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EpidemiologicalDeterminantsAnalysisofthe Covid-19 In Tocantins And The Economic Impact In Public Health

Geovane Rossone Reis[1], Vinicius Garcia Costa[1], Fernando de Sousa Machado[1]
[1](*Department of Physiotherapy, University of Gurupi, Tocantins, Brazil)*

Abstract
Background:*Correlate the social, economic and health determinants of Tocantins municipalities on COVID-19's infectivity, mortality and lethality and analyze the economic and assistance impact of the pandemic on public health.*
Method:*data collection was performed with detailed statistical analysis through public sites in a retrospective and prospective nature - 2020 and 2021 - of social determinants and development of the municipalities of Tocantins, with the availability of intensive care unit beds and their quality indicators, aiming to compare the determinants of each region with the results of infectivity, mortality and lethality, as well as economic impacts on public health. In order to provide development related to social, political and economic issues in the face of a recurrent problem of Tocantins in recent years, such as inefficiency in the sector of high complexity of health care, and understanding economic transformations, it is necessary to construct a detailed study of statistical characteristics, which can correlate these determinants with the increased incidence of COVID-19 and the demand on health services of high complexity, and correlate the secondary impacts to preventive programs of social isolation, aiming at the formation and implementation of public policies that can anticipate investments in tertiary care, with regard to human resources, infrastructure, professional qualification and effective measures for the welfare state in states of emergency.*
Conclusions:*According to data collected from 139 cities in the state of Tocantins, the correlation between the IFDM index, employment and income, education and health, with the incidence, deaths and the fatality rate was high.Thus, we conclude that cities with better education, better education, lower unemployment rates and greater access to health, the fatality rate was lower compared to cities with low development, taking into account that worse levels of education and higher unemployment rates corroborate for worseindicators resulting from infectious diseases and pandemic periods.*
Keywords:*Tertiary health care, COVID-19, economy, regional development*

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I. Introduction

The World Health Organization (WHO) classified the disease caused by SARS-CoV-2 as COVID-19, declaring the outbreak a public health emergency. In March 2020 this outbreak was recognized as a pandemic (WHO, 2020). This disease is characterized by high transmissibility and high demand for health services, especially in tertiary care, where, according to the WHO, 5% require admission to intensive care units (ICU), with the majority in need of ventilatory support invasive (WHO, 2020). In Brazil, as it is a country of continental dimensions, the disparity in public policies for the welfare state and the reality of investments in health denotes great inequality in the main indicators of human development and quality of life, disregarding scalar mediations and different combinations norms that constitute its geography, negatively impacting the formulation of government agendas (ARRETCHE, 1995; FEITOSA & ARANHA, 2020). In this context, it is observed in the results of previous studies (BARROS, 2017; BRAVEMAN et al., 2010) the profound inequality prevalent in living conditions due to the results of research that measured the social disparity in disease patterns and access to care. health (CNDSS, 2008). The "Firjan Municipal Development Index" (IFDM) is an annual study based on official public statistics, released by the Ministry of Labor and Employment, Ministry of Education and Ministry of Health. It monitors the socioeconomic development of Brazilian municipalities and, for this has three indicators: employment/income, education and health. the IFDM is a reference for monitoring socioeconomic development, both locally and nationally. The IFDM has similarities with the Human Development Index (HDI), as it follows its three areas of interest: income, education and health, using exclusively official statistics. For the National Commission on Social Determinants of Health (CNDSS), social determinants of health are the social, economic, cultural, ethnic / racial, psychological and behavioral factors that influence the occurrence of health problems and their risk factors in the population. The homonymous commission of the World Health Organization (WHO) adopts a shorter definition, according to which social

determinants of health are the social conditions in which people live and work. Tocantins is the most recent unit of the Brazilian federation, its creation occurred with the separation from thenorthof Goiás, in 1988. However, this unit of the federation continues to present some social (health and education) and economic problems (BORGES et al. 2013). In this scenario, the need for a basic health care system and the availability of quality hospital care during the rise of SARS-CoV-2 in Tocantins becomes essentially predictable, as it is a state with large territorial extension and a high rate. of social inequality, has a high discrepancy in health indicators between its regions. According to DATASUS data, the main causes of mortality in the period from 2009 to 2019 in the state of Tocantins were CIRCULATORY APPARATUS DISEASES with 23,821 deaths including: acute rheumatic fever and chronic rheumatic heart disease, hypertensive diseases, ischemic heart disease, acute infarction myocardial, other heart diseases, cerebrovascular diseases, atherosclerosis, among other diseases of the circulatory system; followed by EXTERNAL CAUSES OF MORBIDITY AND MORTALITY, which include: transport accidents, falls, accidental drowning and submersion, exposure to smoke, fire and flames, poisoning, intoxication by or exposure to harmful substances, voluntarily self-inflicted injuries, aggressions, events (facts) whose intention is undetermined, legal interventions and war operations, all other external causes, totaling 14,583 deaths According to Reis (2018), the ICUs in Tocantins have shown a high occupancy rate since 2014, long before the COVID-19 pandemic, with the state's tertiary care having a history of problems related to the lack of availability of beds and high length of stay of patients in the units. However, the analysis of the quality of health services offered is encouraged, since indicators such as infection rates, length of stay and nosocomial comorbidities may corroborate the disparity in lethality for the same disease in different cities (COSTA et al., 2019).

Therefore, regional indicators of socioeconomic development such as employment, income and education generate a close relationship with health indices. In Brazil, created in 2008, the FIRJAN Municipal Development Index (IFDM) is a composite indicator that addresses with equal weighting three consecrated areas of human development: employment, income, education and health. Consolidating the level of local socioeconomic development in a single number, through the simple average of the results obtained in each of these three aspects. According to data from the website http://coronavirus.to.gov.br/, Tocantins offers 77 public ICU beds for COVID-19 positive patients, ten in Augustinópolis, seventeen in Araguaína, thirty in Palmas and twenty in Gurupi, where mortality rates (deaths per 100,000 inhabitants) and lethality (deaths per number of infected) must be analyzed and compared with the social determinants of each region. Given the applicability of public resources, the comparison of regional data on indicators – such as mortality and lethality – promotes the assessment of effective health care, the quality of health services, and the operational efficiency of each hospital unit.

Faced with another scenario, According to Nicola et al. (2020) the economic impact of COVID-19 in the world due to recession and unemployment has increased the demand for public health services due to the inability of supplementary health financing by families and the increase in violence, as a direct consequence of the economic crisis. .

Therefore, the objective of the work is to correlate the social, economic and health determinants of the municipalities of Tocantins on the infectivity, mortality and lethality of COVID-19 and to analyze the economic and assistance impact of the pandemic on public health.

II. Methods

Documentary, retrospective and prospective, statistical and descriptive research, carried out through the collection and correlation of data available at the IT department of the SUS - DATASUS (http://www2.datasus.gov.br/), at the Federation of Industries of the State of Rio de Janeiro – FIRJAN (https://www.firjan.com.br/) in the national registry of intensive care (http://www.utisbrasileiras.com.br/) in public websites with state and national data on the coronavirus (http://coronavirus.to.gov.br/ and https://covid.saude.gov.br/), at the Brazilian Institute of Geography and Statistics - IBGE (https://www.ibge.gov.br/) , at the Institute of Applied Economic Research - IPEA (https://www.ipea.gov.br/portal/), on the website of the State Secretariat for Public Security (https://www.ssp.to.gov.br/) , at the National Supplementary Health Agency – ANS (http://www.ans.gov.br/), at the world bank (https://www.worldbank.org/pt/country/brazil) and the National Confederation of Industry (http://www.portaldaindustria.com.br/cni/) , enter the period from January 2020 to November 2021.

Municipal data related to development indices – social, economic and health –, confirmed cases of COVID-19, mortality and lethality, quality indicators of ICUs-COVID, including mortality, lethality, length of stay and costs. Demographic indicators and violence rates during the pandemic. Data on other communicable emergency diseases. Availability of beds. Hospitalization related to external causes. Life data in supplementary health. All data that were incomplete or inconsistent, or that in any way impair the statistical analysis of this research, were excluded from the sample. Furthermore, all data from the aforementioned sites were included.

First, the IFDM (employment & income, education and health) by municipality of Tocantins were monthly listed, through collected data, compared with the rates of COVID-19 cases, mortality and lethality through Pearson's correlation. Afterwards, lethality rates by COVID-19 were compared among all ICUs-COVID in Tocantins, correlating the average length of stay, general costs and availability of beds for every 10,000 inhabitants (by health region).

After collection, data relating to unemployment rates and indices of violence, crime and hospitalization for external causes during the interstice of the research were inserted, in order to compare with data prior to the onset of the pandemic. Finally, through a retrospective analysis, state supplementary health data were allocated. At the end, all indicators were correlated and what the social, economic and health impact was, and which planning measures were more or less effective.

Correlation data between the collected indicators were analyzed using Pearson's coefficient in order to assess the degree of linear association and with the chi-square test for parametric and non-parametric variables. After validation, they were compared with secondary data by the paired Student's t test using SPSS® software. Values will be shown through tables and graphs generated by STATA®, considering the significance level of $p<0.05$ or 5%. Data with a tolerable sampling error of 5% can be used using the Barbetta Formula (BARBETTA, 2001).

III. Results

For a better comparison of the development indices between the cities of Tocantins, figure 1 denotes the discrepancy between the IFDM of the municipalities in the state of Tocantins.

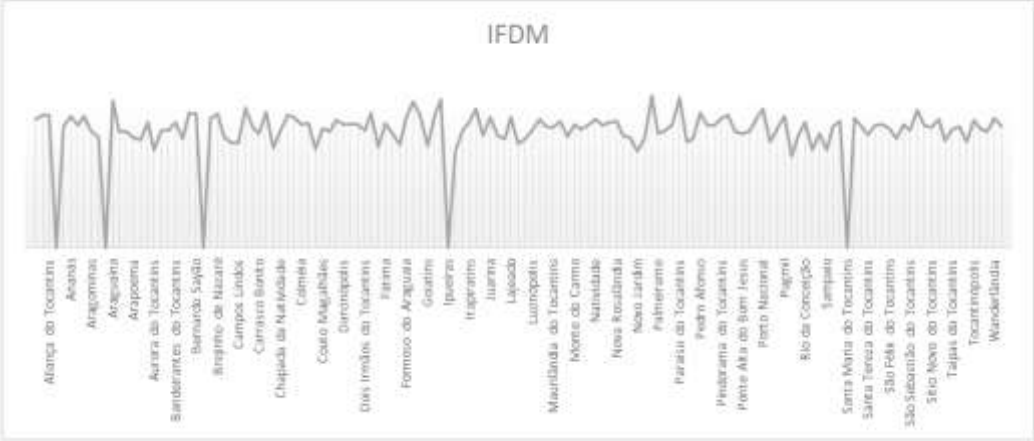

Figure 1: IFDM of the municipalities of the State of Tocantins – Brazil

From Figure 1, it is possible to observe that the development index in the state of Tocantins is presented in a discrepant way among the municipalities, corroborating the premise that the epidemiological results can guide the regional indicators. Which denotes great dispersion between employment, income, education and health.

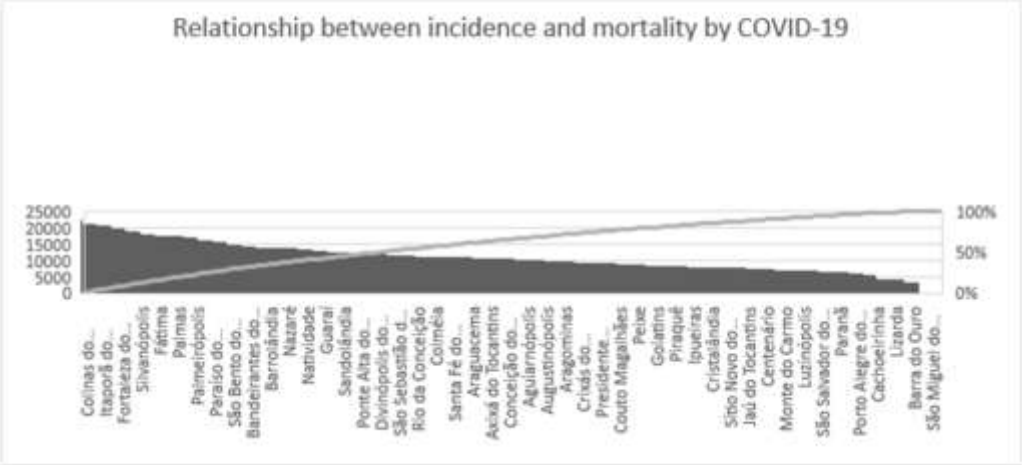

Figure 2: Relationship between incidence and mortality by COVID-19 in Tocantins.

When comparing the incidence relationship with lethality, Figure 2 shows that there was a negative correlation between the variables, demonstrating that there is essentially no higher lethality when there is an increase in the number of infected, leading to the epidemiological observation that the quality provided by health services can feature more expressively

When analyzing the lethality due to the disease, it was observed that the municipalities with a low rate of development had higher mortality among those infected, also associating that they do not have ICU beds, requiring transference for treatment outside the home, which burdens the treatment because of the therapeutic window. The municipalities with the highest mortality rate by Covid-19 in Tocantins can be seen in figure 3.

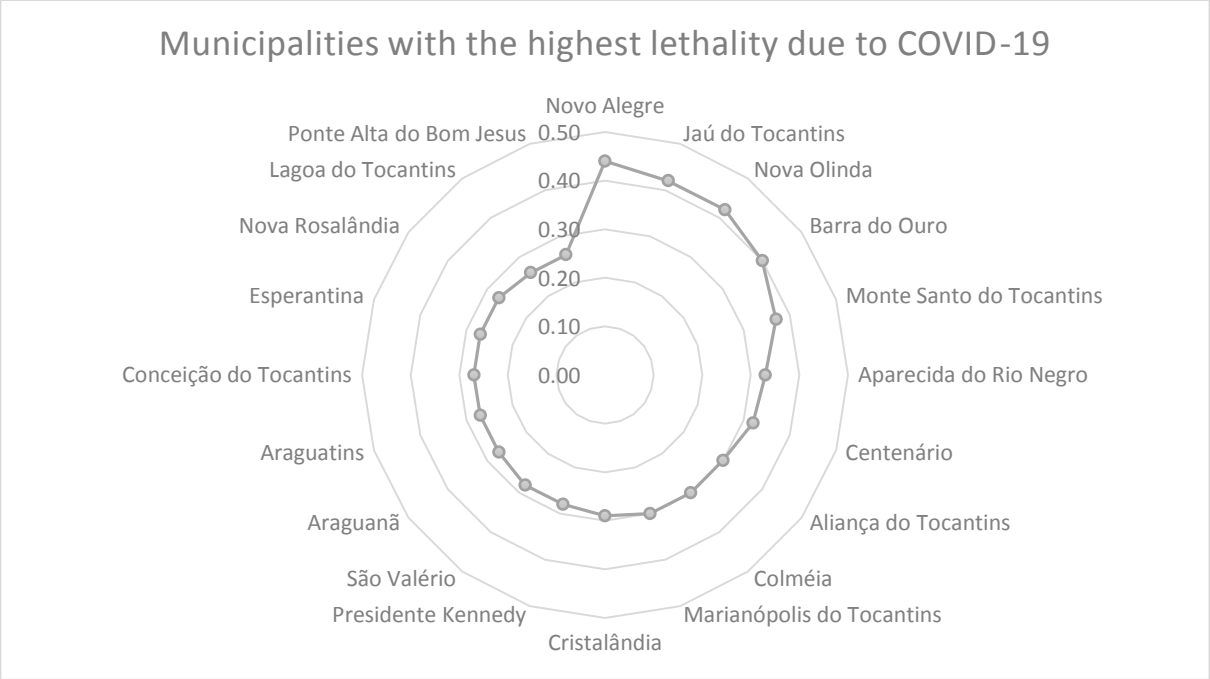

Figure 3: Radar of municipalities with the highest lethality by Covid-19.

For a statistical analysis, table 1 shows the data related to the Pearson correlation coefficient for the collected variables, where positive correlations (result greater than 0) denotes parity between the data, and negative corrections (result less than 0) denotes disparity between the data analyzed.

Pearson	IFDM	Income	Education	Health	Incidence	Lethality	Expenses
IFDM	1,000	0,758	0,661	0,688	-0,455	-0,871	0,279
Income	0,758	1,000	0,790	0,568	-0,401	-0,890	-0,350
Education	0,661	0,790	1,000	0,988	-0,790	-0,489	-0,231
Health	0,688	0,568	0,988	1,000	-0,199	-0,790	-0,035
Incidence	-0,455	-0,401	-0,790	-0,199	1,000	-0,990	0,678
Lethality	-0,871	-0,890	-0,489	-0,790	-0,990	1,000	0,839
Expenses	0,279	-0,350	-0,231	-0,035	0,678	0,839	1,000

Table 1: Pearson's correlation coefficient for the analyzed variables.

Based on table 1, we observed expected data, with an increase in pantry concerning the increased incidence and lethality occurred in the state of Tocantins during the period of the pandemic, however, it is possible to analyze that there was a direct relationship in the reduction of the incidence of disease in municipalities with higher IFDM, with reproduction of the results in municipalities with better indicators of income, education and health, where they had lower incidence and lower mortality from the disease.

Among these, the municipal education indexes had a strong negative correlation with the incidence, with -0.790. Income was statistically more important in reducing lethality, with -0.890.

These results support the analysis of the importance of maintaining social indicators for a given population in mortality rates, especially in relation to infectious diseases that require preventive care and good levels of immunity, conceived by access to quality of life and nutritional quality.

IV. Conclusion

According to data collected from 139 cities in the state of Tocantins, the correlation between the IFDM index, employment and income, education and health, with the incidence, deaths and the fatality rate was high. Thus, we conclude that cities with better education, better education, lower unemployment rates and greater access to health, the fatality rate was lower compared to cities with low development, taking into account that worse levels of education and higher unemployment rates corroborate for worse indicators resulting from infectious diseases and pandemic periods.

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