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# Evolution of Indicators and Intensive Care Capacity for COVID-19 in the State of Paraíba, 2020

Evolución de los indicadores y la capacidad de cuidados intensivos para COVID-19 en el estado de Paraíba, 2020  
Evolução de Indicadores e Capacidade de Atendimento Intensivo para o COVID-19 no Estado da Paraíba, 2020

## ABSTRACT

**Objective:** To describe the evolution of the indicators and the capacity for intensive health care for the treatment of COVID-19 in the State of Paraíba. **Method:** Descriptive ecological study, using SARS-CoV-2 data, in the municipalities with the highest number of confirmed cases. The incidence rates (TI), morbidity (TM), lethality (TL) of COVID-19 and the capacity of hospital beds were calculated. **Results:** From the beginning of the pandemic until the 30th of June, more than 46 thousand cases were recorded across the state. COVID-19's IT is 49.47%, TM 0.99%, and TL is 2.0%. The beds of the Intensive Care Unit - ICU in the State, present a ratio of 1.3. **Conclusion:** It is necessary to create plans based on the number of cases and the number of beds, so that there is adequate care, since the existing quantity is less than recommended by the Ministry of Health.

**DESCRIPTORS:** Coronavirus Infections; Uses of Epidemiology; Epidemiology Descriptive; Bed Occupancy.

## RESUMEN

**Objetivo:** Describir la evolución de los indicadores y la capacidad de cuidados intensivos de salud para el tratamiento de COVID-19 en el Estado de Paraíba. **Método:** Estudio ecológico descriptivo, utilizando datos del SARS-CoV-2, en los municipios con mayor número de casos confirmados. Se calcularon las tasas de incidencia (TI), la morbilidad (TM), la letalidad (TL) de COVID-19 y la capacidad de las camas de hospital. **Resultados:** Desde el comienzo de la pandemia hasta el 30 de junio, se registraron más de 46 mil casos en todo el estado. La TI de COVID-19 es 49.47%, TM 0.99% y TL es 2.0%. Las camas de la Unidad de Cuidados Intensivos - UCI en el Estado, presentan una proporción de 1.3. **Conclusión:** es necesario crear planes basados en el número de casos y el número de camas, para que haya una atención adecuada, ya que la cantidad existente es inferior a la recomendada por el Ministerio de Salud.

**DESCRIPTORES:** Infecciones por Coronavirus; Usos de la Epidemiología; Epidemiología descriptiva; Ocupación de camas.

## RESUMO

**Objetivo:** Descrever a evolução dos indicadores e a capacidade de atendimento intensivo em saúde para tratamento da COVID-19 no Estado da Paraíba. **Método:** Estudo ecológico descritivo, utilizando os dados de SARS-CoV-2, nos municípios com maior número de casos confirmados. Foram calculadas as taxas de incidência (TI), morbidade (TM), letalidade (TL) da COVID-19 e da capacidade dos leitos hospitalares. **Resultados:** Do início da pandemia até o dia 30 de junho foram registrados mais de 46 mil casos em todo Estado. A TI da COVID-19 é de 49,47%, a TM 0,99%, e a TL é de 2,0%. Os leitos de Unidade de Terapia Intensiva - UTI no Estado, apresenta uma razão de 1,3. **Conclusão:** É necessário a criação de planos tomando como base os números de casos e a quantidade de leitos, para que haja um atendimento adequado, visto que a quantidade existente é inferior ao recomendado pelo Ministério da Saúde.

**DESCRIPTORES:** Infecções por Coronavirus; Aplicações da epidemiologia; Epidemiologia descritiva; Ocupação de leitos.

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ORCID: 0000-0002-6479-639X**INTRODUCTION**

**A**t the end of 2019, a new virus of the coronavirus class was identified through an outbreak of severe acute respiratory syndrome, reported by the Wuhan Municipal Health Commission (WMHC). The new virus received the name of SARS-CoV-2, having a similar pattern of infection to SARS-COV (which causes severe acute respiratory syndrome) and to MERS-COV (which causes respiratory syndrome in the Middle East), two human coronaviruses, from class that consists of four other viruses. <sup>(1)</sup>

The COVID-19, caused by the new coronavirus, is predominantly transmitted through the respiratory tract, through droplets generated by contaminated people. The virus also remains active on various objects for different periods of time depending on the surface. Infection may occur if the contaminated hand is brought to the mouth, nose or eyes. The live form of the virus was also found in feces analysis of infected individuals, characterizing the fecal-oral or droplet-faecal form, as another route of transmission. <sup>(2)</sup>

Due to its rapid geographical spread, on a short time scale, we evolved into a pandemic state, declared by the World Health Organization (WHO) on March 11th, 2020. In Brazil, the first case was diagnosed in the capital

of the state of São Paulo, on February 25th. <sup>(3)</sup> On March 5th, the country already had cases in two more states, with community transmission declared nationwide on March 20th, 2020. <sup>(4, 5)</sup> Until June 26th, Brazil registered 1.274.974 confirmed cases, and 55.961 deaths. <sup>(6)</sup>

Paraíba is the thirteenth most populous state in the country, with an estimated 4.018.127 inhabitants. <sup>(7)</sup> 22 days after the first case in the country, the state's first case was registered in João Pessoa, its capital. In Campina Grande, the second largest city in the state, considered one of the main industrial hubs in the Northeast, the first case of the disease was found on the 27th of that same month. In every state there are 42.832 cases reported to date. <sup>(8)</sup>

In this context, the epidemiological data associated with Geographic Information Systems, which are increasingly advanced, having information and updates in a short period of time, are essential for the development of scientific analyzes capable of contributing as a guide for management actions in Public Health. <sup>(9)</sup>

In this scenario, the state has great potential to develop into a contamination pole with significant socioeconomic problems for this population. To date, no spatial analysis studies evaluating the COVID-19 pandemic at the state level in Paraíba have been

published. It is essential to understand the spatial spread of reported cases and the level of human population development, in order to predict local problems and develop public health policies during the progressive stages of the pandemic. Therefore, the objective of the present study was to describe the evolution of the indicators and the capacity for intensive health care for the treatment of COVID-19 in the State of Paraíba.

**METHOD**

A descriptive ecological study was carried out, based on the epidemiological information of COVID-19 in the State of Paraíba/PB. Data on confirmed open access SARS-CoV-2 cases and deaths from the State Health Secretariat's dashboard were used. The State of Paraíba/PB has a population of approximately 4.018.127 million inhabitants, according to the 2019 Brazilian Institute estimate Geography and Statistics - IBGE, in an area of 56.467.242 km<sup>2</sup>, being the 13th most populous region in the Brazilian territory.

The records of the 10 municipalities with the largest number of confirmed cases were analyzed, in addition to the capital, the city of João Pessoa, the second largest city in the state, Campina Grande, Guarabira, Cabedelo, Santa Rita, Patos, Mamanguape,

Pedras de Fogo, Bayeux and Caaporã. The study population included all confirmed cases and deaths of COVID-19 in the referred municipalities in Paraíba, between March 21st (date of the first confirmed case) and June 30th, 2020.

The variables analyzed were: number of confirmed cases, number of deaths, number of hospital beds and number of ICU beds. The research was carried out with data recorded from March 21st to June 30th, 2020, extracted from the Coronavirus Panel of the State of Paraíba<sup>(10)</sup>, which presents online monitoring of cases of the disease in the country, reporting the occurrence of new cases and deaths by region, state, day and epidemiological week. Data on the capacity of hospital beds, including ICU beds, were obtained from the National Registry of Health Facilities (CNES). Data on the resident population were extracted from the websites of IBGE and the Department of Informatics of SUS (Datusus). From the absolute number of confirmed cases and deaths by COVID-19, the incidence rates (number of confirmed cases divided by the resident population, multiplied by 100,000 inhabitants), morbidity, and lethality (number of deaths by COVID-19 divided by the total number of confirmed cases, multiplied by 100). Calculations of incidence, morbidity and lethality, capacity of hospital beds, as well as graphing, were processed using the Excel for Windows 2016 program. In addition, the averages were calculated and the minimum and maximum values for the number of cases were presented. It was not necessary to submit the study for approval by the Research Ethics Committee, as the data are publicly accessible and without identification of participants.

## RESULTS

### Confirmed Cases

On March 21st, 2020, the first case

of the disease was confirmed in the State of Paraíba, in its capital João Pessoa. From the first confirmation until June 30th, another 46 thousand new cases were registered across the state. There was an exponential increase, starting on April 22nd of this year, with more than 40 confirmed cases per day, which reached the confirmation of more than 3300 new cases in a single day, having reached this mark on 19th June, as shown in Figure 01. Of this total of confirmed and duly registered cases, there is no information about sex, or age group. There is also no record of symptoms in these cases or type of clinical examination performed.

The COVID-19 Incidence Rate - IR in the State of Paraíba is 49,47% per 100 thousand inhabitants, taking into account the IBGE estimate, 2019. In the State, 10 municipalities stand out with a large number of confirmed cases, in addition to the capital, the city of João Pessoa, the second largest city in the state, Campina Grande, Guarabira, Cabedelo, Santa Rita, Patos, Mamanguape, Pedras de Fogo, Bayeux and Caaporã. There is no data for calculating the IR in each of the aforementioned municipalities.

In the case of the Morbidity Rate - MR, whose purpose is to measure the occurrence of disease in the population<sup>(11)</sup> is at 0,99% for the State. The Social Isolation index was only 40%, considered low in relation to the target of 70% and the minimum of 50%<sup>(10)</sup>, with that, the capital of Paraíba João Pessoa has a TM of 1,3%, Campina Grande, presents 1,4%, Guarabira 3,1%, Cabedelo 2,4%, Santa Rita 0,8%, Patos 1,0%, Mamanguape, 2,2%, Pedras de Fogo 2,8%, Bayeux, 07% and Caaporã 3,2%, being the highest rate among the municipalities involved in the study.

### Deaths

The Lethality Rate - LR in the State is 2,1%, until June 30th. In the municipalities involved in the study, an LR of 2,5% is observed in the city of João Pessoa, Campina Grande with 1,4%, Guarabira with 0,9%, Cabedelo with 0,6%, with the lowest lethality rate among said municipalities in Paraíba. Santa Rita has a lethality rate higher than the national rate, expressing 7,7% of LR, Patos has an LR of 5,0%, Mamanguape of 1,1%, Pedras de Fogo of 1,4%, Bayeux of 6,3% and Caaporã of 1.2%.

FIGURE 01: Evolution of Confirmed Cases



(Source: SES/PB, 2020)

Among the more than 970 deaths from COVID-19 in the State of Paraíba,

the first date of March 23rd, just 2 days after the confirmation of the first

case, reached the highest death mark on May 25th, totaling 26 deaths in the State. Among all deaths, 60% are male and 40% female. Regarding the age group, deaths from 01 to over 80 years were recorded, as shown in figure 02.

In addition, there is an expressive number of deaths due to COVID-19 in the State with correlation with other comorbidities, among which we highlight Diabetes Mellitus, Hypertension, Heart Disease, Obesity, Neurological Disease, among other pathologies, as shown in figure 03.

### Service Capacity

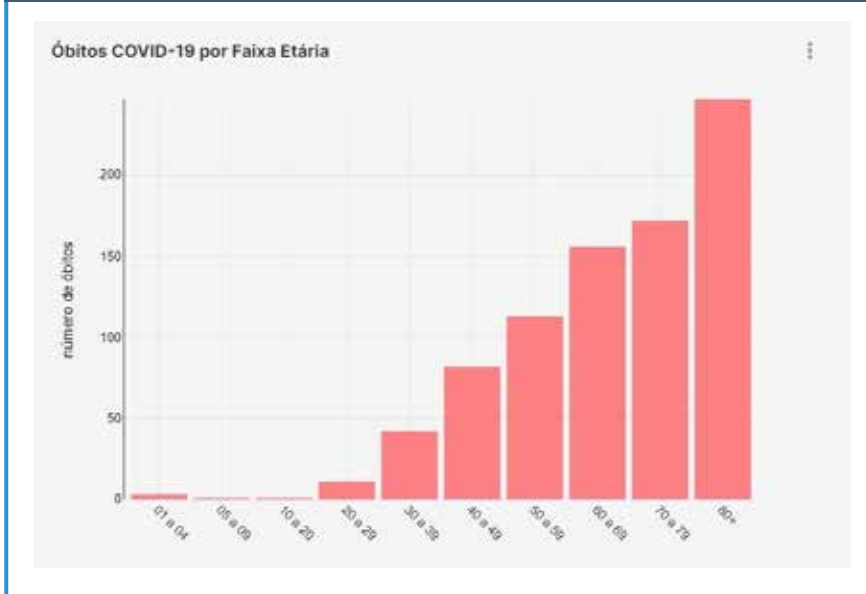
The State of Paraíba has more than 2.600 health care establishments, 1.825 of which are in the public sphere. Of these establishments 155 carry out hospitalizations, of which only 86 are public, but the State has the partnership of 51 private partner units of the Unified Health System - SUS, totaling more than 4.000 thousand public beds available to the population of Paraíba. To cope with COVID-19, the State made 793 new beds available, out of the 1.313 included in the contingency plan. <sup>(12)</sup>

The beds of the Intensive Care Unit - ICU in the State, present a ratio of 1,3 with regard to the distribution in the relationship between ICU beds and resident population, considering that it has, according to the National Coronavirus Panel, 454 ICUs, of which 290 are SUS beds. <sup>(13)</sup>

The total occupancy of ICU beds (adult, pediatric and obstetric) across the state is 62%. Making a cut only of the ICU beds for adults in the Metropolitan Region of João Pessoa, the occupancy rate reaches 70%. In Campina Grande, 64% of adult ICU beds are occupied and in the backlands, 54% of adult ICU beds. <sup>(10)</sup>

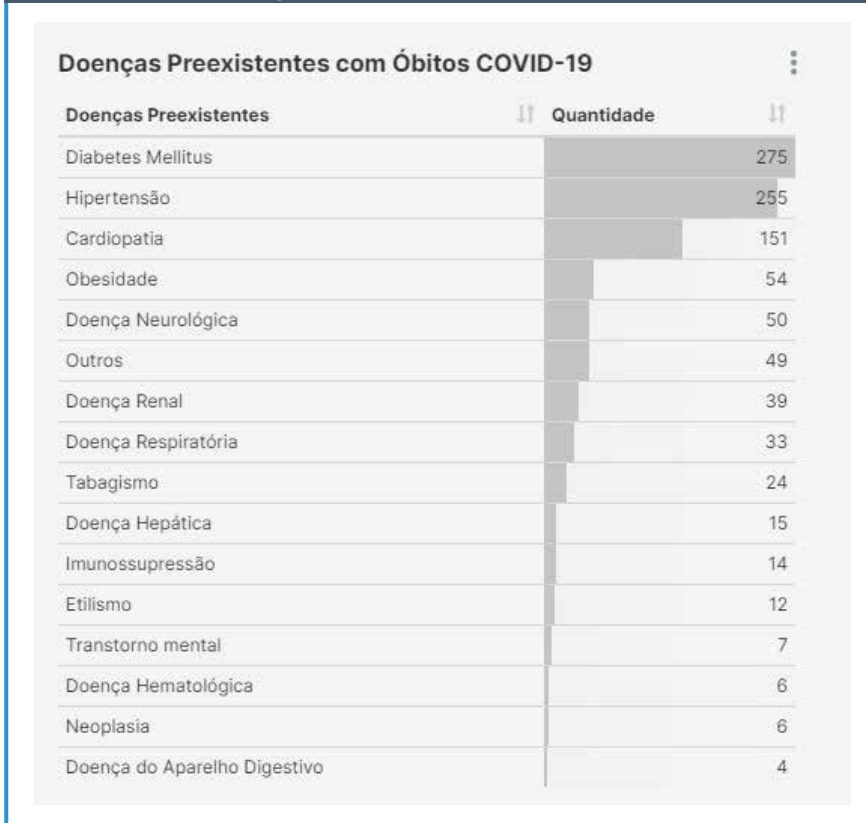
The results reveal that the initial evolution of the COVID-19 epidemic in the State of Paraíba occurred in a non-uniform manner. During

FIGURE 02: Deaths by age group



(Source: SES/PB, 2020)

FIGURE 03: Pre-existing diseases with deaths from COVID-19



(Source: SES/PB, 2020)

the observed period, more than 46 thousand cases of COVID-19 in the State were confirmed. It is important to highlight that Paraíba as well as other states in the Northeast region, as indicated by Marinelli, et al, 2020<sup>(13)</sup>, it does not have enough structure to face the pandemic, even with the expansion of beds.

It is observed that the evolution of cases in the State corroborates the evolution at the national level, where, in the growing line of positive diagnoses in the country, doubling of small double-digit values develops in the first days, having on average more than one thousand cases per day between March 30th and April 13th, registering more than 50.000 cases on June 19th, reaching a total of 1.274.974 infected across the country in 26 in the same month.<sup>(6)</sup>

Paraíba is in disagreement with regard to the high national IR, having less than half of the national tax rate, with 22,13% for every 100.000 inhabitants, which is similar to the rate of the neighboring state, Rio Grande do Norte, with 24,40% IR. Regarding the morbidity rates of the state and its cities, when correlated with the ten largest cities in the state of Alagoas, with MR 1,1%, and similar territorial area, we have, the capital Maceió with 1,4%, Arapiraca 1,1%, Rio Largo 0,9%, Palmeira dos Índios 0,5%, União dos Palmares 0,6%, Penedo 0,2%, São Miguel dos Campos 1,2%, Campo Alegre 0,9%, Coruripe 1,2%, Delmiro Gouveia (0,4%). Based on this correlation, there is a divergence between the states, where Paraíba has the lowest state percentage, however of the ten cities, eight, Paraíba has the highest percentage of RM.<sup>(6,14)</sup>

The variation in Lethality Rates obtained in the 10 largest cities in the state of Paraíba is also a characteristic observed among the states of the federation. They have an LR of 8,8 as in Rio de Janeiro, well above the federal percentage (4,4). Pará (5,0) and Ama-

**Most states in the Northeast prevailed a similar number in Paraíba, between Piauí (574) and Maranhão (1906), with the exception of Pernambuco and Ceará, respectively, which had the highest death rates in the Region, Pernambuco 54,86% of deaths female, inconsistent with the predominance of the state of Paraíba.**

zonas (4,0), with percentages approximately that of Brazil. Minas Gerais and Roraima, equaling in percentages of Paraíba (2,1), and Mato Grosso do Sul (0,9), in agreement with the City of Guarabira.<sup>(15)</sup>

In Brazil there were 55.961 deaths between February 26th and June 26th of this year, with the highest number of deaths in a single day on June 4th, registering 1,473 deaths. Most states in the Northeast prevailed a similar number in Paraíba, between Piauí (574) and Maranhão (1906), with the exception of Pernambuco and Ceará, respectively, which had the highest death rates in the Region, Pernambuco 54,86% of deaths female, inconsistent with the predominance of the state of Paraíba. Sergipe, a state with a close territorial area, in turn showed a similar percentage, 54,6% of the deaths recorded were male. Regarding the age group, the state of Sergipe corroborates with the state of Paraíba, where there were deaths among individuals under 1 year old, and 80 years or more.<sup>(6,15,16)</sup>

The presence of pre-existing comorbidities such as Diabetes Mellitus, Hypertension, Heart Disease, Obesity, and other chronic pathologies are risk factors, which associated with COVID-19 can become a serious condition and consequently lead to death. The data from the state under analysis aimed at this statement, as well as in the states of Rio Grande do Norte, the deaths were related to pathologies already existing before the development of the disease caused by the new coronavirus in 28,28% Diabetes, 25,18% with Chronic Heart Diseases, and only 0,18% Chronic Respiratory Disease. In Sergipe, 215 of the 579 registered deaths are related to Hypertension, 36 to Obesity and 34 to Kidney Disease, 18 from Pulmonary Disease.<sup>(16,17)</sup>

The World Health Organization (WHO) and the Ministry of Health have recommendations regarding the ideal availability of ICU beds, with

1 to 3 beds for every 10.000 inhabitants. Brazil has a total proportion of 2,2 beds, but it is not satisfactory. The proportion of beds in the SUS is 1,4 beds for every 10.000 inhabitants, and 4,9 in the private network. In particular, the Northeast Region has 8.857 beds in total, with 4.952 in SUS and 3.635 in Supplementary Health, resulting in 1,5 beds/10.000 inhabitants. When correlating with the availability of beds in the state of Paraíba (1,3), the data are below the national and re-

gional percentages, in which it is already disproportionate and inadequate in relation to the recommended.<sup>(18)</sup>

## CONCLUSION

The study evaluated the indicators together with the COVID-19 intensive care capacity in the state of Paraíba. With the analysis it was possible to describe and observe the high numbers that gradually grew in the state. Therefore, it was seen that the

demand for beds is insufficient compared to the number of cases, making the capacity for intensive care lower than recommended by the Ministry of Health.

It is essential that, based on the findings, plans are thought to have a direct connection with the number of cases and the number of beds, in order to generate control and adequate care. The results found in the study are essential for a general assessment, contributing data to public health. ■

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