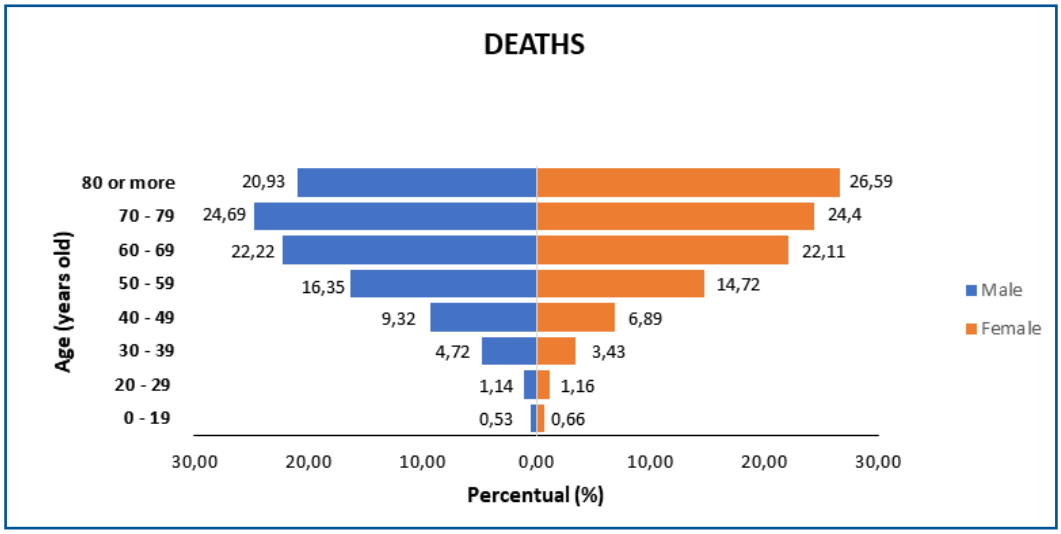
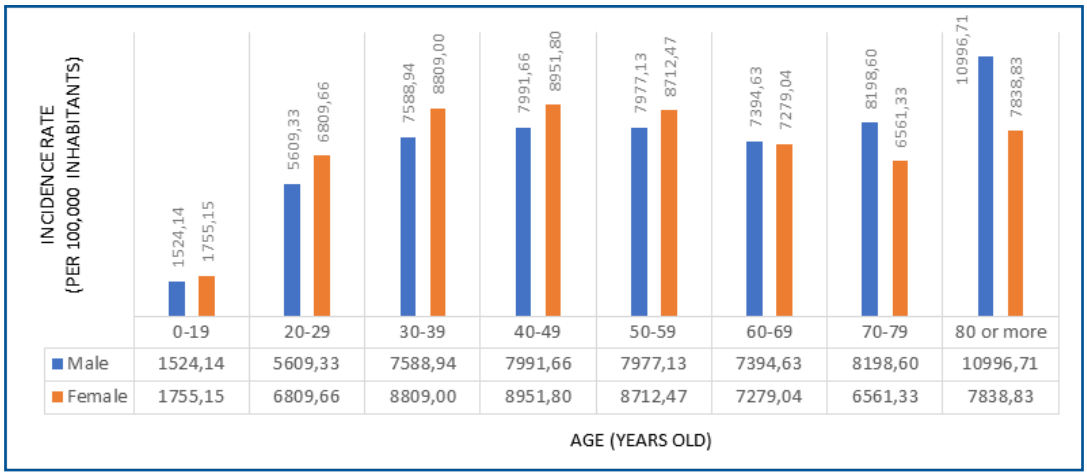


Figure 5: COVID-19 proportions of cases (A) and total deaths (B) (%), by gender and age group, in the state of Pernambuco, Brazil, from April 2020 to June 2021

Regarding gender and age, the COVID-19 incidence, mortality, and lethality rates in the state of Pernambuco, Brazil, were analyzed from April 2020 to June 2021 (figure 6).

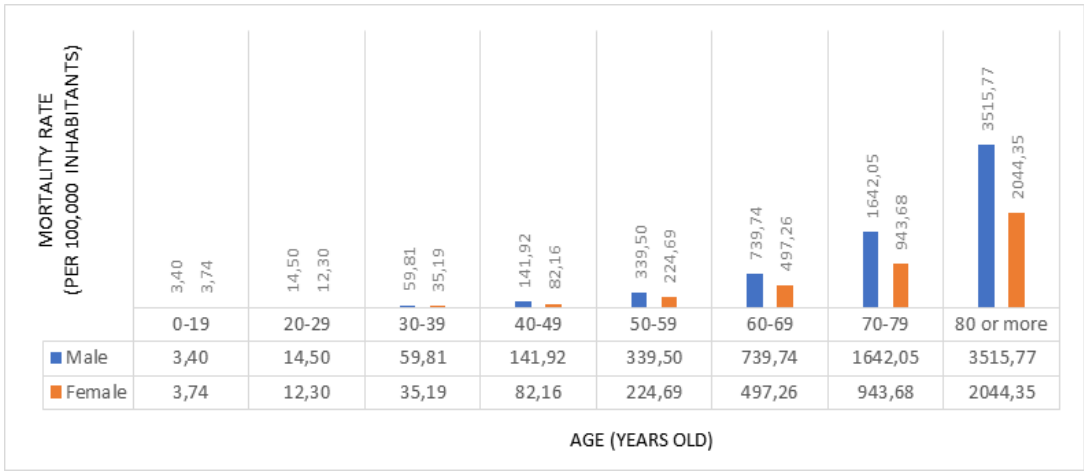
The analysis found the highest incidence, mortality, and lethality in males and individuals aged over 80 years. In females, the highest incidence was in the age group between 40 and 49 years, and the most increased mortality and lethality rates were observed in the age group over 80 years for both genders.

(A)



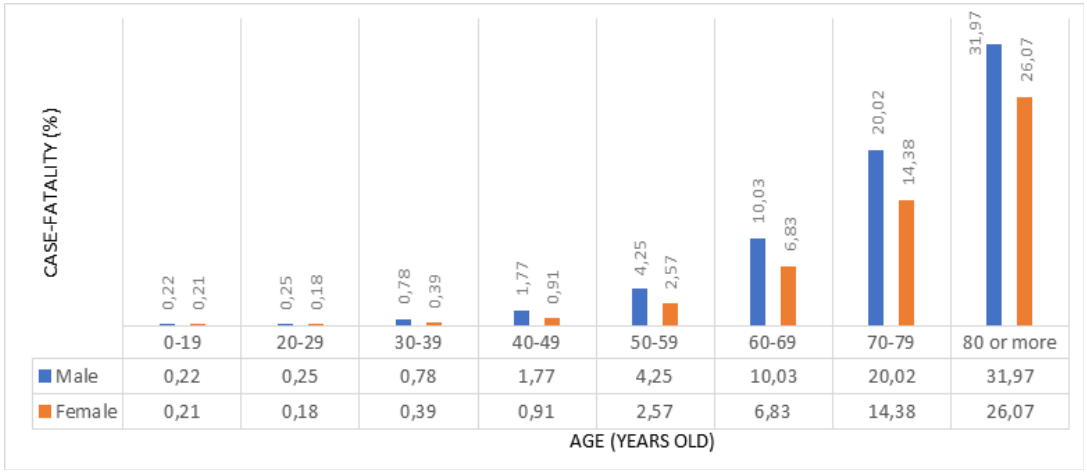
	0-19	20-29	30-39	40-49	50-59	60-69	70-79	80 or more
Male	1524,14	5609,33	7588,94	7991,66	7977,13	7394,63	8198,60	10996,71
Female	1755,15	6809,66	8809,00	8951,80	8712,47	7279,04	6561,33	7838,83

(B)



	0-19	20-29	30-39	40-49	50-59	60-69	70-79	80 or more
Male	3,40	14,50	59,81	141,92	339,50	739,74	1642,05	3515,77
Female	3,74	12,30	35,19	82,16	224,69	497,26	943,68	2044,35

(C)



	0-19	20-29	30-39	40-49	50-59	60-69	70-79	80 or more
Male	0,22	0,25	0,78	1,77	4,25	10,03	20,02	31,97
Female	0,21	0,18	0,39	0,91	2,57	6,83	14,38	26,07

Figure 6: COVID-19 incidence (%), mortality, and lethality (per 100,000 inhabitants) rates, distributed by gender and age group, from April 2020 to June 2021 in the state of Pernambuco, Brazil

DISCUSSION

By July 31, 2021, 197,195,568 confirmed cases and 4,210,201 deaths of COVID-19 had been reported worldwide, from which 19,914,578 confirmed cases and 556,437 accumulated deaths occurred in Brazil. In this scenario, the state of Pernambuco has conveyed 590,785 confirmed cases of SARS-CoV-2, from which 52,034 were considered severe and 538,751 mild cases, as well as 18,784 deaths. Pertain to immunization, Pernambuco has already applied 5,893,326 doses, and 1,469,314 people that were vaccinated with immunizers applied in two doses, and other 166,560 people from Pernambuco who were contemplated with vaccine applied in a single dose by COVID-19 vaccines available in Brazil that are CoronaVac, Janssen, Oxford, and Pfizer[25-27].

Of the laboratory tests performed, 1,019,790 were performed by the RT-PCR method, while 949,376 were rapid tests, and 190,352 were serological. The difference between the tests is in the media in which it is analyzed and their mechanism of action. The serological test analyzes blood serum or biological fluids detecting COVID-19 antigens and antibodies. The RT-PCR uses nasal swabs, eye secretions, or saliva to isolate the RNA viral through DNA polymerase reaction[28].

The reverse transcription-polymerase chain reaction (RT-PCR) test is currently considered the gold standard for diagnosing COVID-19 due to its capacity for a more accurate diagnosis and identification of specific pathogens, providing greater diagnostic certainty. Despite these test characteristics through RT-PCR, serological tests are still important due to their ease, speed of diagnosis, and cost-effectiveness, serving as a complement to the RT-PCR and even practicality for use during the work routine by the government institutions[29].

Regarding the characterization of deaths, the most affected age group was between 70 and 79 years old, while the least affected was between 0 and 19 years old. Moreover, the male mortality was higher with 9,962 deaths, and the most affected race was the brown with 10,130 deaths (67.9%).

One of the most notable aspects influencing the incidence data is the number of tests applied and their diagnostic effectiveness, with several divergences concerning the relative number of infected people with the virus30. The fact that the incidence findings are increasing, in addition to the lack of mass-employed diagnoses, there are deficiencies ineffective surveillance strategies in the areas affected by COVID-19 in the state of Pernambuco. Evidenced a need for strategic surveillance studies, especially at the community level, to generate more robust and reliable spatiotemporal data and implement public policies based on evidence to verify the pandemic reality[31].

Through the exposure of the results of mortality and lethality rates and trends in the state of Pernambuco, Brazil, we provide a time series understanding of the COVID-19 pandemic in the region. With the region showing increasing incidence in the 1st and 2nd waves, there was a stationary trend in the 1st wave an increasing trend in the 2nd wave concerning mortality, a decreasing trend in the 1st wave, and a stationary trend in the 2nd wave concerning lethality.

The presentation of case fatality with the decreasing trend in the first wave is a specific and unusual data observed in the trends compared to the rest of Brazil; this is probably because the case fatality sample in May 2020 in the state was one of the highest rates ever seen in the country, acuminating in the great decrease until the end of the 1st period[32-37].

Regarding demographic data related to age and gender, COVID-19 incidence, mortality, and lethality rates showed a predominance of the age group of 80 years old or more in males, only differing from females in respect to the incidence, which was higher in the age group between 30 and 49 years old. Trends of more significant mortality and lethality rates in older age groups (80+) of both genders have been evidenced in the literature. Noteworthy, these age groups have a greater predictor of mortality rates characterized by the disease of COVID-19[38,39].

In further analysis, it was found that although the largest number of cases are between the age group of 30 to 39 years in both genders, the highest number of deaths was evidenced in the elder people (70 to 79 years for males and 80+ for females). The incidence, mortality, and lethality rates when analyzed about age and gender, showed a predominance of the age group of 80 years or more in males in the three analyzed rates, differing only in the incidence of females, which was higher in the age group between 30 and 49 years old.

Among the profile of mild cases, the most affected age group was between 30 and 39 years old with 129,737, while the least affected was between 80+ with 8,993 cases, the most affected gender was female with 299,736 cases, the most affected race was the brown with 265,588 cases, data that come from the COVID-19 epidemiological bulletin of the state health department of Pernambuco[27].

Concerning populational groups, the number of COVID-19 cases among health professionals was 30,683, as for the population living in confined spaces in which 2,864 cases were confirmed, and for the indigenous people, 1,181. Even with all the scientific measures mitigated by the world and by the state of Pernambuco, the number of cases of COVID-19 among health professionals and other populational groups is alarming, calling for new strategic measures to reduce the contagion, in addition, to mitigating existing protective measures[15,40,41].

The analysis of the mortality during the 2nd Wave surge corroborated with studies of Baggio JAO *et al.* 2021[38]. These authors demonstrated that a high mortality rate is linked to regions of high social vulnerability, as in most areas of Pernambuco. Thus, preventive and protective measures to assist vulnerable populations are required, especially those with diabetes and non-communicable diseases, which may be achieved through the making process of more efficient public health policies.

When we relate the findings of lethality in the state of Pernambuco, we see a decreasing trend concerning the 1st Wave; this may be associated with the effectiveness of the preventive measures adopted by the State since a growing trend was not observed, but a stationary measure of the development of the 2nd Wave in the pandemic[42].

When we stratified the rates by sex and age group, we found a trend towards greater involvement in mortality

and lethality rates in older age groups (80+) in both sexes, as it has been scientifically evidenced that these age groups have a greater predictor of discharges Mortality rates characterized by the disease of COVID-19[38,39].

Limitations

This study has some limitations, one of which is that the analyzed data was taken from the Pernambuco State Health Department. Although the data are from an official and reliable source, the case data were classified according to the date of July 20, 2021. That is, it does not necessarily reflect the occurrence of the beginning of the case. Inconsistencies may have occurred due to the slow diagnosis in addition to false positives/negatives. Another limitation of the study may be the little diversity of variables present in epidemiological bulletins, demonstrating a restriction in the variety of analyses between groups whose function would be crucial to aggregate comparisons and data analysis.

The lack of correlation between analysis of trends by period and strategies used in Pernambuco, inter-municipalities immigration data, and relative information about SUS or private health service users was not available, as well as the scarcity of previous COVID-19 time series analysis studies in the state of Pernambuco. These kinds of data may provide more robustness to the discussion.

Thus, this article aimed to increase the scientific knowledge regarding time series trends of COVID-19 epidemiological situation in the state of Pernambuco, Brazil, from April 2020 to June 2021, performing analyzes of cases and deaths through incidence, mortality, and lethality rates as well as their trends and characterization by sex and age group. Insights of this work highlight an urgent need to develop surveillance measures and public policies for vulnerable populations, in addition to continuing preventive measures.

CONCLUSION

In the period from April to October 2020 (1st wave), the incidence had an increasing trend, the mortality had a stationary trend, while the case fatality had a decreasing trend, highlighting the highest incidence in July 2020, while mortality and case fatality peaked in May 2020. All trends peaked in May 2021 during the second period. The second period presented an aggravation due to an increasing trend in mortality and a stationary trend in case fatality compared to the first period showing that trend updates are essential for monitoring the pandemic advance in the state of Pernambuco. Great efforts are needed to control the spread of SARS-CoV-2 throughout the state until we can see a decreasing trend in incidence, mortality, and case fatality, and consequently, COVID-19 is no longer a threat to public health.

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Resumo

Introdução: mutações contínuas do vírus SARS-CoV-2, com possibilidade de reinfecção ou reativação do vírus, podem levar a uma maior disseminação do vírus e, consequentemente, novos períodos de infecção. O estado de Pernambuco, Brasil, tem enfrentado muitas adversidades em meio à pandemia, exigindo estudos e novas técnicas espaço-temporais para entender o desenvolvimento da pandemia e planejar ações para reverter a situação atual.

Objetivo: o objetivo foi avaliar as tendências de mortalidade e letalidade do COVID-19 de abril de 2020 a junho de 2021 no estado de Pernambuco, Brasil, com a divisão em dois períodos de acordo com as ondas de infecção até o momento (1º Período e 2º Período).

Método: foi realizado um estudo ecológico de série temporal com dados populacionais da Secretaria Estadual de Saúde de Pernambuco. Coletamos o número de casos confirmados e óbitos por COVID-19. As tendências foram analisadas segundo o modelo de regressão Prais-Winsten em dois momentos de março de 2020 a setembro de 2020 e o segundo de outubro de 2021 a junho de 2022. As diferenças foram consideradas significativas quando $p<0,05$.

Resultados: o estado de Pernambuco teve 581.594 casos confirmados de COVID-19, sendo 51.370 graves casos, sendo 530.224 casos leves, além de 18.444 óbitos. Dadas as tendências analisadas, a mortalidade foi crescente no segundo período (abril/2020 a junho/2021), enquanto a letalidade diminuiu no primeiro período e ficou estacionária no segundo período.

Conclusão: este estudo encontrou uma tendência crescente na mortalidade por COVID-19 no estado de Pernambuco, Brasil no segundo período, destacando a necessidade urgente de desenvolver medidas de vigilância e políticas públicas para populações vulneráveis, além de continuar com as medidas preventivas adotadas até o momento.

Palavras-chave: COVID-19; letalidade; mortalidade; epidemiologia.