The Impacts of Social Distancing on the Incidence of Covid-19 in a Municipality in the Brazilian Amazon

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Abstract— *The Covid-19 pandemic culminated in the rupture of the contemporary world's relationship with infectious diseases, as it is an unprecedented event. In this way, social distancing measures were necessary, through confinement and seclusion with the delimitation of some rules. To analyze the effects of implementing social distancing on the incidence of Covid-19 in a municipality in the Brazilian Amazon region.*

This is a descriptive study with a cross-sectional quantitative approach, about the impacts of social distancing in the pandemic in the municipality of Tucuruí, in the inner city of the Pará state. This work took place through the collection of secondary data in the public domain, therefore, dispensing with the Ethics Committee. It took place in 3 stages, namely data collection, tabulation and data analysis. Results: From January 2020 to December 2021, the Department of Epidemiological Surveillance of Tucuruí carried out 8,499 notifications of cases of Covid-19, with an average of 4,249 cases per year in this period, with 2021 being the highest incidence, with 65.81% (n = 5,594) reported cases. There were 4 lockdowns during this period, with an average decrease of 32% (n = 200) in notifications. In summary, it was noted that the weather caused by Covid-19 devastated the population and especially the health management system of the municipality. However, with the establishment of service management, it was possible to verify the control of new cases, favoring the quality of the conduct of the managing health institutions.

I. INTRODUCTION

The COVID-19 pandemic culminated in the rupture of the contemporary world's relationship with infectious diseases, given that the impacts of such a pathology on society have not yet been fully dimensioned and the course of contagion, infection and illness are an event unpublished [1].

The Brazilian federal government was unprepared for a long time to control and reduce the number of Sar-Cov-19 cases, corroborating the increase in national deaths in the Brazilian Amazon region, which already has a historical difficulty in accessing health, the which makes the pandemic generate even more serious health demands in this region [2].

From this perspective, the world scenario has changed and, for that, a goal was established to reduce the number of new cases and, consequently, deaths. Thus, social distancing measures were necessary, through confinement and seclusion with the delimitation of some rules to keep the population at home, resulting in the suspension of different non-essential services and activities [3].

This prevention measure was widely disseminated in the community, however it received several criticisms, which made it difficult or even prevented its maintenance, directly reflecting the increase in the number of cases, given that social distancing is essential to reduce the transmissibility of the pathogen, being that it has the intention of delaying major outbreaks of the disease and thus leveling the demand for hospital beds, avoiding their overload [4].

In this sense, it is noted that such events impacted the lives of individuals, drawing attention to the scope it had and the speed of its dissemination, which affected a relative coefficient of the population, overloading the global health system, especially the Unified Health System. Health (SUS), in Brazil. Consequently, it began to demand more workload, performance, availability, qualification, training and ethical principles from health professionals [5].

Therefore, given the current scenario, states that epidemiological studies are essential tools for the Unified Health System (SUS), as they allow optimizing care, quickly training professionals according to the profile of the population, thus, promoting public policies in an accessible way. That said, this work aimed to describe the effects of the implementation of social distancing on the incidence of Covid-19 in a municipality in the Brazilian Amazon region.

II. METHODOLOGY

This is a descriptive study with a cross-sectional quantitative approach, which encompasses the fundamentals of field research methodology, whose objective is to observe and analyze a certain reality through the description of its aspects, collection, quantification and qualification. of data collected [6].

The research was carried out in the municipality of Tucuruí-PA, located in the Southeast region of the state of Pará, which has a total population of approximately 116,665 thousand people distributed in 2,084,289 km², corresponding to 46.56 inhab/KM², according to data from the Brazilian Institute of Geography and Statistics (2020). The sample selection used in the research corresponded to the total sample of the statistical data of the reported cases

of Covid-19 from January 2020 to December 2021 in the municipality of Tucuruí. The criterion used to choose this sample had a census character, since the entire population of donors will be analyzed [7].

Data collection will be carried out after acceptance by the institution where the study will be carried out. In addition, 3 steps were established to obtain data, as follows: In the first phase, an official letter was requested from the institution with the request of the aforementioned data. Subsequently, authorization was requested, via official letter, from the Department of Epidemiological Surveillance. After that, the data contained in the system was removed.

In this way, the data were tabulated in electronic spreadsheets in the Microsoft Office Excel 2016 program and organized in the form of graphs, for the percentage demonstration of the results obtained in the investigation and used in the statistical analysis. Then, the information obtained underwent a second detailed analysis in order to draw a curve to represent whether the decrease in the incidence of Covid-19 and the lockdowns promoted are being related.

The study remained faithful to the precepts and guidelines of the National Health Council, regarding research with human beings, since all the data collected came from reliable and freely accessible government databases, with no exposure of people and, thus justifying the absence of the opinion of a Research Ethics Committee.

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III. RESULTS AND DISCUSSION

For a better analysis of the impacts of social distancing on the incidence of Covid-19, the research was divided into 2 categories, the first corresponding to the effects of distancing on the incidence of the virus and the second category referring to the profile of infected patients.

Category I: Effects of distancing on virus incidence

First, it is important to note that the municipality under study decreed from January 2020 to December 2021, three (3) decrees that imposed mandatory social distancing. Of these two lockdowns were implemented in 2020 and one was established in 2021. All of these were implemented through decrees and proposed to reduce contamination by the virus, given that, as it is an unprecedented infectious episode worldwide , the scientific ignorance of Covid-19 about the modes of transmission as well as therapeutics, provided the mass contagion of the population contingent, thus characterizing the pandemic process of this infection. Such measures implemented in the municipality were shown in table 01.

Table.1: Loockdown decrees according to social isolation measures.

Decre	Date	Implemented
Municipality	05/19/2020	Intercity entry and exit of people is prohibited.
Municipality	06/16/2020	Non-essential activities are stopped
Municipality	10/03/2021	Non-essential activities are stopped.
Municipality	01/19/2022	Start of vaccination for the population at risk
Municipality	02/22/2022	Second dose for the population at risk
Municipality	05/01/2022	Initiation of vaccination for the general population

Official website of Tucuruí City Hall.

According to Kupferschmidt & Cohen (2020)[8], the measures implemented by managers in order to prevent, as well as reduce the number of cases of the disease, were essential for the reduction of cases of Covid-19, given that it has the intention of delaying major outbreaks of the disease and thus leveling the demand for hospital beds, avoiding overloading the health system.

Taking this into account, in the same period of implementation of the aforementioned decrees, according to the Tucuruí Epidemiological Surveillance Department, 8,499 notifications of confirmed cases of Covid-19 were made, with an average of 4,249 cases per year in this period. The year with the highest incidence was 2021 with 65.81% (n = 5,594) reported cases and the year with the lowest was 2020 with 34.18% (n = 2,905).
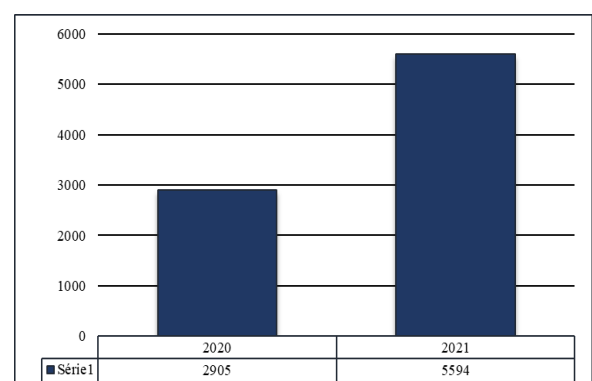

Fig. 1: Incidence of cases of Covid-19 second year of notification.

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It was found that cases increased exponentially from May 2020, with 7.49% (n = 637) reaching its peak this year in June with 8.15% (n = 693), and since July they have decreased significantly. drastic in 66.81% (n = 463) of reported cases. It is worth noting that this intense decrease in cases occurred after the implementation of the two lockdowns for the year.

It was observed that cases increased again from October 2021 with 2.48% (n = 211), this exacerbation of cases may have been the result of the non-maintenance of the non-social distancing decrees. Therefore, Covid-19 reached its peak of the year 2021 in May, which represented 11.37% (n = 967). Since then, it started to progressively decrease with the follow-up from vaccination to the second dose in the public over 60 years and progression to the general population.
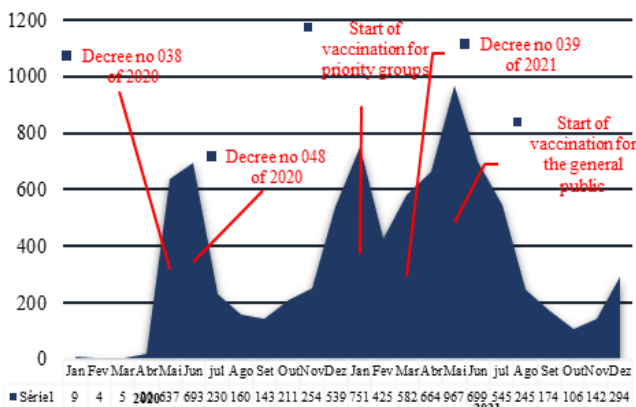

Fig. 2: Incidence of Covid-19 from 2020 to 2021, second month of notification and decree established.

Moreira et al. 2022.

This is due to the readaptation of measures according to the situation of the cases, given that they are implemented gradually, varying in intensity and formulation, and consequently differing in terms of results. Thus, over time, when there was a reduction in the number of Covid-19 cases, some prevention strategies were reduced, a factor that can be seen as a success, due to the decrease in death rates, or a challenge as if they stop as their effect, the numbers tend to rise again [9]

With regard to mortality, the rate was 3.31% (n = 282), accounting for a total of 282 deaths in the two years, with no significant difference between the years studied, given that in 2021 there was 50.35% (n = 142) deaths and in 2020 49.64% (n = 140) cases were reported.
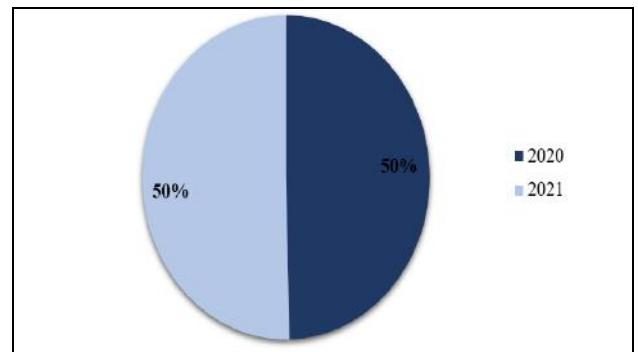

Fig. 3: Death rate according to the year of notification 2020 to 2021.

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According to a study by the Chinese Center for Disease Control and Prevention (CCDC)[10], Covid-19 has a fatality rate of 2.3%. In addition, due to the internalization of the place, the increase in demand for care in relation to cases of Covid-19, directly influence the mortality rate, given that hospital beds have reduced capacity.

Furthermore, it was observed that the death rate increases exponentially with the increase in the incidence of cases. And it gradually decreases from the lockdown decrees and the increase in vaccination for the population at risk, as shown in graph 04.
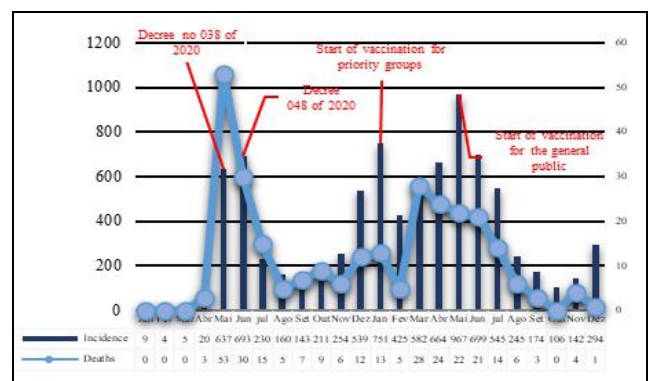

Fig 4. Death rate according to the month compared to the incidence rate and prevention measures of Covid-19.

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Thus, it is considered relevant to report that the established public health measures had a considerable effect on reducing the mortality caused by the Covid-19 virus. In this way, the establishment of social distancing, called "Lockdown", has become an effective tool to combat the pandemic, as according to studies, it has already been used in several countries to mitigate other pandemics, one of which is the H1N1 influenza. from 2009-2010[11, 17].

Thus, it is observed that as throughout the country, municipal managers have established measures to contain viral transmission in a comprehensive way and in a short period of time with the objective of reducing the incidence and death rates by Covid-19, bringing results. positive from an epidemiological perspective. Therefore, according to Silva et al. (2020)[12], these strategies provided an improvement in the current pandemic scenario.

In addition, it appears that there is a shortage in the bases of studies regarding the effectiveness of vaccination to reduce the numbers of severe cases of Covid-19 in Brazil. However, according to Orellana et al. (2022)[13], vaccination enabled a significant reduction in the mortality of individuals between 60-69, who were vaccinated for 14 days, as they enjoyed the maximum potential of the vaccine.

Accordingly, according to this same study, people who had both doses of the vaccine have reduced symptoms compared to those who had no vaccination history or only an incomplete vaccine regimen, a fact that limits the direct effects of the immunizing agent. In addition, it is worth mentioning that the action potential of vaccines is different, so the effectiveness of protection between them varies according to their formulation.

Category II: Profile of infected patients

Regarding the profile of diagnosed patients, it was Regarding the profile of diagnosed patients, it was noted that the most prevalent age group was the economically active, being 30 to 40 years old, which comprise 21.76% (n = 1850) of the notifications, 40 to 50 years old, being 20.73% (n = 1762), and from 20 to 30, estimating 15.13% (n = 1286) of the cases. Furthermore, in terms of gender, females have 54.70% (n = 4649) while males have 45.29% (n = 3850).

This is due to the fact that the labor market is made up mostly of young adults, who are exposed in the most diverse areas. In addition, female, black and elderly patients are more vulnerable to the disease, as most of them have associated chronic health conditions and go to health facilities frequently for medical consultations for self-care[14, 19].

Of the reported patients, 15.43% (n = 1321) were asymptomatic. In symptomatic cases, the most prevalent symptoms were fever, which was present in 54.80% (n = 4658), followed by cough, with 54.50% (n = 4462) and dyspnea, with 23.43% (n = 1994).

According to Silva (2020)[12] and Santos et al. (2020)[20], the main symptoms caused by the virus infection in the human body can vary from mild to severe, ranging from a dry cough to myalgia, runny nose, diarrhea,

respiratory failure and even death. These changes occur due to the potential for infection and inflammation of Covid-19 that can reach multiple organs, raising levels of normality causing atypical manifestations in the body's homeostasis.

The mortality rate due to complications from Covid-19 was 3.31%, totaling 282 deaths. Regarding the profile of patients who died due to complications resulting from Covid-19, it was found that the most prevalent age group was the oldest, being over 80 years old, which comprised 24.82% (n = 70) of notifications, followed by 71 to 80 years old with 22.34% (n = 63) and by 61 to 70 with an estimated 20.92% (n = 59) of the cases. In addition, with reference to gender, males were the most incident with 57.80% (n = 163).

That said, these data are in agreement with the study by Zhou et al. (2020)[15], which showed that the risk of death for males is 2.15% higher compared to females. disabling diseases that can also cause the prevalence of deaths.

Of the patients who died, about 57.80% (n = 163) of the patients had some comorbidity. Of the most prevalent comorbidities in patients with complications from Covid-19, the most found were heart disease with 28.36% (n = 84) of the cases, followed by diabetes mellitus with 21.28% (n = 60).

In the meantime, it is observed that many of the deaths caused by Covid-19, mostly affected individuals who had some type of comorbidity, the main ones being Systemic Arterial Hypertension (SAH), Diabetes Mellitus (DM) and obesity, such as evidenced in the study. study, also adding heart disease. In addition, it is noted that this infection can cause changes in the stabilization of chronic diseases, enhancing inflammatory processes and compromising the homeostasis of the human organism[16, 18].

Therefore, the presence of comorbidity increases the risk of death from Covid-19 infection by 9.44 times in relation to infected individuals who do not have comorbidities, that is, healthy people are more likely to experience milder cases of infection, than those individuals who have chronic diseases.

IV.   CONCLUSION

The Covid-19 pandemic resulted in large impacts for the global and Brazilian health system, culminating in the rupture of the contemporary world's relationship with infectious diseases, given that it changed the dynamics of communication, fraternization and mobility throughout Brazil. In the Amazon region, it resulted in an unprecedented demand for the health sectors, which the Unified Health System (SUS) was not prepared to face.

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