



Epidemic Curve of Covid-19 Cases after Lockdown in the Municipality of Belém, Pará State, Brazil

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Authors' contributions

This work was carried out in collaboration among all authors. Authors FDMV and LGO designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors TSD, PSF, LCSC and AVC managed the analyses of the study. Authors PFS and DMBS managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Objective: To describe the evolution of COVID-19 cases three weeks after the start of the lockdown in the municipality of Belém, State of Pará.

Methodology: Descriptive-epidemiological study, quantitative approach. The reported cases of Covid-19 were collected and analyzed in the municipality of Belém, from May 28 to June 3, 2020, that is, three weeks after the decree that regulated the lockdown. Data were extracted from the websites of the state departments and the following variables were evaluated: gender, age group, city.

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Results: It was identified that there were records of 92 confirmed cases and 19 deaths from coronavirus in the municipality. People aged 60 years or older were the ones who received the most confirmation of the disease and who also died the most. Women were predominant among confirmed cases and men among deaths.

Conclusion: The present study consists of offering the academic environment reflections about the implementation of lockdown and how it reflects on the possible control of the increase of cases in the face of the coronavirus pandemic, based on the collection of epidemiological data of the disease, carried out in the municipality. For this, there was an increasing trend in the number of both confirmed cases and deaths. However, after the lockdown, it was possible to identify that the incidence remained in an isolation rate interval, without exponential growth, different from what was expected without the strategy. This contributes to the lower demand for care in health services and funeral homes.

Keywords: Coronavirus; epidemiology; pandemic; epidemic curve.

1. INTRODUCTION

COVID-19 disease is caused by a virus that belongs to a set that encompasses part of the coronavirus discovered in the 1960s, responsible for causing respiratory infections in a variety of animals, including birds and mammals. Six main types of coronavirus are known. Of these, two - SARS-CoV and MERS-CoV, present records for causing severe acute respiratory syndrome (SARS) [1].

The new virus was discovered in December 2019 in China, with patient zero being speculated to be from wuhan city. It is called SARS-CoV-2 the cause of COVID-19, its transmission happens through one sick person to another or through contact with droplets, handshake, catarrh cough or objects and surfaces, primarily affecting the respiratory system. Symptoms presented by the infected person may range from mild, moderate and severe, including cough, fever, runny nose, sore throat and difficulty breathing [2].

After the emergence of the new virus, a local epidemic spread and with the exponential increase in the number of cases and easy spread, COVID-19 rapidly spread around the world, infecting and causing millions of deaths. In view of this, the World Health Organization (WHO) declared in March 2020 a pandemic for the new Coronavirus [3].

In Brazil, the first positive case for COVID-19 was registered in February 2020. From that moment on, the federative entities began to define strategies to contain the progress of the disease. Thus, individual and collective measures were implemented, such as horizontal social isolation, hand washing, use of masks and

hygiene of the environment. According to the Ministry of Health, information published on Monday, May 25, result in the number of 23,473 deaths and 374,898 cases. Brazil is the second country in the world with the highest number of confirmed cases of the disease, behind the United States [4].

Public health can carry out interventional measures according to the need, when we approach about the dissemination of the new coronavirus lies-if the need for the implementation of measures for community control, which can vary between horizontal and vertical social isolation. Among the variations on the measures implemented, the lockdown is adopted as a rigid form of community containment, previously established the period that can be extended by the Government that adopts it [5-6].

In the state of Pará, according to data from the state health departments (SESPA), the first case reported by COVID-19 occurred on March 18, a 37-year-old male patient. Since this date, according to the epidemiological bulletin released by the same agency, new contaminated cases have been reported, totaling 46,473 confirmed cases and 3,245 deaths as of June 3, 2020 [7]. Preventive measures were adopted by the Government to control the spread of the virus.

Understanding the association between the situation of how the COVID-19 virus and the adoption of social isolation can act directly in reducing the transmission profile, based on data provided by the State Health Agency (SESPA), can be a strategy for better guidance in search of mechanisms for prevention in a more positive way [7].

Therefore, in order for containment measures to be applied according to the reality of each region, it is important to recognize the incidence of cases and deaths. For this identification may support the choice of a more severe measure or the flexibilization of those that have already been imposed. Thus, taking into account, the contagion characteristic of SARS-CoV-2 and its accelerated dissemination in the municipality of Belém, lockdown was decreed.

Knowing the emergence of adoption of control measures, the preparation of the study allows the analysis of the epidemiology of the disease, as well as the effectiveness of the strategy. This can help the population and authorities to recognize the risk of the disease and the context in which they are inserted.

In view of this scenario, the aim of this study was to describe the evolution of COVID-19 cases three weeks after the start of the lockdown in the municipality of Belém, State of Pará, and to highlight the importance of social isolation in the fight against the pandemic.

2. METHODOLOGY

Descriptive-epidemiological study, quantitative approach. Where there was the collection and analysis of the reported cases of Covid-19 in the municipality of Belém, in the period from May 28 to June 3, 2020, that is, three weeks after the decree that regulated the lockdown.

The decree of total lockdown was the non-pharmacological measure elected by the State, aiming that the population kept in isolation as much as possible, avoiding exposures to reduce the number of people infected and consequently deaths. Only essential services, such as supermarkets, pharmacies and banks, could be used for 10 days between 07 and 24 May 2020.

The city of Belém, constituted as the capital of the State of Pará and is considered its main urban center. Because of this, it presents concentration of services and flow of people. As a territorial organization, it has 8 administrative districts and 71 districts [8]. According to IBGE, it has a territorial extension of 1,059.466 km², with a population estimate of 1,492,745 inhabitants. Being its current mayor Zenaldo Rodrigues Coutinho Júnior [9,10].

In this regard, the data were collected on the websites of the state departments. Being one of

them, the Department of Health of the State of Pará (SESPA) (<https://www.covid-19.pa.gov.br/#/>), in which the information was extracted daily, because the site contains a limitation, which with each new update the last one expires. Thus, during the days in question, the collections were performed twice a day, one by the afternoon shift and another by the night shift, a time when there is usually the updating of the cases.

Data were also collected from the website of the Secretariat of Public Security and Social Defense (SEGUP) (<http://www.segup.pa.gov.br/>), to identify the isolation index in the period stipulated for the study.

After collection, the data was unified and grouped into the Microsoft Office Excel 2007 program to facilitate descriptive analysis. The following variables were evaluated: gender, age group, city. The research began on May 28 to June 3, 2020 to assess the progress of the disease.

Considering that both sites used consist of a public domain database, there was no need for a Research Ethics Committee, being in consensus with what is regulated by Law No. 12,527 of November 18, 2011. In which, aiming at transparency and access to information of public interest, it enables the use for scientific production.

3. RESULTS AND DISCUSSION

During the data extraction period, which occurred between May 28 and June 3, 2020, according to what was reported by the Pará State Health Department (SESPA), there were 92 confirmed cases and 19 deaths from coronavirus in the municipality of Belém.

Based on the survey, it was possible to identify that there were confirmed cases in most age ranges. However, according to Table 1, about 27.2% of the total corresponded to people aged 60 years or older, which represented the group with the highest prevalence among the infected. People aged 30 to 39 years totaled 26.1%. On the other hand, it was noted that children aged 2 to 9 years are the ones who are least infected by COVID-19, having no record during the week of study.

Women had a predominance in most age groups and represent 53.3% of all infected people.

However, in the age range with the highest accumulation of confirmed cases, men had a higher incidence in the age group of ≥60 years. Therefore, it was evident the existence of two large groups with the highest number of cases, but with different characteristics, which may also be associated with different vulnerability factors for the disease.

As for coronavirus deaths, 19 were recorded in the city. Since, as shown in Table 2, none of these corresponds to people aged between 2 and 39 years. On the other hand, people over 60 years of age recorded the highest number, corresponding to 78.9% of all cases. Regarding the predominance by sex, men had 26.4% more incidence than women.

Fatalities due to COVID 19 affect the elderly more incisively, although young people have the same chance of contamination. It was found that the probability of infection is accentuated proportionally to the increase in age. In this follow-up, it was observed that people over 59 years of age are approximately

five times more likely to die than those aged 30 to 59 years [11]. In view of this, the recognition of the predominance of age and sex becomes indispensable for the greater understanding of priority groups in the face of this pandemic.

Therefore, in what corresponds to the profile that holds the prevalence of deaths, it is significant to take into account the weaknesses they present. In view of this, for the Ministry of Health, the elderly are part of the main risk groups of COVID-19 because they are more likely to contract the disease [12].

Fig. 1 allows the visualization of the epidemiology of the disease, in association with the age group. Thus, it is possible to identify that from 30 to 39 years of age, there was a high number of confirmed cases, when compared to the others, but there was no record of death in this range. In contrast, people aged 60 years or older, in which, although the highest number of confirmed cases, had the highest number of deaths.

Table 1. Distribution of the number of confirmed cases of COVID-19 in Belém/PA by age group and gender

Age group (years)	Population		Sex			
	Examined	%	Female	%	Male	%
≤ 1 Year	1	1,1	1	1,08	0	0
2 to 9 years	0	0	0	0	0	0
10 to 19 years	3	3,3	1	1,08	2	2,17
20 to 29 years	5	5,4	1	1,08	4	4,34
30 to 39 years	24	26,1	15	16,31	9	9,77
40 to 49 years	21	22,8	13	14,14	8	8,68
50 a 59 anos	13	14,1	7	7,61	6	6,51
≥ 60 years	25	27,2	11	11,96	14	15,2
Total	92	100	49	53,3	43	46,7

Source: Sespa, (<https://www.covid-19.pa.gov.br/#/>,) updated on 03/06/2020

Table 2. Distribution of the number of deaths of COVID-19 in Belém/Pa by age group and gender

Age group (years)	Population		Sex			
	Examined	%	Female	%	Male	%
≤ 1 Year	1	5,3	1	5,25	0	0
2 to 9 years	0	0	0	0	0	0
10 to 19 years	0	0	0	0	0	0
20 to 29 years	0	0	0	0	0	0
30 to 39 years	0	0	0	0	0	0
40 to 49 years	1	5,3	1	5,25	0	0
50 to 59 years old	2	10,5	1	5,25	1	5,26
≥ 60 years	15	78,9	4	21,02	11	57,93
Total	19	100	7	36,8	12	63,2

Source: Sespa, (<https://www.covid-19.pa.gov.br/#/>,) updated on 03/06/2020

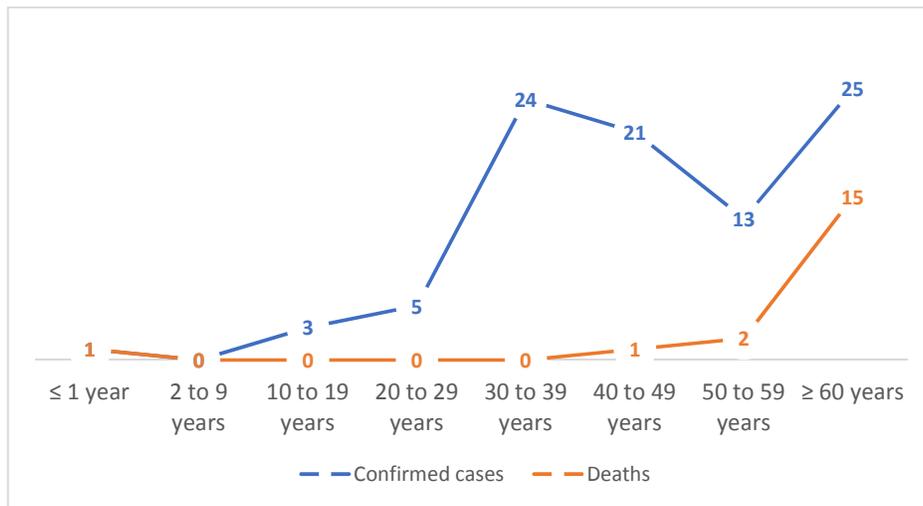


Fig. 1. Representation of the age group relationship between confirmed cases and deaths of COVID-19 in Belém/PA

Source: Sespa, (<https://www.covid-19.pa.gov.br/#/>), updated on 03/06/2020

Thus, to understand the factors associated with this prevalence, some studies have devoted themselves to verifying the existence of previous comorbidities, given the importance in the evolution of the patient's clinical condition. In one study, arterial hypertension was considered the main associated disease [13] and in another cardiovascular disease [14]. That is, in different scenarios, people who have characteristic symptoms of the disease, may have diseases with the potential to affect important organs in the maintenance of the functioning of the body.

The representation of epidemiological data in figures are extremely relevant for statistical projection, since its use can contribute to the visualization of how the study site behaves in the face of the embedded method, which allows identifying whether the result was satisfactory or not, from the epidemic curve generated – ascending or descending, as to the period implemented the study was sufficient to be satisfactory as to the objective, decrease in the epidemic curve. In the city of Belém, we were able to classify them as satisfactory when the cases and deaths recorded demonstrate the curve downwards [5].

It is believed that the implementation of a unified and agile information system can be a strategy to cope with the pandemic. However, during data collection, some obstacles were observed in the identification of characteristics of confirmed cases and deaths on the websites made

available by the state government and municipalities. Where, to obtain information about gender, age and municipality, it was necessary to extract the data whenever there was updating, that is, twice daily on the site at the state level. For, there is no organization of the consolidated notifications with these details of the infected per day [15].

In addition, in view of the notifications from the municipalities passed late to the state secretariat, it was noticed that during the week of data collection, that many cases were not counted on the day of diagnosis. Adding the transparency of the cases, with the greatest scope of testing, the measures can be adopted based on the reality of each region [15].

There was a decrease in the curve of confirmed cases in the exposed period, the decrease in the Fig. 2 demonstrates the attenuation of the virus. As well as, there is also a decrease in the number of confirmed deaths between the period from 28/05 to 03/05, but cases begin to increase in the interval from 30/05 to 02/06, and soon after the curve decreases.

When we observed the correlation in the number of confirmed cases and confirmed deaths, from Fig. 1, from the period in which the collection of epidemiological data consists, we see a significant decrease in the numbers registered by the Health Department of the State of Pará - SESPA. Thus, we visualized a 97% decrease in

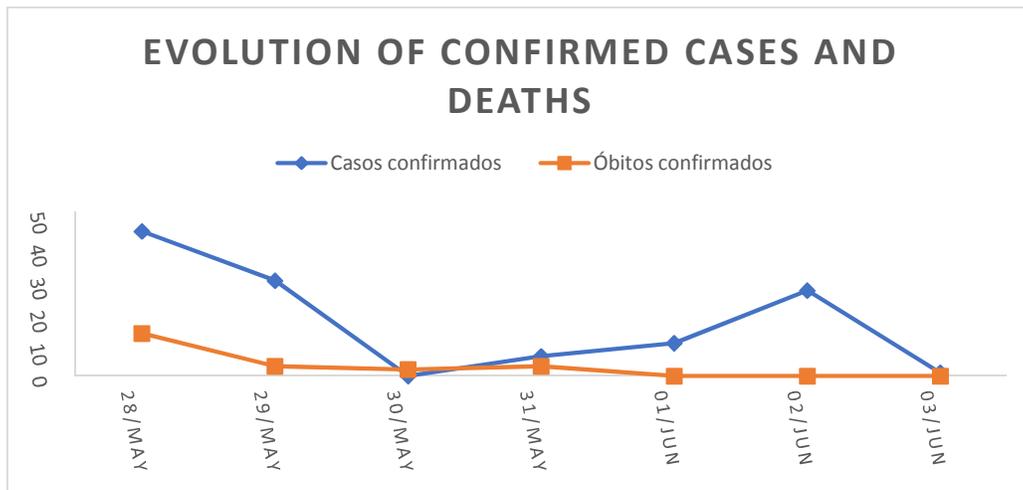


Fig. 2. Evolution of confirmed cases and confirmed deaths of COVID - 19 in Belém/Pará
 Source: Sespa, (<https://www.covid-19.pa.gov.br/#/>), updated on 03/06/2020

the number of confirmed cases, recorded only the increase of the curve on 02/03, but still with 40% of the given collection, as to the number of obtained the curve decreases significantly, reaching 0, decrease of 100%.

The oriented approaches, both for the elderly and for the general population in the current pandemic scenario, is social distancing, hand hygiene with soap and water through their correct hand washing or gel alcohol [16].

In this scenario, the metropolitan region recorded the maximum number of cases. Consequently, stricter determinations were followed in order to contain the progress of the disease. Thus, between the dates of 7 to 24 May, the lockdown came into force in Belém and other municipalities, which allowed only the execution of activities considered essential.

The mean data of social isolation, based on the percentages presented in Fig. 3, was 44.1%, where on May 31, the one with the highest percentage (50.9%). After that date, there was a gradual drop in the isolation of the city, approaching 40% on June 3. Then, in 3 days, a 10.8% drop in the index that confirms the permanence of the population in their homes was found to control the spread of the virus.

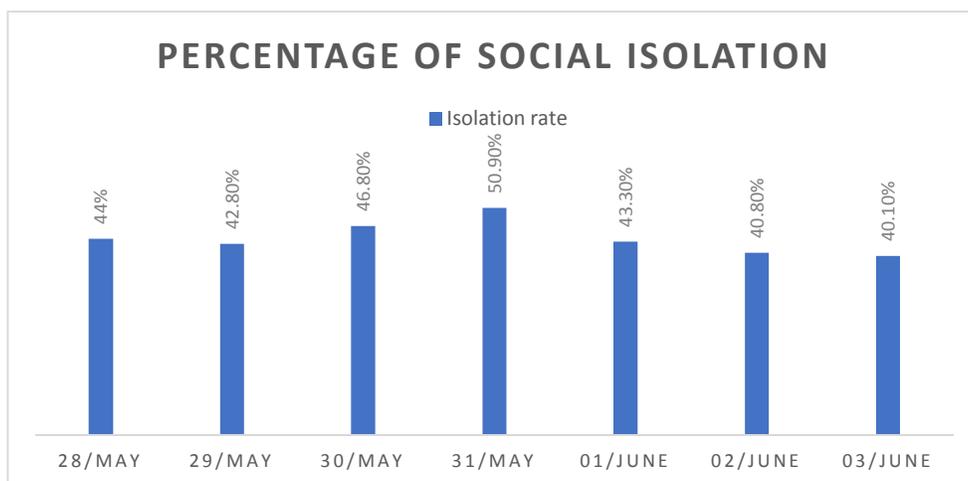


Fig. 3. Rate of social isolation in combating COVID-19 in Belém, during the period from 28/05 to 03/06

Source: Sespa, (<https://www.covid-19.pa.gov.br/#/>), updated on 04/06/2020

Given the above about the spread about the COVID-19 virus, it is necessary to understand the effectiveness of distancing and social isolation. Through the surveys conducted, it is noted the reduction in the number of cases significantly three weeks after the lockdown decree, given the greater adherence to the period of social isolation, however, the population did not reach the minimum indicated by the World Health Organization (WHO) which is 70% isolation to reduce the number of infections [17].

The discussion about social isolation is quite recurrent, since it has an impact on people's lives. One of the guidelines on the subject refers to the influence of the socioeconomic factor, in which the population with lower needs their locomotion to work, reflecting, then, in the decrease in the rates of social isolation [18].

Thus, total blockage emerges as a public health measure in view of the need of the municipality, state and federal government in view of the lack of control of the case curve and the need to reduce the burden of the health system. Lockdown is a non-pharmacological community containment measure to combat pandemic [5,19].

4. CONCLUSION

The present study consists of offering to the academic environment reflections about the implementation of lockdown and how it reflects on the possible control of the increase in cases in the face of the coronavirus pandemic, based on the collection of epidemiological data of the disease, carried out in the municipality of Belém, Pará, Brazil.

The number of confirmed cases and deaths indicated the need for more severe measures by the State Government, such as lockdown. Because this is a study that was developed three weeks after the impediment of the operation of non-essential services, it was possible to observe the effectiveness of the strategy. For this, there was an increasing trend in the number of both confirmed cases and deaths. However, after the lockdown, it was possible to identify that the incidence remained in an isolation rate interval, without exponential growth, different from what was expected without the strategy. This contributes to the lower demand for care in health services and funeral homes.

Therefore, the identification of the characteristics of those who became ill and the incidence may contribute to the flexibilization of measures. To this end, it is important to collaborate with the population, as well as the authorities should reinforce the need to maintain prevention measures and be cautious in returning normal activities.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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