Predictors for hospitalization in ICU of patients with COVID-19 in the year 2021

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1 INTRODUCTION

The first case in the world of SARS-Cov-2 was detected in 2019 in China, being identified as a new type of coronavirus, COVID-19. After three months of the first detection, the World Health Organization - WHO declared a state of pandemic due to the calamity that the world population was facing, and together, there was a need for social isolation in countries, in order to reduce the advance of contamination (WISE, 2021).

All these measures aimed at stopping the spread of contamination were based on the high death rates, since 230,452 deaths were recorded in Brazil alone in 2020 by COVID-19 (FIOCRUZ, 2021).

Thus, it was verified the existence of factors that can lead to the worsening of the disease, such as lifestyle habits, smoking, advanced age and the existence of previous diseases, such as respiratory diseases and obesity. If   these are identified in a patient diagnosed with COVID-19, together with a timely medical intervention, they can enable a greater chance of patient survival; otherwise, the chance of evolution to a need for hospitalization in an intensive care bed and with consequent evolution to death could be a highly probable outcome (KASSIR *et al*., 2020; PIRES *et al.,* 2020; SILVA et *al., 2020*).

In search of solutions to this great impact on the social and economic scenario, the vaccination campaign against COVID-19 was initiated in Brazil in January 2021, being essential for reducing the severity of cases and consequent evolution to deaths from the disease. In addition, the vaccine resulted in a decrease in ICU bed occupancy rates and reduced new transmissions and contaminations of the disease (FIOCRUZ, 2022).

2 OBJECTIVE

To evaluate the predictive factors in relation to ICU bed admission in patients diagnosed with COVID-19 in all federative units of Brazil in 2021.

3 METHODOLOGY

It refers to a retrospective cohort study, through analysis of national data (Brazil) regarding ICU patients diagnosed with COVID-19.

Data were obtained from a COVID-19 Surveillance database, DataSUS 2021. Eligible cases for the study were patients tested positive for SARS-CoV-2 by RT-PCR detectable in naso-oropharyngeal secretion sample, with final SARS classification by COVID-19 and who required ICU hospitalization.

The public database was built based on 1,048,575 cases, however, the analysis was initially based on 7,307 cases, considering that ignored and blank data were excluded; of these only 2,752 required ICU. Data filtering was based on sociodemographic variables (race, gender, age group, educational level, area of residence), symptomatic variables (cough, fever, anosmia, ageusia, dyspnea, respiratory distress, diarrhea, vomiting), climatic variables (need for ventilatory support, x-ray result, vaccine, antiviral use, saturation < 95%) and with regard to comorbidities (e.g., respiratory distress, respiratory distress, diarrhea, vomiting).95%) and associated comorbidities (heart disease, hematological diseases, Down syndrome, liver disease, asthma, diabetes mellitus, neurological diseases, pneumopathies, immunodepression, renal diseases and obesity).

The database was generated and filtered using Excel and statistical analysis was performed using EPI-INFO 7.2.

This study did not require the application of the Free and Informed Consent Form (CNS Res. 466/2 in its chapter IV.8), since it is an analysis of public domain data (SIM) of unrestricted access, where personal data of the records are not informed and, according to Resolution 510/2016, of Law 12.527/2011, it was not necessary to submit this research for evaluation by the CEP-CONEP System.

4 RESULTS AND DISCUSSION

The analysis of the results showed that among the sociodemographic factors, those responsible for greater hospitalization in the ICU were the white/brown/yellow race with 2,517 (91.46%), male gender with 1,484 (53.92%), age group of 40-59 years with 996 (36.19%), education level up to elementary school with 1,480 (53.78%) and residents of the urban/periurban area with 2,650 (96.29%) cases.

Regarding race, unexpectedly individuals of white/brown/yellow race had a higher degree of hospitalizations in ICU, however in other studies they point to the black race as a risk group for the evolution of the disease. However, as there was no individual separation of races in the data analysis, the application was not effective in these variables (ARAUJO *et al*, 2020).

With regard to the higher number of cases in men when compared to women, it can be explained by the fact that the female immune system has a stronger response of T cells in relation to the male

immune response, resulting in a lower evolution of the severity of the condition in women (TAKAHASHI *et al.*, 2020).

In relation to the age group , the elderly would be the most affected by the severity of the disease, in view of their immune fragility; however, the age group >60 years was not the one that most evolved to ICU hospitalizations in 2021 due to the fact that this group of the population was the priority to receive the first doses of the vaccine against COVID-19, which would justify this group not being at the top of ICU hospitalizations. Thus, the most advanced group that did not complete the vaccination schedule, between 40-59 years of age, was among the population with the highest rate of ICU hospitalizations (FIOCRUZ, 2022).

Regarding educational background, individuals with a high school education had a higher risk of hospitalization, as this fact associated with other risk factors are responsible for increasing the severity of these patients (BUFFON *et al*. 2021).

Along the same lines, the rural population has a more effective defense system when compared to those in the urban/peri-urban area, which would justify the latter having a higher number of hospitalizations (MBOW *et al.*, 2014).

Regarding symptoms, those associated with higher cases of hospitalization were cough with 2,112 (76.74%), fever with 1,620 (58.87%), dyspnea with 2,385 (86.86%) and respiratory distress with 2,130 (77.40%) cases. Among the climatic variables, the use of invasive ventilatory support with 1,496 (54.36%), x-ray showing interstitial infiltrate with 1,989 (72.27%) and saturation <95% with 2,405 (87.39%) cases were predisposing factors for ICU bed admission and among the associated comorbidities, heart disease was responsible for 1,599 (58.10%) cases.

Patients with heart disease are pre-disposed to hospitalization, mainly because the infectious condition of COVID-19 induces the release of cytokines that will considerably affect the myocardium and coronary arteries. In addition, a worsening of the respiratory condition will induce greater cardiac work to compensate for this low O saturation$_2$, and this will lead to an even greater overload of the heart, which can cause a progressive worsening in cardiac patients (SCHWERZMANN *et al.*, 2021).

Among the symptoms, dyspnea and discomfort can be explained by the reduction in O_2 saturation <95% due to hypoxia secondary to SARS-Cov-2. Corroborating this, the need for ventilatory support and changes in the x-ray showing interstitial infiltrate are justified by the same reasons, since not having O_2 in sufficient quantities to meet the basic needs of the body, there will be the appearance of symptoms and changes in the tests mentioned above.

5 FINAL CONSIDERATIONS

Based on the data obtained in the study, it is understood that knowledge about the epidemiological profile of patients with COVID-19 is of paramount importance for increasing care

coverage for patients due to the association of predisposing factors with the need for hospitalization in the ICU being linked to the most severe clinical conditions. Thus, public management strategies are essential to deal with possible complications related to SARS-Cov-2, considering the main risk factors, whether sociodemographic, symptomatological or related to comorbidities, as well as strengthening vaccination, which is an essential variable to reduce virus contamination.

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