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EPIDEMIOLOGY OF SARS-COV-2 IN BRAZIL – A NEW CHALLENGE FOR PUBLIC HEALTH

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ABSTRACT

In December 2019, a new disease was identified in China. From the investigation of cases of pneumonia of indefinite origin, researchers came to the identification of a new coronavirus, called SARS-CoV-2. Causing more than 3.5 million cases and nearly 250.000 deaths between December 2019 and May 2020, COVID-19 was declared a Pandemic by the WHO in March 2020 and since then major consequences and changes in the daily lives of the world population have been occurring. Elucidating its epidemiology, knowing its associated risk factors are fundamental points to combat COVID-19.

Keywords: Coronavirus; COVID-19; Pandemic; Quarantine

INTRODUCTION

Since December 2019, the world has been witnessing the expansion of a new disease caused by a type of coronavirus, which every day shows dramatic epidemiological proportions, directly impacting the public health sectors in several countries and leading to various economies of the world.

The first notification of the disease occurred in Wuhan, Hubei Province, China, on December 12, 2019, through a patient with pneumonia of unknown etiology. Initial epidemiological investigations suggested that the outbreak would be associated with a seafood market, and later the disease was named COVID-19, caused by the coronavirus agent SARS-COV-2 with zoonotic origin, possibly from bats (ZHOU et al., 2020).

There were no bats in this market, but there was a wide variety of other animal species for sale when the disease was first reported, and further studies are needed to confirm the species that act as a natural reservoir and any intermediate hosts of COVID-19. (WU et al., 2020).

On January 30, 2020, the World Health Organization (WHO) officially declared the disease a Public Health Emergency of International Interest, and its growing expansion in the following weeks culminated in the COVID-19 Pandemic declaration on March 11, 2020.

The disease is characterized by an acute respiratory clinical picture, with clinical presentation of dry cough, respiratory difficulty and pneumonia, with a marked increase in the severity of cases and lethality rates in people over 60 years of age, with chronic diseases, diabetics and others who will be listed throughout the text (WU et al., 2020; GUO et al., 2020). One of the major epidemiological challenges is asymptomatic carrier transmission, however

the mechanism by which asymptomatic carriers contract and transmit SARS-COV-2 requires further studies (BAI et al., 2020).

As of May 5, 2020, more than 3.5 million cases and 247.000 deaths worldwide have been confirmed, with 101.826 cases and 7.051 deaths confirmed in Brazil, with the escalation of confirmed cases and deaths growing exponentially (WHO, 2020a).

This review aims to elucidate some fundamental points of epidemiology and the impact of COVID-19 in Brazil.

Characterization of the Etiological Agent and its variants in the world

The virus responsible for COVID-19, formally identified as SARS-CoV-2 in a group of 41 patients hospitalized in China (GOU, et al., 2020), is an RNA virus, a member of the Coronaviridae family and part of a coronavirus subset (CoVs), alongside the 2002 SARS-CoV (Severe Acute Respiratory Syndrome - SARS), of and of MERS-CoV, (Middle East Respiratory Syndrome – MERS) , identified in 2012. Other human coronaviruses usually cause mild respiratory infections, but these three can cause highly lethal diseases (MEMISH et al., 2020).

The CoVs are named after their crown-shaped peaks on the viral surface, being classified into four main subgroups, known as alpha, beta, gamma and delta. SARS-CoV-2 is not only phylogenetically related to SARS-CoV, but also uses the same receptor to bind to human cells, the angiotensin-converting enzyme II. MERS-CoV, on the other hand, differs from the previous ones, because it binds to the host cell receptor dipeptidil peptidase 4 (DPP4) in order to infect human cells, besides being phylogenetically distinct from both (SUN et al., 2020).

In a phylogenetic network analysis of 160 complete genomes of SARS-CoV-2, three variants distinguished by amino acid alterations were found to date, which were named A, B and C. Type A is considered the ancestor, with 96.2% genetic similarity between a bat coronavirus and the human virus. Type B is derived from A by two mutations, and type C consists of a type B shunt (FORSTER et al., 2020).

Types A and C are found outside east Asia, on the European and American continents. Type C is also the main one found in Europe, in countries such as France and Italy, being the predominant one in Brazil. Type B is the most common in East Asia, not spreading out of this region (FORSTER et al., 2020).

One hypothesis is that variant B is immunologically or environmentally adapted to a large part of the East Asian population, but had to undergo mutations to overcome resistance outside this region. Thus, while the ancestral Type B is monopolized by East Asians, the entire B-type genome outside Asia has mutated (FORSTER et al., 2020).

Current COVID-19 data in the World and Brazil

Around 3.5 million cases of COVID-19 have been reported worldwide, with a total of approximately 247,000 deaths. The United States concentrates more than one million cases, followed by Spain with 226,000 cases and Italy with 210,000 cases. China, the first epicenter, has confirmed 86,000 cases. In relation to deaths, the United States concentrates approximately 25% of all deaths in the world, more than 67,000 deaths (WHO, 2020a).

In Brazil, until May 5, 2020, 101.826 cases of COVID-19 were confirmed, with the first notification of a confirmed case, according to the Ministry of Health, on February 26, 2020 (BRASIL, 2020a). The Southeast region concentrates most of the confirmed cases (51.69%, 25.583/49.492), followed by the Northeast (27.04%, 13,381/49,492) and North (11.14%, 5,514/49,492).

The overall incidence (cases/1 million inhabitants) in the country, up to May 5, was 485 cases per million inhabitants. The highest incidence of Brazil occurs in the North region, 299

cases/million inhabitants, and the highest state rates occur in Amazonas and Amapá (696 and 647 cases/million inhabitants, respectively), as can be seen in Figure 1 (BRASIL, 2020).

There were 3,313 deaths due to COVID-19 in Brazil in the period, representing a lethality of 6.69%. The Southeast region had the highest lethality rate, 7.69%, followed by the Northeast (6.22%) and North (5.86%). The highest lethality among the states is in Paraíba (11.59%), followed by Pernambuco, Rio de Janeiro, Amazonas and São Paulo, all with higher lethalities at 8% (BRASIL, 2020).

Regarding the profile of deaths due to COVID-19, until April 20, there is a higher proportion of men (60%, 1,249/2,082), aged 60 years or older (71.66%, 1,492/2,082). In 45.39% of deaths, the patient had heart disease, the main associated comorbidity, followed by diabetes (35.25%, 734/2,082) and pneumopathy (8.98%, 187/2,082) (BRASIL, 2020).

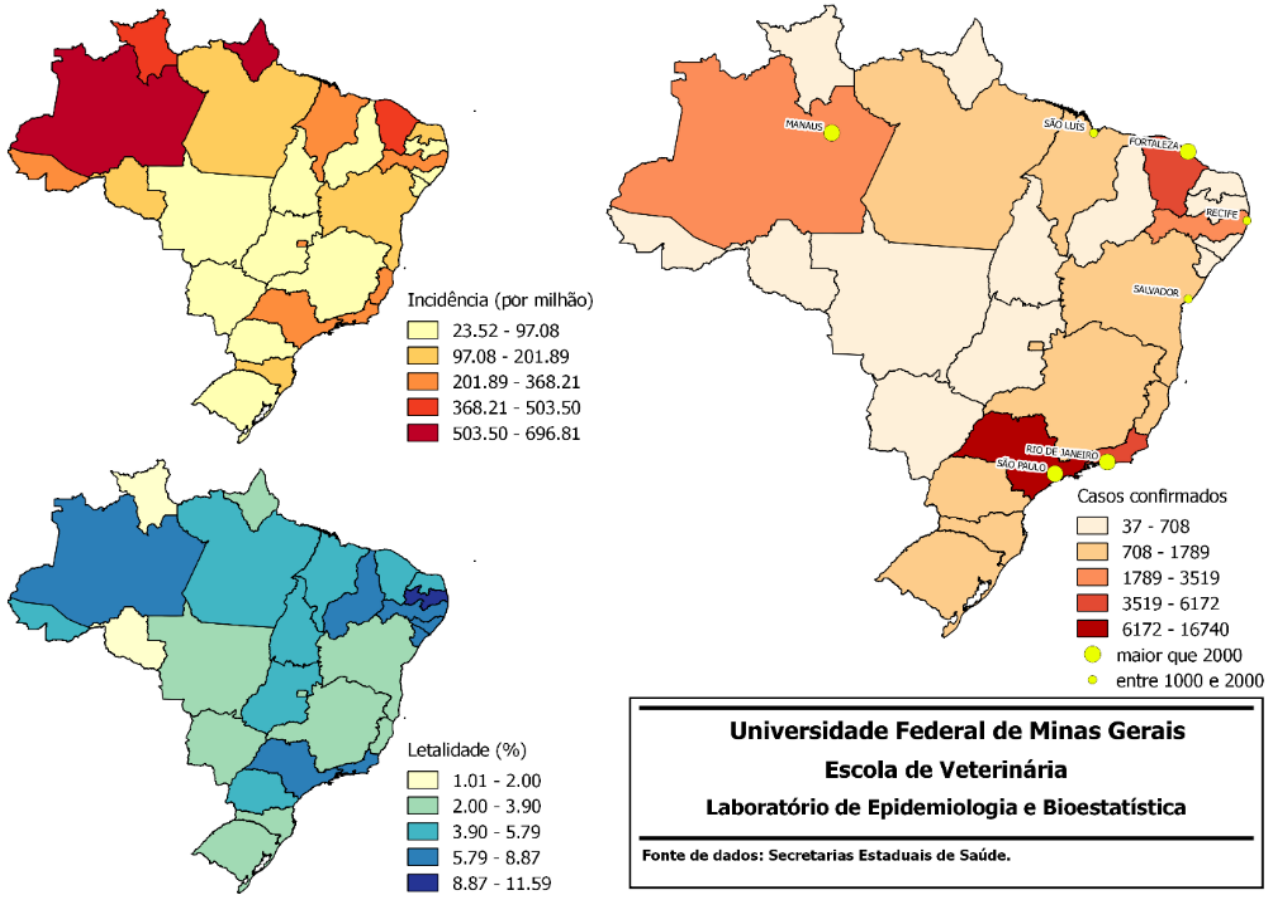

Figure 1. Spatial distribution of incidence, lethality and confirmed cases of COVID-19, by state, in Brazil, from February to April 2020. Municipalities with more than 1,000 confirmed cases were highlighted as points on the map on the right.

Epidemiological profile of cases of SARS-Cov-2

Based on the current epidemiological investigation, the incubation period is from 1 to 14 days, for most patients this period was from 3 to 7 days, being contagious during the latency period (JIN et al., 2020). As an emerging acute respiratory infectious disease, COVID-19 spreads mainly through the respiratory tract, droplets, respiratory secretions and direct contact requiring a small infectious dose (CHAN et al., 2020; LI et al, 2020; GUO et al., 2020).

The basic playback number (R0) is used to measure the transmission potential of the virus. This number is an average of how many people an infected patient is able to transmit the agent, assuming that people close to the patient are not immune to it. Studies have demonstrated a great variability of R0, ranging from 1.5 to 14 people contaminated by infected patient, depending on local characteristics (ROCKLÖV et al., 2020).

The general population is susceptible to the virus, including children and babies (JIN et al., 2020). Most cases have a favorable prognosis, however, the numbers of severe cases are remarkable. This severity of the observed symptoms, which initiated disease surveillance, is a major problem of COVID-19. The SARS-CoV-2 virus is a pneumotropic agent and can cause severe pneumonia requiring intensive hospital care, especially among the elderly and individuals with concomitant diseases (LA MAESTRA et al., 2020).

A meta-analysis with only eight studies, including 46,248 patients showed hypertension as risk factors for worsening COVID-19 (odds ratio 2.36 - 95% CI 1.46 to 3.83), respiratory disease (2.46 - 95% CI 1.76 to 3.44) and cardiovascular diseases (3.42 - 95% CI 1.88 to 6.22) (YANG et al., 2020).

Obesity and smoking were also associated with increased risks (HUANG et al., 2020). In Italy, higher risks have been reported in men than in women, which could be partly a reflection of higher rates of smoking and comorbidities (LIVINGSTON and BUCHER, 2020). However, the relative importance of underlying health under different conditions is unclear, important confounding factors such as age, sex, smoking, insufficient follow-up and likely underreporting of pre-existing conditions are expected (YANG et al., 2020).

Control and Prevention Measures

To date, no specific antiviral treatment has been confirmed as being effective against COVID-19. In relation to patients infected with COVID-19, it is recommended to apply appropriate symptomatic treatment and supportive care (HUANG et al, 2020). Studies have also explored the prevention of hospital infection and psychological health problems associated with COVID-19. The measures that have been suggested to reduce infection in the hospital environment include training in prevention and control of health professionals, exclusion of companions in the hospital environment, isolation, disinfection and use of different personal protective equipment for health professionals according to the risks in different hospital wards (ADHIKARI et al., 2020). WHO guidelines recommend the use of particulate respirators with N95 or FFP2 certificates, and the use of surgical masks by suspected and confirmed cases in health care sites (WHOb, 2020; WHOd, 2020). With regard to psychological health, some suggested psychological intervention for confirmed and suspected cases and also for the medical team due to the great social impact generated by loneliness resulting from social isolation (ADHIKARI et al., 2020; XU et al., 2020).

Although there are several research groups around the world working on the development of COVID-19 prevention strategies, there is currently no vaccine to prevent it. The best prevention is to avoid being exposed to the virus (OU et al, 2020). Measures that may reduce this risk of exposure include regular hand washing with soap and water or hand sanitizer disinfection containing at least 70% alcohol (if soap and water is not available); cover your mouth and nose during coughs and sneezing with scarves that should be discarded safely (or, if there are no scarves available, use the flexed elbow to cover your mouth and nose when coughing or sneezing); avoid contact with people and maintain an adequate distance, as large as possible (of at least 1 meter) from each other; refrain from touching the eyes, nose and mouth with unwashed hands; and the use of face masks (ADHIKARI et al., 2020; WHOb, 2020; WHOc, 2020).

There are studies indicating that there is insufficient scientific evidence to indicate the mass use of face masks by the population as a prevention measure against COVID-19

(MARASINGHE, 2020; LONG et al, 2020). The WHO also advises against the use of surgical masks by the general population due to the risk of shortage of these masks for health professionals (WHOd, 2020). However, the masks produced at home, called homemade masks, are simple, inexpensive, potentially effective and it is believed that, if used both at home (mainly by the person who shows symptoms) and also outside the home in situations where there is a chance of direct or indirect contact with other people, such as during purchases, in public transport and etc., they could generate a substantial impact on transmission , with a relatively small impact on the social and economic life of the population (GREENHALGH et al., 2020). Therefore, several municipalities in Brazil and worldwide have made it mandatory to use face masks in collective environments. Proper disinfection and disposal of these masks is also very important to reduce the risk of transmission (WHOd, 2020).

Diagnosis

For WHO, a confirmed case of COVID-19 occurs when there is a positive laboratory diagnosis for the presence of the SARS-Cov-2 virus through an accurate diagnostic test. In due course, the agency provided explanations and technical guidance on laboratory diagnosis (WHOg, 2020). The Gold Test for the diagnosis of SARS is PCR, Elisa or IFA test, with results indicating seroconversion or increased titration greater than four times the antibody titer. With regard to the PCR test, it is necessary to send at least two different clinical samples (nasopharynx and feces) or the same sample collected in two or more days or the re-test of the same sample (WHOg,2020).

The Ministry of Health defines in Brazil the cases confirmed both by laboratory criterion and by the clinical-epidemiological criterion, which is defined as a patient with a history of close or home contact, in the last 7 days before the onset of symptoms, with a laboratory confirmed case for COVID-19 and for which it was not possible to perform a specific laboratory investigation (BRASIL, 2020). The clinical-epidemiological criterion is especially used in the context of overload of the health system and lack of necessary inputs for diagnosis, which is directed especially to severe cases.

Economic Impacts of the COVID-19 Pandemic

Isolation and/or quarantine measures to control COVID-19 cause the interruption of an entire economic chain of normal activities, and it is estimated that more than 1/3 of the world's population is in social isolation. This process triggers lower consumption, lower production and lower investments. Public investments are basically redirected to the health sectors, whether required for the purchase of physical inputs, such as personal protective equipment and respirators, or training and hiring of health agents (UFRJ, 2020).

On April 14, 2020, the International Monetary Fund (IMF) updated its global growth projections indicating that the global economy is expected to suffer its worst recession since the great depression, surpassing the 2008 housing crisis. The IMF predicts that Brazil's GDP will shrink by more than 5%, and the global contraction average is expected to be 3%. However, countries such as Italy (expected to retract 9.1%), Spain (8% downturn), France (7.2% downturn), Germany (7% downturn) and the United States (5.9% decrease), these rates should be more dramatic. The Fund expects a recovery for 2021, however, this recovery depends heavily on the path of the pandemic in the second half of 2020 (IMF, 2020).

In China, the first epicenter of COVID-19, trade activity is expected to grow at a rate of 1.2% in 2020, faced with 6.1% in 2019, below the 6% forecast in 2020. The IMF points out that "the magnitude and speed of the collapse of economic activity" caused by COVID-19 "is unlike anything that has happened in our time" (IMF, 2020).

The World Labor Organization estimates more than 25 million jobs lost, totaling US$3.4 trillion. The pandemic ended up mercilessly exposing the deep flaws and weaknesses of labor

markets around the world. Several companies, from small to large, have already had to reduce working hours, thus cutting pay and, consequently, laying off employees. The crisis is expected to particularly affect workers in low- and middle-income countries, especially in informal sectors (ILO, 2020).

All simulations and forecasts are made based on the premise that the pandemic would end in the first half of 2020, so the economic outcome will be so severe and intense, when the persistence of the pandemic itself. Health-focused policies are essential to prevent worse economic outcomes (IMF, 2020).

FINAL CONSIDERATIONS

The COVID-19 pandemic is an unprecedented event for public health systems worldwide. All health-oriented policies, prevention measures, assistance, economic and fiscal measures should be impacted and will undergo profound transformations over the coming years. The economic and health impact can even be measured or modeled and predicted, but the impact on human, social and their transformations will hardly be measured or valued.

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