Original

Cases, deaths and lethality due to COVID-19: analysis of social and assistance data from the Brazilian Northeast

Casos, óbitos e letalidade por COVID-19: análise de dados sociais e assistenciais do Nordeste brasileiro

Casos, muertes y letalidad por COVID-19: análisis de datos sociales y asistenciales del Nordeste brasileño

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Abstract

Objective: To analyze the impact of the coverage of Primary Health Care, Human Development Index and Bolsa Família on the occurrence of cases, deaths and lethality due to COVID-19 in the Brazilian Northeast. **Method:** Descriptive, cross-sectional study, with data extracted from the state platforms for COVID-19, the Health Information System for Primary Care and the Institute for Applied Economic Research. Spearman and Kruskal-Wallis correlation tests were used. **Results:** It was found that 483,793 confirmed cases of COVID-19 and 19,307 deaths from this condition were reported in the Brazilian Northeast. Regarding the occurrence of COVID-19, the State of Ceará had the highest rate of cases (1200.83/100,000 inhabitants). It was observed that the greater the coverage of FHS, the greater the number of confirmed cases (r=0.855 and p-value=0.002) and deaths (r=0.818 and p-value=0.004) due to COVID-19. **Conclusion:** The Family Health Strategy is an organizational model of Primary Health Care powerful to cope with the pandemic, based on prevention, tracking among the most vulnerable groups, identification and notification of cases and deaths due to COVID-19.

Descriptors: Primary Health Care; Health Services Coverage; Development Indicators; Coronavirus Infections; Social Programs

Whats is already known on this?
There are factors that influence the indicators of COVID-19, health infrastructure, presence of comorbidities, lifestyle habits and factors related to the circulation of virus variants, among others.

What this study adds?
The study reinforces the role of the Family Health Strategy as an effective Primary Health Care organizational model to deal with the COVID-19 pandemic, since it was observed that the greater the coverage of FHS, the greater the identification of the occurrence of confirmed cases.

Resumo

Objetivo: Analisar o impacto da cobertura da Atenção Primária à Saúde, Índice de Desenvolvimento Humano e Bolsa Família na ocorrência de casos, óbitos e letalidade por COVID-19 no Nordeste brasileiro. *Método: Estudo descritivo, de caráter transversal, com dados extraídos das plataformas estaduais da COVID-19, Sistema de Informação em Saúde para Atenção Básica e do Instituto de Pesquisa Econômica Aplicada. Foram utilizados testes de correlação de Spearman e Kruskal-Wallis.* *Resultados: Verificou-se que foram notificados no Nordeste brasileiro 483.793 casos confirmados de COVID-19 e 19.307 óbitos por esse agravo. Com relação à ocorrência da COVID-19, o Estado do Ceará apresentou maior taxa de casos (1200,83/100.000 habitantes). Observou-se que quanto maior cobertura da ESF maior identificação da ocorrência de casos confirmados (r=0,855 e p-valor=0,002) e óbitos (r=0,818 e p-valor=0,004) por COVID-19.* *Conclusão: A Estratégia Saúde da Família é um modelo organizativo da Atenção Primária à Saúde potente para enfrentamento da pandemia, a partir da prevenção, rastreamento entre grupos mais vulneráveis, identificação e notificação dos casos e óbitos por COVID-19.*

Descritores: Atenção Primária à Saúde; Cobertura de Serviços de Saúde; Indicadores de Desenvolviment; Infecções por Coronavírus. Programas Sociais.

Resumén

Objetivo: Analizar el impacto de la cobertura de la Atención Primaria de Salud, el Índice de Desarrollo Humano y el Bolsa Família en la ocurrencia de casos, muertes y letalidad por COVID-19 en el Nordeste de Brasil. *Método: Estudio descriptivo, transversal, con datos extraídos de las plataformas estatales de COVID-19, el Sistema de Información en Salud para la Atención Primaria y el Instituto de Investigación Económica Aplicada. Se utilizaron las pruebas de correlación de Spearman y Kruskal-Wallis.* *Resultados: Se constató que se notificaron 483.793 casos confirmados de COVID-19 y 19.307 muertes por esa condición en el Nordeste brasileño. En cuanto a la ocurrencia de COVID-19, el Estado de Ceará presentó la mayor tasa de casos (1200,83/100.000 habitantes). Se observó que cuanto mayor era la cobertura de la ESF, mayor era el número de casos confirmados (r=0,855 y p-valor=0,002) y muertes (r=0,818 y p-valor=0,004) por COVID-19.* *Conclusión: La Estrategia de Salud Familiar es un modelo organizativo de Atención Primaria a la Salud potente para enfrentar la pandemia, basado en la prevención, seguimiento entre los grupos más vulnerables, identificación y notificación de casos y muertes por COVID-19.*

Descriptores: Atención Primaria de Salud; Cobertura de los Servicios de Salud; Indicadores de Desarrollo; Infecciones por Coronavirus; Programas Sociales.

INTRODUCTION

In December 2019, the onset of cases of coronavirus (Sars-CoV-2) infections in the city of Wuhan, China, was considered an abrupt event, given the rapid dissemination of the infection and associated deaths around the world. This fact led the World Health Organization (WHO) to declare a public health emergency of international concern, which was subsequently elevated to the status of a pandemic.[1-2]

In Brazil, the Ministry of Health (MS, as per its Portuguese acronym) received the first notification of a confirmed case of COVID-19 on February 26, 2020 and, in four months, in the 26th epidemiological week (21 to 27/06), a total of 1,067,579 cases and 49,976 deaths were confirmed. The epidemic curve was more accelerated in the North and Northeast regions of Brazil, with the Northeast being the second region with the highest number of cases (451,076) and deaths (18,324).[3]

In view of the exponential growth of this viral infection and the number of patients who progress to serious conditions, who require hospital care, the WHO recommended that countries adopt mass social isolation, quarantine and operation of essential services only.[4] Such measures aimed to protect the elderly people, immunocompromised people, people with comorbidities and those who, even without being within the risk groups, could progress to serious conditions and even death.[1] This is because the knowledge produced about the disease points out that the reduction in deaths from COVID-19 is associated with social isolation, the permanence of people in their homes, the identification and the monitoring of cases.[4-7]

In Brazil, cases of COVID-19 have advanced from capitals to the countryside, with the frequency of occurrence of cases being greater among municipalities in the countryside when compared to most of their capitals. In the Northeast Region, cases evolved heterogeneously among the States, evidencing concern about the lack of beds and supplies to combat the pandemic. This situation probably aggravates some indicators, such as lethality and mortality, due to the low installed capacity of tertiary care, such as beds in Intensive Care Units (ICU), which are concentrated in the capitals and in the largest urban centers.[8] The Northeast Region is considered vulnerable due to the combination of insufficient hospital infrastructure and health service coverage, as well as the fact that a high proportion of the population is dependent on the Brazilian Unified Health System (SUS, as per its Portuguese acronym).[9]

Coping with the COVID-19 pandemic is a challenging experience, since it is embedded in a complex context, given the little knowledge we have about the disease, its various possibilities or modes of intervention, which are affected in several dimensions: biological, clinical, epidemiological, eco-social,

technological, economic and political, where all have interfaces that can worsen its course, thereby requiring comprehensive health care, with the entire Health Care Network (HCN) active.[10]

Among the points of HCN, Primary Health Care (PHC) presents itself as a powerful device of the health system to cope with the pandemic, in such a way that MS disclosed the competencies of PHC in the face of COVID-19, namely: coordination of the care procedures in HCN, implementation of telemarketing actions, prevention measures, identification of suspects, stratification of disease severity, therapeutic management and home isolation of mild cases.[11-12]

Accordingly, in view of this new context, for a stronger PHC, whose care model is based on community-based principles, intra and extramural teamwork, as well as partnership of users, families and community, there is a need to reorganize teams and actions, personal protection equipment, full operation of physical and technological structures and immediate and continued action of the State. The pandemic requires community work with the use of long-distance communication, both in individual and family clinical care.[11]

In this new scenario of care, given the trend of dissemination of infection by Sars-Cov-2 among vulnerable populations that live in inadequate sanitary conditions, PHC, as the first level of health care, in addition to prevention and tracking along with vulnerable groups, reinforces care for the elderly population and people with chronic diseases.[13-15]

In view of the presented pandemic situation, the Brazilian government also implemented other measures to reduce the negative economic effects on the most vulnerable populations, including the expansion of payment limits for social programs, including the Bolsa Família Program (PBF, as per its Portuguese acronym) and the establishment of emergency aid for informal or self-employed workers.[16]

This study has the objective of analyzing the impact of Primary Health Care coverage, Human Development Index (HDI) and Bolsa Família Program on the occurrence of cases, deaths and lethality due to COVID-19 in the Brazilian Northeast.

METHODS

Descriptive and cross-sectional study, with secondary data extracted from state platforms for COVID-19, which are in the public domain, made available by the State Health Departments of the Northeast Region of Brazil (Alagoas, Bahia, Ceará, Maranhão, Paraíba, Pernambuco, Piauí, Rio Grande do Norte and Sergipe).[17-25] Data from reports from the Health Information System for Primary Care and the Institute for Applied Economic Research were also collected.[26-27]

Data regarding the occurrence of COVID-19 and deaths from this condition corresponded to the period from March 15 to June 30, 2020 and were extracted on July 1, 2020.[17-25] Data on coverage of PHC and percentage of beneficiaries of the PBF Program refer to the month of March 2020.[26] The HDI available for consultation refers to the year 2017. For this variable, the following classification was considered: low HDI (0.350-0.554), medium HDI (0.55-0.699), high HDI (0.700-0.799) and very high HDI (0.800-1.000).[27]

The evaluated variables were: confirmed cases and deaths due to COVID-19 by State; coverage rates: Family Health Strategy (FHS), Community Health Workers (CHW) and Primary Care (PC); percentage of beneficiaries of the PBF Program; and HDI.

Data were organized in Microsoft Excel® and then submitted to statistical processing in the *Statistical Package for the Social Sciences* (SPSS) *software*, version 20.0. In order to calculate the indicators, the population estimate for 2020 was considered, based on the comparison between the 2000 and 2010 censuses, since the 2020 census was canceled due to the pandemic and, therefore, this estimate, although close, may be different from reality.[28]

Initially, a coefficient of prevalence of COVID-19 was calculated in the population of the respective States, considering the number of accumulated cases as the numerator and the population estimate for the year 2020 as the denominator.[28] A mortality coefficient was also calculated, where the number of deaths accumulated due to COVID-19 was assigned in the numerator and the population estimate for the year 2020 in the denominator.[28] For standardization purposes, the prevalence and mortality coefficients per 100,000 inhabitants were adopted. In addition, the lethality coefficient of COVID-19 was calculated.

After that, the *Shapiro-Wilk* test was performed to verify the assumption of normality, and a non-normal distribution pattern was found. The *Spearman Correlation* test was performed to evaluate the correlation between the occurrence of cases, deaths and lethality with the coverage of FHS, CHW, PC, percentage of beneficiaries of the PBF Program and HDI. In order to observe the difference between

averages of the occurrence of cases, deaths and lethality of the States with the HDI strata, the non-parametric *Mann-Whitney* test was applied. For all tests, p≤0.05 was considered.

Considering Resolution nº 510/2016, issued by the National Health Council of the Ministry of Health, this study was not submitted to the Research Ethics Committee, in view of the use of secondary data available on public domain platforms, thereby respecting all relevant ethical aspects and applicable, contained in Brazilian regulations.[17-27]

RESULTS

During the data collection period, a total of 483,793 confirmed cases of COVID-19 and 19,307 deaths from this condition were reported in the Brazilian Northeast. With regard to prevalence, the State of Ceará had the highest rate of cases (1200.83/100,000 inhab.), followed by Paraíba (1168.63/100,000 inhab.), Maranhão (1137.09/100,000 inhab.), Sergipe (1105.45/100,000 inhab.), Alagoas (1077.56/100,000 inhab.), Rio Grande do Norte (864.17/100,000 inhab.), Piauí (673.92/100,000 inhab.), Pernambuco (615.86/100,000 inhab.) and Bahia (492.88/100,000 inhab.) (Chart 1).

As for mortality from COVID-19, Ceará also appears as the State with the highest indicator in the Brazilian Northeast (67.30/100,000 inhab.), followed by Pernambuco (50.53/100,000 inhab.), Alagoas (31.52/100,000 inhab.), Rio Grande do Norte (29.66/100,000 inhab.), Sergipe (29.41/100,000 inhab.), Maranhão (28.95/100,000 inhab.), Paraíba (24.31/100,000 inhab.), Piauí (20.96/100,000 inhab.) and Bahia (12.46/100,000 inhab.) (Chart 1).

Chart 1. Prevalence and mortality from COVID-19 in the states of the Brazilian Northeast. Northeast, Brazil, 2020.
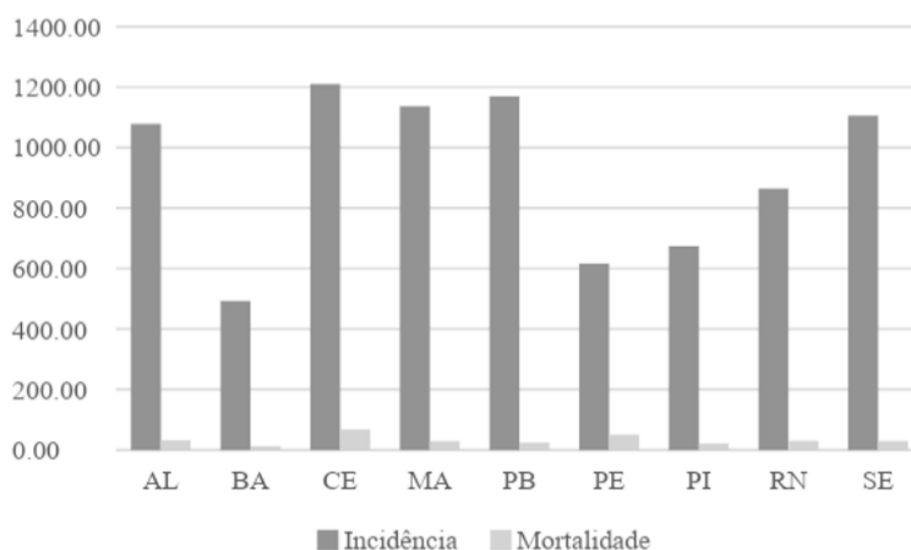

Table 1 shows positive correlations between the occurrence of COVID-19 (rho=0.855 and p-value=0.002), deaths (rho=0.818 and p-value=0.004) and coverage of FHS.

Table 1. Correlation between the occurrence of cases, deaths and lethality due to COVID-19 with coverage of FHS, the CHW Program, PC, percentage of beneficiaries of the Bolsa Família Program and HDI. Northeast, Brazil, 2020.

Variables	Coverage FHS	Coverage CHW	Coverage AB	% Bolsa Família	HDI
Occurrence of COVID-19					
rho	0.855	0.176	0.367	0.224	0.300
p-value*	*0.002*	0.627	0.332	0.533	0.433
Occurrence of deaths					
rho	0.818	0.345	0.617	0.067	0.350
p-value*	*0.004*	0.328	0.077	0.855	0.356
Lethality					
rho	0.255	0.383	0.427	0.006	0.477
p-value*	0.476	0.275	0.252	0.987	0.194

Caption: rho: Spearman Correlation Test;
*The p-value was obtained by the Spearman Correlation test.

It was found that there was no statistically significant difference in the average occurrence of cases, deaths and lethality of COVID-19 when comparing the States with medium and high HDI (Table 2).

Table 2. Comparison of the average occurrence of cases, deaths and lethality of COVID-19 with the Human Development Index (HDI). Northeast, Brazil, 2020.

Variables	Human Development Index (HDI)				p-value*
	Medium (n=3)		High (n=6)		
	Average	SD	Average	SD	
Occurrence of cases	46,157.33	30,501.88	57,553.50	29,706.45	0.606
Occurrence of deaths	1,262.00	704.86	2,586.83	2,318.14	0.796
Lethality	2.83	0.30	4,08	2.36	0.697

Caption: SD: Standard Deviation;
*The p-value was obtained by the Mann-Whitney test.

DISCUSSION

The achieved results show heterogeneity in terms of morbidity and mortality from COVID-19 in the States of the Brazilian Northeast, where Ceará is the State with the highest number of cases and deaths in the region, thereby accumulating the highest rates of cases and deaths per 100,000 inhabitants, during the study period. The region has marked social inequalities, between states and within them, which can impact the pattern of disease occurrence. Regarding access to health services, it is observed that the coverage of FHS has a positive correlation with the occurrence of cases and deaths.

The COVID-19 pandemic is the most serious in recent human history. The morbidity and mortality indicators presented in the Brazilian Northeast indicate a worsening of the epidemiological curve due to the delay in the adoption of control and prevention measures coordinated and led by the Ministry of Health, as well as the precariousness in the wide adoption of individual and collective behavioral measures by the majority of the municipalities.[29-30] The lethality rate due to COVID-19 in the Northeast Region is higher than the national average, which denotes the severity of the disease and the need to adopt measures to prevent and mitigate its effects, in order to avoid the collapse of the health system in the different States.[31]

Notably, from the beginning of the pandemic until the period of the study, a pattern of concentration of cases and deaths was observed in capitals, such as, for example, Fortaleza, Ceará. Historically, these capitals have shown extreme social inequalities, where the majority of the population lives in poverty, a situation that makes them vulnerable to serious cases of COVID-19.[32] Similarly, it was found that there was a higher prevalence of severe cases of the disease in other Brazilian regions, such as in all areas of social vulnerability in the city of Rio de Janeiro, especially in poor communities embedded

in prime areas.[33] In the North Region of the country, in the city of Manaus, the pandemic reached the highest number of cases and deaths in socioeconomically more precarious areas.[34]

This study portrays that the greater the coverage of FHS, the greater the identification of the occurrence of cases and deaths from COVID-19. This data reflects the presence of teams linked to FHS and their role in terms of coping with the pandemic based on the identification and notification of cases and deaths due to COVID-19 in their territory. Furthermore, it must be considered that the greater coverage of FHS takes place in areas of greater vulnerability, where development indicators are worrying and mitigation measures are more difficult to implement.[35]

Historically, large urban centers have relatively low coverage, with major challenges in terms of coordinating care in care networks.[36] Such aspects contribute to inequalities in access to health services. In the context of caring for cases of COVID-19, the first organizational efforts and investments in the health system were focused on the hospital network, with emphasis on providing respirators and ICU beds, relegating to the background the role of PHC in the actions of prevention and monitoring of cases in the territories.[37] This reality was recurrent in several countries.

Another studied variable was the impact of HDI and the percentage of beneficiaries of the PBF Program on the indicators of COVID-19. However, it was found that there was no relationship between the indicators. Although the Northeastern states have medium and high HDI, they had difficulty in terms of responding rapidly to the pandemic. Also in countries with a high HDI, similar difficulties were found, resulting from fragility in the organizational models of social and health public policies.[38]

Nonetheless, a study carried out in the Northeast Region, notably in the State of Ceará, showed an association between COVID-19 and human development based on geographic tracking, pointing to greater vulnerability of the population with low levels of municipal HDI.[39]

From the perspective of impacting vulnerabilities, the pandemic scenario has imposed on the world the mitigation of the negative effects on socioeconomic conditions. Income transfer policies or programs have sought to guarantee a minimum income to families in times of social distancing. Brazil reorganized the PBF Program with essential measures to cope with the losses resulting from the COVID-19 pandemic.[16] This internationally recognized program aims to reduce poverty in Brazil and, at this time of pandemic, it has a strategic function to guarantee the minimum social needs for Brazilian families, hyposufficient in the context of the COVID-19 pandemic.[40]

The findings of this study reinforce the relevance of PHC as a fundamental element for strengthening the health system and reducing morbidity and mortality from COVID-19, especially in municipalities with greater coverage of FHS. Nonetheless, it is important to highlight that, despite having been conducted based on information contained in official databases, there are limitations related to difficulties in the data publication process by the states of the Brazilian Northeast, which may contribute to underreporting of confirmed cases and deaths from COVID-19.

Although the study was conducted based on information contained in official databases, limitations may be related to difficulties in the data publication process by the states of the Brazilian Northeast and contribute to underreporting of confirmed cases and deaths from COVID-19. In addition, in order to calculate the indicators, the population estimate for 2020 was considered, based on the comparison between the 2000 and 2010 censuses, since the 2020 census was canceled due to the pandemic and that, therefore, this estimate, although close, may be different from reality.[28]

CONCLUSION

It is concluded that the coverage of FHS impacts the occurrence of cases and deaths from COVID-19, so that the greater the coverage of FHS, the greater the identification of the occurrence of cases and deaths. There was no impact of the percentage of the PBF Program beneficiaries and HDI on the indicators of COVID-19 in the Brazilian Northeast.

Accordingly, it is expected that this study may have the strengthening of the role of the Family Health Strategy as its main implication for practice, since it is a powerful organizational model for coping with the pandemic, based on prevention, tracking among the most vulnerable groups, identification and notification of cases and deaths due to COVID-19.

CONTRIBUITIONS

Contributed to the conception or design of the study/research: Silva Júnior FJG, Monteiro CFS, Reichert APS, Morais APP, Guimarães JMX, Maia ER, Pessoa TRRF, Rodrigues MP. Contributed to data collection: Silva Júnior FJG, Monteiro CFS, Reichert APS, Morais APP, Guimarães JMX, Maia ER, Pessoa TRRF, Rodrigues MP. Contributed to the analysis and/or interpretation of data: Silva Júnior FJG, Monteiro CFS, Reichert APS, Morais APP, Guimarães JMX, Maia ER, Pessoa TRRF, Rodrigues MP. Contributed to article writing or critical reviewSilva Júnior FJG, Monteiro CFS, Reichert APS, Morais APP, Guimarães JMX, Maia ER, Pessoa TRRF, Rodrigues MP. Final approval of the version to be published: Silva Júnior FJG, Monteiro CFS, Reichert APS, Morais APP, Guimarães JMX, Maia ER, Pessoa TRRF, Rodrigues MP.

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