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SARS-CoV-2: a preliminary comparative epidemiological analysis between Brazil and the World

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ABSTRACT

Introduction: The world is facing a public health emergency due to the pandemic of the new coronavirus (SARS-CoV-2) and on March 20th, 2020, COVID-19, the disease caused by this virus, was considered to be community transmission throughout Brazil. As the incidence, mortality and lethality of COVID-19 are not homogeneous for all countries or regions within the same country, it is essential to monitor the profile of epidemiological indicators in Brazil in relation to the world. **Objective:** This research aims to know the epidemiological characteristics of the COVID-19 pandemic, comparing data from Brazil with the total world data from countries with registered cases. **Methods:** The data used to calculate the incidence, mortality, lethality, percentage of recovered and active cases were obtained from Johns Hopkins University & Medicine Coronavirus Resource Center, between March 23rd and April 21st of 2020, totaling 30 days. Statistical tests of correlation and comparison of means were used to evaluate the relationship between incidence and mortality rates, the evolution of the epidemiological indicators over time and to make a comparison between Brazil and the world. **Results:** The curves of incidence, mortality, lethality and percentage of cases recovered in Brazil and in the world were relatively parallel at first, with lower values for Brazil compared to the world ($p < 0.05$). Unlike the other indicators, the percentage of the active cases was higher in Brazil than in the world ($p < 0.05$). There was also a trend of approximation of the curves throughout the evaluated period and a directly proportional positive correlation between incidence and mortality rates in the world and in Brazil ($p < 0.05$). **Conclusion:** The data analysis showed an expansion of the COVID-19 epidemic in Brazil, revealing the importance of establishing preventive measures aiming to control the infection rate by flattening the epidemiological curves and, finally, avoiding the collapse of local and regional health services.

Keywords: COVID-19, epidemiology, Brazil, health surveillance, preventive measures.

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1. INTRODUCTION

The history of the evolution of SARS-CoV-2 is related with the increase in the human population that acquires contact with various environments and animal species, and the virus can generate varieties capable of infecting other species due to its biochemical characteristics, among them the fact that it is an RNA virus, which is a less stable molecule than DNA. The most variable part of the virus is the sequence encoding for the binding domain in the surface spike protein, responsible for the interaction with the receptor of the angiotensin-converting enzyme 2 (ACE2) of the target cells and which is a structure conserved in several species of animals including the human species, which has an impact on the transmissibility of the virus (ANDERSEN et. al., 2020).

Regarding the clinical characteristics, morbidity and mortality of COVID-19 infection, many uncertainties are present in the origin of the new coronavirus (SARS-CoV-2), considered the agent responsible for COVID-19. Epidemiological and clinical evidence is still being described and its natural history is also being described and discovered. Studies indicate that the basic reproduction number (R0) of SARS-CoV-2 is 2.74, and the incubation period is, on average, 5 days (WEISSMANN *et al*., 2020; LINTON *et al*., 2020; LAUER *et al*., 2020) ranging from 2 to 14 days (LINTON *et al*., 2020; BRAZIL, 2020a). Transmission happens from person to person, through saliva droplets or nasal secretion, when an infected person coughs or sneezes (BRASIL, 2020a). There is recent evidence of transmission by mildly symptomatic and asymptomatic people (CHAN *et al*., 2020; ROTHE *et al*., 2020a). Probably the first 3 to 5 days of onset of symptoms are the ones with highest transmissibility (WEISSMANN *et al*., 2020). According to the World Health Organization (WHO), about 80% of patients with COVID-19 may be asymptomatic (BRASIL, 2020b) and a susceptibility is general. It is not yet clear whether the infection in humans is capable of producing immunity against new infections and whether this immunity will last a lifetime (BRASIL, 2020a; KISSLER *et al*., 2020).

The clinical condition of COVID-19 varies from asymptomatic infections to severe respiratory conditions

(BRASIL, 2020b), in some cases evolving to death. According to the profile of cases confirmed in the first month of occurrence in Brazil, the most common clinical signs and symptoms in outpatients are: a) cough (73.7%); b) fever (68.8%); c) runny nose (37.4%); d) sore throat (36.2%) and e) dyspnea (5.6%). Among hospitalized patients the most common symptoms are: a) fever (81.5%); b) cough (79.8%); c) runny nose (31.1%); d) sore throat (26.1%) and e) dyspnea (26.1%) (BRAZIL, 2020a). Approximately 80% of the cases are mild, do not require hospitalization and should remain in home isolation; 15% require hospitalization outside the intensive care unit (ICU) and less than 5% need intensive support (WEISSMANN *et al*., 2020).

There is much discussion about the physiopathogenesis of COVID-19 and its most common laboratory abnormalities in patients hospitalized with pneumonia include: a) leukopenia; b) lymphopenia; c) leukocytosis; d) elevated hepatic transaminases; e) high lactate dehydrogenase and; f) high C-reactive protein. Other abnormalities include neutrophilia, thrombocytopenia, decreased hemoglobin, decreased albumin, and renal failure (HUANG *et al*., 2020; WANG *et al*., 2020; LI *et al*., 2020). Serious diseases are associated with advanced age and the presence of underlying health conditions and the most prevalent comorbidities in general are cardiovascular disease (7.4%), diabetes (2.9%), chronic lung disease (2.1%) and neoplasia (1.0%) (BRAZIL, 2020a). The COVID-19 was declared a pandemic by the World Health Organization (WHO) on March 11, 2020, and, on March 20, 2020, the Brazilian Ministry of Health (MS) declared that the transmission of the new coronavirus should be considered a community transmission throughout the country. The incidence, mortality and lethality are not homogeneous or definitive for all countries or regions within the same country (BRASIL, 2020c). The main cause of death in patients with COVID-19 is respiratory failure caused by acute respiratory distress syndrome (RUAN *et al*., 2020), coded and designated as follows: U04.9 - Severe Acute Respiratory Syndrome (SARS). The other most common complications in deceased patients are: a) myocardial injury, b) liver or kidney injury and, c) multiple organ dysfunction (YANG *et al*., 2020).

The SARS-CoV-2 mutations reflect on their pathogenicity (YAO *et al*., 2020) and also their ability to develop antiviral-resistant phenotypes such as those directed to viral RNA polymerase (PACHETTI et. al., 2020) and that could mean new episodes of virus infections in the coming years (BISWAS et. al., 2020). The mutation rate studied for the CoV-1 is 0.8-2.3 x 10-3 nucleotide substitution per site per year and this is not much different from other RNA viruses. If the CoV-2 mutation rate is slower than 2.3-3.7 x 10-3 nucleotide substitution per site per year observed for influenza virus (ZHAO *et al*., 2004; DENISON *et al*., 2011), this could be considered a positive factor for the development of vaccine for the CoV-2, despite its current diversity (PHAN, 2020),

Other possibilities to combat the virus are: a) the use of microRNAs (SARDAR *et al*., 2020) that allow silencing the expression of strategic proteins in infectivity and viral pathogenicity, assisting in the therapy of severe cases; b) to stimulate the immunity of the population through the BCG vaccine used against tuberculosis, since one study showed an epidemiological correlation regarding the protection of certain immunized populations with the evolution of less severe forms of COVID-19 (MILLER *et al*., 2020); c) innovative strategies such as monoclonal antibodies, messenger RNA vaccines, antivirals and proteases linked to nanomicelles, which are being studied and subjected to clinical trials (HODGSON, 2020).

This work aims to evaluate the epidemiological characteristics of the COVID-19 pandemic, to analyze the incidence and mortality, comparing data from Brazil with the total data of countries with registered cases, in this research called world data. It also aims to understand the magnitude of lethality, recovered cases and active cases in Brazil as compared to the world.

2. MATERIALS AND METHODOS

This is a documentary research conducted by the criteria and procedures of descriptive epidemiology based on a quantitative characterization. The data used were obtained at the https://coronavirus.jhu.edu/map.html site, from the JOHNS HOPKINS UNIVERSITY & MEDICINE CORONAVIRUS RESOURCE CENTER, intended to information of the daily records of notifications related to the amounts of reported cases, deaths and recovered cases. The site is publicly accessible and such information is available to all interested parties. Data were recorded daily, from March 23, 2020 to April 21, 2020, constituting a total of thirty (30) days. Similarly, they were collected respecting the daily rigor, always between 10:30 PM and 11:30 PM, considering the Brasilia-DF-Brazil time (1:30 AM and 2:30 AM, Greenwich Mean Time). It is necessary to inform that records of COVID-19 began at this site on January 22, 2020 with 555 cases and in Brazil the first case was registered on January 26, 2020. Data on the world and Brazilian population were collected at the https://www.worldometers.info/world-population/population-by-country/ site, available on March 23, 2020. Thus, it was adopted to refer the world population to the following amount: 7,696,163,325 inhabitants and for Brazil the population of 212,559,417 inhabitants was adopted. The epidemiological indicators analyzed were: incidence and mortality rate, considering the proportion per group of 100,000 inhabitants; for lethality, recovered cases and active cases, the proportion per group of 100 (percentage) was used.

Regarding statistical analysis, data were tested for normal distribution (Shapiro-Wilk test) and homogeneity of variances (Levene and Brown-Forsythe tests), conditions for application of parametric statistical tests for comparison of means of independent samples. When verifying the relationship between incidence and mortality, Pearson's correlation test was applied. Subsequently, one-way ANOVA was performed followed by Tuckey or Kruskal-Wallis ANOVA to evaluate the evolution of markers over time, considering the interval every 10 days. For the comparison of the variables incidence, mortality, lethality, percentage of recovered cases and active cases between Brazil and the world, the Student t-test or Mann-Whitney was applied when appropriate. The data were expressed through the values

of epidemiological rates and also in mean and standard deviation. All statistical and exploratory analyses were performed adopting a significance level of 5% ($p < 0.05$) by the STATISTICA12.0 software (StatSoft Inc., USA).

3. RESULTS

The graphs presented below demonstrate the curves of incidence, mortality and lethality of COVID-19 in Brazil and in the world, in which it is possible to observe that these curves are relatively parallel. However, in Brazil these indicators present values lower than those observed in the world, over the 30 days ($p < 0.05$) (Figures 1, 2 and 3). The graphs showed a trend of approximation of the curves, and the data from Brazil approximated the world data mainly in relation to the COVID-19 lethality curve (Figure 3).

Regarding the incidence curves (Figure 1), there is a distance between the rate observed in Brazil and in the world, indicating an increase in the incidence rate in the world, with a value of 5.18 on the first day of registration and 33.28 on the last day, while the incidence rate in Brazil was 0.89 on the first day and 20.27 on the last day, considering the period under review when both curves were increasing.

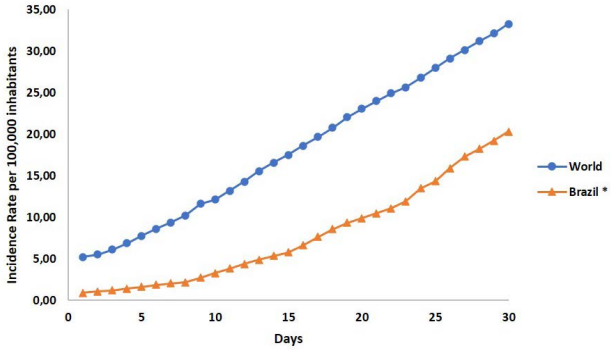

Figure 1. Comparison of daily data on the incidence rate of Brazil and the world per 100,000 inhabitants over a 30-day period. Data analyzed by the Student t-test or Mann-Whitney when appropriate. * Statistically significant differences between Brazil and the world over the 30-day period ($p<0.05$).

Regarding mortality curves (Figure 2), the distance remains and there is a more marked distance from the mortality rate from the 5th day of observation, being a value of 2.21 on the 29th day in the world, while a value of 1.19 on the 29th day for Brazil.

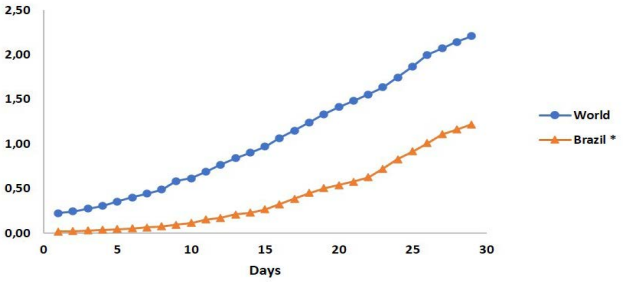

Figure 2. Comparison of daily data from Brazil and the world of mortality rate per 100,000 inhabitants over a 30-day period. Data analyzed by Student t-test or Mann-Whitney when appropriate. * Statistically significant differences between Brazil and the world over the 30-day period ($p<0.05$).

In respect of the curves related to the lethality rate (Figure 3), there is a progressive approximation between them considering the period analyzed, from the 25th day, when the world rate of 6.67 is very close to the rate of 6.40 observed in Brazil.

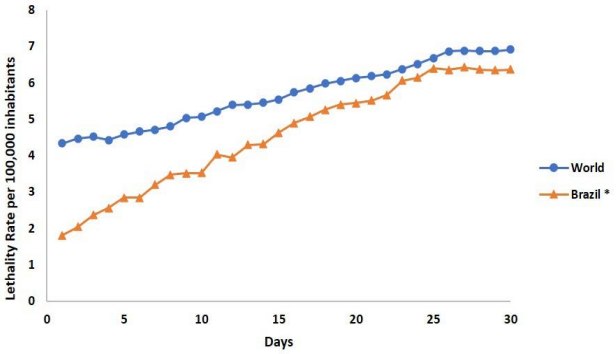

Figure 3. Comparison of daily data from Brazil and the world of the lethality rate per 100,000 inhabitants over a 30-day period. Data analyzed by Student t-test or Mann-Whitney when appropriate. * Statistically significant differences between Brazil and the world over the 30-day period ($p<0.05$).

Concerning the percentage of the number of cases recovered, unlike all previous indicators, was the parameter that showed greater heterogeneity in Brazil in relation to the world data (Figure 4), with a high increase from the 22nd day, while the world data remain relatively stable with a value of 26.54 on the 30th day, while this value was 53.37, more than double in Brazil on the 30th day.

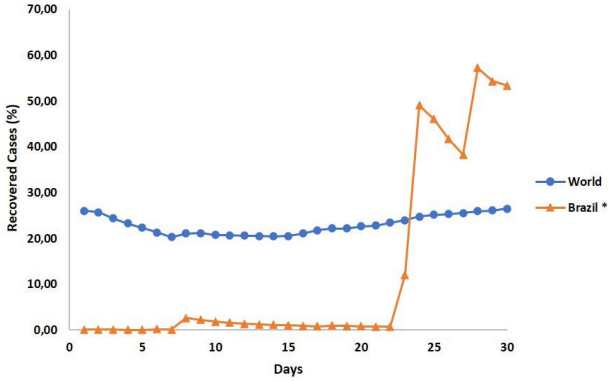

Figure 4. Comparison of the daily data from Brazil and the world of the percentage of cases recovered over a period of 30 days. Data analyzed by Student t-test or Mann-Whitney when appropriate. * Statistically significant differences between Brazil and the world over the 30-day period ($p<0.05$).

In regard to the percentage of active cases, around the 23rd day there were significant changes in the Brazilian curves, with an abrupt decrease in the percentage of active cases (Figure 5) of Brazil in relation to the world, and we can see that the number of active cases remained until the 22nd largest day in Brazil than in the world ($p < 0.05$).

When the profile of epidemiological indicators was analyzed every 10 days (Table 1), a similar profile was observed between data from Brazil and the world, and in the first 10 days there was a significant increase in incidence, mortality rate and also lethality ($p<0.05$). Regarding the active cases, in the last 10 days, a

significant drop was detected in the case of Brazil in relation to the initial 20 days ($p<0.05$) and in relation to the recovered cases, there was a significant increase in the last 10 days ($p<0.05$).

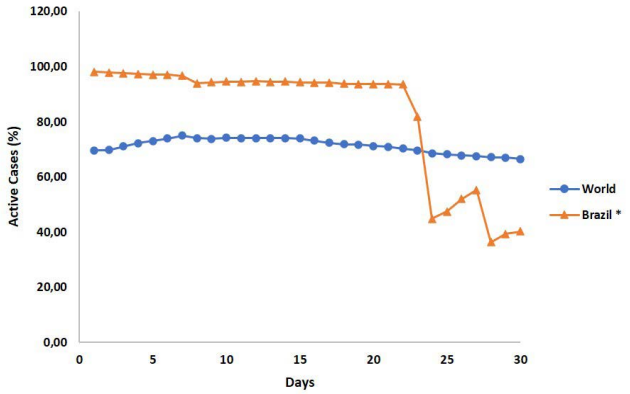

Figure 5. Comparison of the daily data from Brazil and the world of the percentage of active cases over a period of 30 days. Data analyzed by Student t-test or Mann-Whitney when appropriate. * Statistically significant differences between Brazil and the world over the 30-day period ($p<0.05$).

Table 1. Temporal analysis of the epidemiological parameters evolution of the COVID-19 pandemic in Brazil and worldwide in a period of 30 days.

	Location	Beginning (0-10 days)	Middle (10-20 days)	End (20-30 days)
Incidence	World	8,33±2,48	18,11±3,29	28,52±3,18
	Brazil	1,77±0,74	6,46±2,10	7,12±3,42
Mortality Rate	World	0,39±0,14	1,04±0,24	1,90±0,29
	Brazil	0,05±0,03	0,32±0,14	0,39±0,23
Lethality	World	4,66±0,25	5,67±0,32	6,64±0,29
	Brazil	2,82±0,62	4,73±0,56	4,29±0,33
% number of recovered cases	World	22,64±2,09	21,27±0,85	24,98±1,21
	Brazil	0,74±1,04	1,07±0,26	11,02±22,24
% number of active cases	World	72,70±1,90	73,05±1,15	68,38±1,49
	Brazil	96,45±1,57	94,20±0,35	78,94±22,53

Data expressed in mean ± standard deviation of periods of 10 days (total n = 30 days) and analyzed by One-way ANOVA followed by Tuckey or Kruskal-Wallis ANOVA (significant differences detailed in the text).

It was also observed that there is a directly proportional positive correlation between incidence and mortality rate both in the world ($r = 0.9961$; $p < 0.05$) and in Brazil ($r = 0.9986$; $p < 0.05$), so that the higher the incidence of COVID-19 cases, the higher the mortality rate.

4. DISCUSION

The observation of maintaining the progress of the incidence rate so far in the world and in Brazil of COVID-19 (Figure 1) is a cause for warning, especially when mortality rates (Figure 2) and lethality remain high (Figure 3). In Brazil there are reports that in certain states such as São Paulo, Rio de Janeiro, Ceará, Pará and Amazonas, the health network, especially the SUS (the Brazilian unified national health system), is operating at its maximum limit, and at the moment there is already a collapse in funeral care, such as that registered in the city of Manaus-AM (BRASIL, 2020d).

It is known that lethality can be affected by factors such as knowledge about the disease, installed diagnostic capacity and hospital overcrowding (FREITAS *et al.*, 2020). The international experience shows that countries that have adopted mass testing in the population have been able to better control epidemics and assess the actual lethality rate. In the countries with wide PCR application, the lethality rate obtained was less than 1%. The countries with the highest reported lethality rate are precisely those that have done the least tests per capita (DIAS, 2020).

We can observe that lethality rates in Brazil can be attributed to a diversity of factors characteristic of the Brazilian population that is very diverse between regions. There are population concentrations in large urban centers like São Paulo and Rio de Janeiro with pockets of poverty and other social and economic factors, including the access to education and dependence on professional subsistence activities. Furthermore, the lack of sanitation and medical assistance, despite the universal coverage of the SUS.

Another aspect to be considered is the population characteristics in Brazil of the elderly and patients with comorbidities such as hypertensive, diabetic and obese patients in general affected by metabolic syndrome, in view of unhealthy habits in the general population, especially in large urban centers. The striking feature of the Brazilian population is its ethnic diversity and, among these, we have individuals in the northern region descended from indigenous peoples who may be more susceptible to viral infections. However, a positive aspect to be considered is the average age of the Brazilian population (32 years) that is younger than that of Europe (45 years), but not much different from other developing countries, such as China (36 years) and India (28 years) .

The acquisition of immunity by the population, especially from the tenth to the twentieth day, can partly explain the relative decline in active cases (Figure 4) and the arising of recovered cases (Figure 5) due to a phenomenon of natural immunity, which is expected to contribute to the decrease in infectivity afterwards, when a certain proportion of the immunized population constitutes a barrier to transmission.

For the occurrence of recovered cases contribute the patients that were adequately attended and treated by the health system and also the surveillance of new cases, represented by the incidence rates that allow to guide the necessary measures of readiness and actions such as social isolation and transmission control with the use of masks and other hygiene actions, avoiding the collapse of the health system and maintaining the availability of the health service for serious and critical cases that may represent about 20% of total cases (SILVA, 2020).

There are different forms of evolution of COVID-19 among individuals and there are variations in the time to seek and effectively be attended by the health service, so that the curves predominantly reflect severe and critical patients. In relation to the recovered cases, it is expected that around the twentieth day of infection most of them could develop immunity, justifying the phenomena observed in the curve of figure 4.

In 30 days, there is already been a tendency for Brazilian curves to approximate the world curves (Table 1), although the pandemic was established in the world almost 40 days earlier. In addition, it is noteworthy that the incidence rate tends to double every 8.5 days and

that of mortality every 8 days worldwide. In Brazil, the incidence rate tended to double every 6 days and mortality every 3.6 days, showing a possible acceleration in the infection process and mortality. This may have occurred due to failures in containment measures in the most populous states and, as a result, the desired flattening of the disease incidence curve has not been achieved.

The world faces a serious and acute public health emergency due to the pandemic COVID-19 (WALKER *et al*., 2020). The worldwide and Brazilian incidence rates present similarities and are in an ascending phase. However, COVID-19 presents different epidemiological scenarios in several countries (FREITAS *et al*., 2020). Some countries are in a complete transmission cycle (China, South Korea), while others in a post-transmission cycle (Italy, Spain, France). In China, the epidemic curve of onset of symptoms peaked from January 23 to 26 and began to decline until February 11. Brazil, which has not yet reached its peak, has uncertainty in the cycle projection as well in the slowdown of disease transmission growth (DIAS, 2020).

These different scenarios bring great concern in the face of a disease that has spread quickly in several regions of the world, since the initial identification in China, with different impacts (FREITAS *et al*., 2020). The experience of countries in Europe as Italy and Spain so far has emphasized the intense pressure that the COVID-19 epidemic causes in national health systems, with demand for intensive care beds, that quickly exceeds their availability, even in countries with relatively high availability of resources (REMUZZI; REMUZZI, 2020).

In relation to the other countries analyzed, Brazil is still in an early phase of the epidemic, having presented an acceleration in the number of confirmed cases from the epidemiological week 15, that is the period between April 5 to 11th. Most cases were concentrated in the Southeast region (53.8%) followed by the Northeast regions (24.9%) and South (7.2%). Among the Federal Units, São Paulo had the highest number of confirmed cases of the disease (BRASIL, 2020b).

The so-called exponential curve of COVID-19 is of great concern, because the possibility of cases doubling very quickly, since the SARS-CoV-2 contagion capacity measured by its basic reprodution number (R0) is 2.74, that is, a person sick with COVID-19 transmits the virus, on average, to another 2.74 people (WEISSMANN *et al*., 2020). The way in which countries respond with mitigation measures will be critical to influence the trajectory of national epidemics (WALKER *et al*., 2020).

Countries such as the United States, Italy and Spain showed an exponential increase in records, reflecting the commitment of local health structures and services. Among the control measures directed at COVID-19, the restriction on the movement of people was adopted in several countries and advanced progressively towards the closure of borders, reduction of the flow of airplanes, isolation and quarantine of neighborhoods, cities, states and countries. The highly transmissible characteristic of SARS-CoV-2 has led to several strategies to reduce the flow of people to be implemented on all continents, all with the objective of reducing the spread of the disease among people worldwide (BRASIL, 2020a).

In some countries, isolation measures were adopted long after the infectious incubation period of COVID-19, so most of the population was affected, which may have changed the distribution curve of the cases, higher at the beginning and lower later. As in most epidemics, the peak occurs when 50% of the population is contaminated; in the case of implementing social distancing policies, two peaks may occur. As the speed of contamination by COVID-19 is high, the first peak is higher than the second, since most of the population has already been contaminated. It is assumed, based on the great epidemic of 1918 (with community transmission) and the various Influenzas, that the death curve fell, when more than half of the population is contaminated (DIAS, 2020).

Brazil implemented measures to restrict travel from March, with the closure of the border with Venezuela on March 18 and almost all countries on March 19, in addition to restricting the entry of foreigners of all nationalities from March 27 by international airports. These measures occurred due to the high risk of spreading the disease among countries, generating an important reduction in the flow of international travelers worldwide (BRASIL, 2020a).

The COVID-19 pandemic is divided into four epidemic phases: localized transmission, uncontrolled acceleration, deceleration and control. At the moment, the country is in the localized (community) transmission phase, with some cities entering the uncontrolled acceleration phase. In view of this scenario, the Brazilian Ministry of Health (MS) evaluated that the strategies of social distancing adopted by states and municipalities, contribute to preventing the collapse of local health systems, as has been observed in countries such as the USA, Italy, Spain, China and, recently, Ecuador. The social distancing allow managers to structure the population's health care services, with the consequent protection of the health system capacity. It is estimated that these measures should be taken until there are sufficient conditions to safely promote the transition to a selective social distancing strategy (BRASIL, 2020a).

In Brazil, there is low testing for COVID-19, due to the scenario of community transmission, in which the etiological diagnosis began to be performed in cases of Severe Acute Respiratory Syndrome (SARS) by emergency or hospital services (BRASIL, 2020c). This fact may have influenced the disease incidence rate, as Brazil is one of the least tested countries in the world, although it is the 14th most affected. While the United States tests 8,866 people per million for a total population of 330 million inhabitants as Brazil does 296 tests per million inhabitants for a total population of 211 million inhabitants, according to an estimative made on April 10th (AZEVEDO, MALTCHIK 2020).

The limitation in carrying out tests to confirm the cases of COVID-19 makes it difficult to assess the real picture of the evolution of the disease in the country. If there is a greater number of infected people without the registration of these cases, there is a higher risk of transmission of the virus by individuals who do not present symptoms, causing a constantly delayed epidemiological picture, since the insufficiency or delay in testing causes a delay in the notification of cases and directly impacts the statistics with which governments work to contain the spread of COVID-19 (JUCÁ, 2020).

The guidelines on public and social health measures were published by the WHO, recommending forms of isolation and the importance of testing the population for the next phase of the response to COVID-19 (WHO, 2020a). Currently, there is no evidence that people who have recovered from COVID-19 and have IgG class antibodies could be protected against a second infection (WHO, 2020b). In this way, it would be possible the patients' reinfection by the same virus several times throughout their lives, and this may display a new picture of the disease and spread the virus once again through the population. Fact that does not take into account the mutagenic capacity of the virus, which can eventually become a problem for the human immune system and for the development of diagnostic tests and vaccines (ARAÚJO, 2020).

Factors such as the study of the pathogenic potential of the virus and its varieties can help in the development of diagnostics, arsenal of drugs and more appropriate methods of therapeutic management, in addition to the development of vaccines, immunotherapies and technological innovations. However, epidemiological knowledge is fundamental for understanding the populations affected by the epidemic and for estimating the disease progression curves, optimizing the resources available for its control and resolution, as well as inferring possible resurgences of the SARS-CoV-2 virus and its varieties, as well as other coronaviruses, in order to prevent other episodes of such dimension as the COVID-19 pandemic.

5.CONCLUSION

This study showed that the high incidence rate has strong relationship with the mortality rate in Brazil and worldwide. Therefore, it is necessary and imperative to carry out interventions capable of keeping the incidence rate under control, since its significant and accelerated increase can compromise the quality of health care services and, thus, contribute to the increase in the lethality rate.

In addition, a positive correlation was found between mortality and lethality, which increases as the incidence and active cases also increase, bringing Brazilian data closer to world data.

Our study also demonstrated the existence of a correlation between the increase in the percentage of recovered cases and the decrease in active cases. Considering that the resolution of cases occurs due to death or recovery, the percentage of cases recovered may indicate the ability of health services to solve problems, while the percentage of deaths may indicate their weaknesses.

From the temporal analysis of the evolution of the epidemiological parameters of the COVID-19 pandemic in Brazil and worldwide over a period of 30 days, which demonstrates an accelerated increase, both in the incidence and in the lethality rates, it is strongly recommended the need for consistent and immediate actions in two aspects related to health surveillance practices: a) effective measures to control the incidence rate increase and b) improvement of installed hospital capacity, especially with regard to high complexity treatments, laboratory services and primary health care.

In the absence of confirmed effective therapeutic methods of immunization and prevention, it is recommended to adopt WHO guidelines for social isolation/distancing, use of personal protective equipment according to local and regional specificities, increase testing as a safe way to return to normal activities, also providing better reliability of the population's infectivity and lethality data. It is also advisable to adapt the health network through human resources and equipment to deal with the pandemic and, finally, health educational actions that promote preventive behaviors in the general population.

CONFLICT OF INTEREST

The authors declares that there is no conflict of interest regarding the publication of this paper.

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