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RESEARCH ARTICLE

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COVID-19: OBESITY AS A RISK FACTOR

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ABSTRACT

The objective of this study was to verify the situation of obesity in Brazil and relate it to the aggravations of covid-19. The research developed through the following guiding question: "What is the situation of obesity in Brazil and its relationship with the aggravations for Covid-19? This is a literature review work. The search for scientific articles took place between June and October of 2020 through the Virtual Health Library portal, using the following databases: Medical Literature, Analyzes and Retrieval System Online, Latin American and Caribbean Literature in Health Sciences. Health and Scientific Electronic Library Online. For the searches, controlled descriptors were used and combined with Boolean operators OR and AND, with the following keywords: Obesity, Coronavirus infections, and COVID-19. After analysis, it was possible to perceive that patients with obesity have greater complications when infected with COVID-19, which can worsen the disease since they are at greater risk of developing infections and also dying. In this sense, this group of patients requires greater care, being necessary in several cases the use of mechanical ventilation due to the aggravating increase in chronic diseases caused by obesity.

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INTRODUCTION

The COVID-19 pandemic that currently mobilizes the world emerged in December 2019, in the city of Wuhan (China), and is caused by a betacoronavirus related to the Severe Acute Respiratory Syndrome

virus called (severeacuterespiratorysyndromecoronavirus 2 - Sars-CoV-2) , which have a clinical spectrum ranging from asymptomatic to severe infections, which can affect the upper and lower respiratory tracts due to severe respiratory failure, causing asymptomatic infection, myocarditis, diarrhea, in addition to causing acute

respiratory distress syndrome (ARDS) in some cases., sepsis followed by septic shock, acute kidney injury, and cardiac injury, and ultimately progressing to multiple organ failure. Epidemiological studies show the high contagion power of COVID-19 in all age groups in the different countries affected. Data from the Brazilian Ministry of Health reveal an increasing mortality rate, on December 5, 2020, 66,540,034 cases of COVID-19 were confirmed in the world, in which 1,528,868 died. 6,577,177 were infected and 176,628 died from COVID-19 (BRASIL, 2020, COSTA *et al.*, 2020). It is known that there is a higher probability of death among individuals over 60 years of age, with an increase directly proportional to the higher age groups. Deaths are often associated with pre-existing comorbidities, such as heart disease, diabetes, chronic respiratory diseases, high blood pressure, cancer, and others. H1N1. In a research carried out with Covid-19 patients admitted to a Chinese hospital, those infected who had Body Mass (BMI) outside the ideal standards had a higher prevalence of complications, such as thrombotic conditions, resistant infections due to low immunity, and high levels of acid. lactic acid (BROOKE, JACKSON, 2020, COSTA *et al.*, 2020). Obesity is characterized by the excessive accumulation of body fat in the individual. For diagnosis in adults, the most commonly used parameter is the Body Mass Index (BMI) associated with the measurement of abdominal circumference. Obesity can generate other damages to health, so having a body mass index (BMI) above that indicated for the age group constitutes one of the greatest risk factors for several diseases, including cardiovascular diseases, type II diabetes and several diseases. cancer types. In this context, obesity is the result of an imbalance between energy consumption and expenditure, and excess energy that is stored in adipose tissue as triglycerides (SANTOS *et al.*, 2012).

One aspect that must be considered in this pandemic is social isolation and the consequences associated with it, namely, the possibility of decreasing usual physical activity as well as changing eating habits, which could lead to an increase in body weight and, consequently, contribute to increasing the prevalence of overweight and obesity, conditions with high prevalence in Brazil. According to the National Survey of Food and Physical Activity (2015-2016), about 60% of the population were overweight or obese. This excess weight causes physical and psychological challenges that may compromise the well-being, quality of life and health of individuals. In addition, having a BMI greater than or equal to 40 kg/m² is considered a risk factor for severe cases of COVID-19 (OLIVEIRA *et al.*, 2018). However, studies relating obesity and COVID-19 are still scarce and/or inconclusive. Initial hypotheses seek to explain whether the worsening of the condition is due to the existence of other comorbidities resulting from excess weight (that is, obesity increases the probability of the existence of other pathologies such as diabetes and cardiovascular disease and this may explain its effect disease severity) or whether this relationship is independent (GUAN *et al.*, 2020). In view of the above, the guiding question of this research was: "What is the situation of obesity in Brazil and its relationship with the aggravations for Covid-19?" The hypothesis is that Brazil has a high prevalence of obesity, and obesity affects conditions such as difficulty in breathing air through the lungs, resistant infections due to the inflammatory factor of obesity and low immunity. Thus, the study aims to verify the situation of obesity in Brazil and relate it to the aggravations of COVID-19, in this sense, the present study will be able to subsidize reflections and actions for the prevention and management of Covid-19 in obese patients.

METHODS

The study is a literature review. The following steps were followed: 1) Definition of the choice of guiding question 2) Delimited inclusion and exclusion criteria 3) Presentation of the products 4) Analysis of the findings 5) Interpretation of the results obtained 6) Description of the evidence found (CROSSETTI, 2012). It adopted as a guiding question, "What is the situation of obesity in Brazil and its relationship with the complications for Covid-19?" The search for scientific articles took place between June and October 2020 through

the Virtual Health Library (VHL) portal, from the Medical LiteratureAnalysesandRetrieval System Online (MedLine), Latin American and Caribbean Literature databases. in Health Sciences (Lilacs) and ScientificElectronic Library Online (SciELO). Controlled descriptors were used for the searches, combined with Boolean operators OR and AND, with the following Health Sciences Descriptors (DeCS): "Obesity", "COVID-19", "Infection from coronavirus ". The terms used in the search strategy are described in table 1. The search strategies in the databases were identified in the title, abstract or keywords, using the Boolean operator and. Articles available in full, in Portuguese, published in the period from 2019 to 2020, with the design of literature review studies, quantitative research and randomized research that related the issue of obesity and COVID-19 in adults were chosen excluded.

RESULTS

In the initial search, 98 articles were found, 52 articles in the Scielo database, 28 articles in the MedLine database and 18 articles in the Lilacs database. After the introduction of filters, 78 articles were excluded because they did not present the inclusion criteria previously defined according to the theme and 10 because they were duplicated in the databases, making a total of 10 articles eligible for the research. Figure 1 presents the flowchart of the findings. Table 1 represents variables related to the studies (author, year, article title and the relationship between obesity and Covid-19).

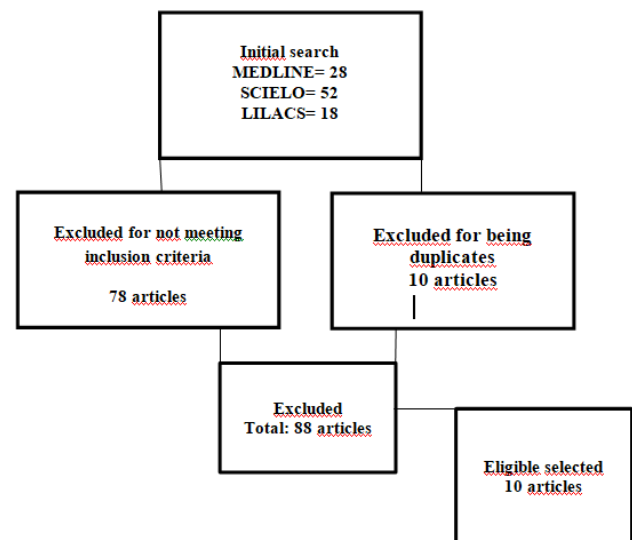


Figure 1. Flowchart of articles collected in Medline, Scielo and Lilacs databases on the relationship between obesity and Covid-19

DISCUSSION

According to our findings, obesity is the condition resulting from the accumulation of adipose tissue, due to positive energy balance, and can occur at any age, including childhood, becoming harmful to health. People with obesity regardless of age group are subject to a higher risk of serious complications from infection by the novocoronavirus. This is especially related to the fact that obesity is the condition that brings with it important changes in lung function, anatomical changes and increases the possibility of coexistence of Chronic Non-Communicable Diseases (NCDs). The association of obesity with other comorbidities, such as SAH and DM, facilitates the infection and prevalence of the new coronavirus (COSTA *et al.*, 2020). According to the literature, the greater probability of worsening of the condition of obese patients is mainly due to the excess of adipose tissue, which acts as a reservoir for viral dissemination, in a more extensive way. This mechanism can be explained by the increase in shedding, immune activation and, soon after, the expansion of cytokines, thus favoring infection, and increasing ICU admissions. These cytokines are molecules that participate in communication between cells and play a particularly

Table 1. Databases and search strategy

Data base	Search strategy
BVS Brasil	Crossover of descriptors: (Obesity AND COVID-19 OR Obesity AND Coronavirus Infection), title identification, abstract reading
MedLine	Crossover of descriptors: (Obesity AND COVID-19), title identification, abstract reading
Lilacs	Cross-descriptors: (Obesity AND Infection by coronavirus), title identification, abstract reading
SciELO	Crossover of descriptors: (Obesity AND Coronavirus Infection AND COVID-19), title identification, abstract reading

Table 2. Characteristics of the included studies according to author, title and relationship between obesity and Covid-19

Article title	Author and Year	Obesity and Covid-19 Relationship
Obesity as a coefficient in the worsening of patients affected by Covid-19	Costa <i>et al.</i> , 2020	The complications arising from obesity in patients with COVID-19 may be related to the cytokines present in the state of chronic inflammation characteristic of patients with obesity.
A relação da obesidade com os óbitos por Covid-19: análise dos números da pandemia no Brasil	Dias <i>et al.</i> , 2020	Na faixa etária mais jovem (<60), a obesidade foi a terceira comorbidade mais comum e nos idosos a sétima mais comum. Esses dados sugerem que a obesidade é um fator mais agravante nos indivíduos mais jovens, sendo a obesidade um importante fator associado aos óbitos pela COVID-19, no Brasil.
The COVID-19 pandemic and changes in the lifestyle of Brazilian adults: a cross-sectional study, 2020	Malta <i>et al.</i> , 2020	During the period of social restriction, the following were reported: decreased physical activity, increased time in front of screens, consumption of ultra-processed foods, number of cigarettes smoked and consumption of alcoholic beverages, factors that contribute to the increase in obesity.
Diabetes mellitus, obesity and bad life habits: their relationship with COVID-19	Monteiro <i>et al.</i> , 2020	Individuals with obesity are at significant risk due to the high production of pro-inflammatory cytokines and functional changes in T cells that lead to a weakened immune response to contain the infection.
Factors associated with hospital death from COVID-19 in Espírito Santo, 2020	Maciel <i>et al.</i> , 2020	Higher mortality was observed in the elderly, with comorbidities (obesity) and users of public hospitals.
Risk stratification for predicting the spread and severity of Covid-19 in Brazil	Guimarães, Eleutério, Silva, 2020	Obesity is considered one of the factors for belonging to a risk group that influences the fatality rate.
Obesity and COVID-19: main risk factors	Martelleto <i>et al.</i> , 2020	Obesity can induce hyperactivity of the renin-angiotensin-aldosterone system, which leads to increased levels of angiotensin 2, which is related to severe damage to the lungs. Obesity is also one of the leading risk factors for atrial fibrillation, which leads to a worse prognosis and increased mortality in cases of COVID-19. Obese patients may have chronic inflammation and a high level of pro-inflammatory cytokines, which impair the immune response and affect the lung parenchyma and bronchi, aggravating factors in COVID-19 mortality.
Physical inactivity, obesity and COVID-19: perspectives across multiple pandemics	Pitanga, Beck, Pitanga, 2020	Increasing levels of physical activity in the population can help fight obesity and other cardiometabolic disorders, as well as improve mental health and immune function, and consequently better prepare us, both for the current COVID-19 pandemic, and for other future pandemics with similar characteristics.
Obesity and COVID-19: What is the evidence?	Silva, 2020	Inflammation caused by obesity generates immune dysregulation, oxidative stress, endothelial dysfunction and cardiovascular abnormalities that are caused by excess adipose tissue which would lead to a hyper-inflammatory state, and in patients with COVID-19 would cause many complications. The higher the BMI of the patients, the more they needed ventilatory support.
Association of COVID-19 with: age and medical comorbidities	Mercês, Lima, Neto, 2020	The gradual growth of deaths from COVID-19 has a strong relationship with both the present comorbidities (obesity) and advanced age, so people at risk should redouble their care.

important role in regulating the immune system, accelerating the inflammatory process to deal with infections. Cytokines are produced by a wide range of cells of the immune system, such as lymphocytes, macrophages, monocytes and leukocytes. One of the fatal factors of the SARS-CoV-2 coronavirus is the overreaction it causes in the immune system which is known as a cytokine storm. A cytokine storm (CytokineStorm), cytokine cascade, inflammatory storm, or hypercytokinemia, is a potentially fatal immune reaction consisting of a positive feedback loop between cytokines and white blood cells, with very high levels of various cytokines. Cytokine storms may explain why some people have a severe reaction to coronaviruses, while others experience only mild symptoms (COSTA *et al.*, 2020). The seriousness of the damage caused by the COVID-19 virus to the body of an elderly person or person with an underlying pathology is indisputable. This risk group includes overweight individuals, who showed a worsening in their health condition. Obese people are classified as subjects predisposed to contracting other comorbidities, including infections, given that they have a more vulnerable immunity than a person of normal weight. Due to these factors, being overweight is associated with increased lethality in people with COVID-19. It should be noted that most deaths from COVID-19 are associated with young and obese patients, as these, due to their

nutritional condition, ended up developing worse prognoses (DIAS *et al.*, 2020). The impacts of the pandemic in Brazil reflected negatively on economic stability and the daily life of the population. The growing increase in the number of contaminated people combined with the number of deaths resulting from the speed in the spread of the virus, made the states and municipalities opt for social isolation. The social restriction resulted in a change in people's lifestyle, who began to adopt preventive and restrictive actions to control the virus. Although the decision of public authorities was beneficial in containing and spreading the virus, on the other hand, the drastic imposition of changing people's lifestyles ended up compromising the health of Brazilians. The period of social restriction was marked by changes in the eating habits of individuals with consumption of ultra-processed foods, alcoholic beverages, tobacco use and abstention or reduction in physical activity. Another alternative adopted by the Brazilian people to face the pandemic was the exaggerated use of electronic devices: cell phones, computers, tablet and TV. Such factors have proven to be reflected in the health of the citizen, with the development of mental and metabolic problems such as anxiety, depression and obesity. Changes in body weight are associated with unhealthy food intake and sedentary lifestyle, resulting in damage to health. The effects of the pandemic that devastates the country was

also responsible for the increase in obesity in Brazil (MALTA *et al.*, 2020). Diabetes is a disease determined by hyperglycemia associated with metabolic syndromes such as insulin resistance, obesity, dyslipidemia and hypertension, in addition to events such as endothelial activation and dysfunction¹. Endothelial processes (endothelial activation and dysfunction) at the pulmonary level, both derived from SARS-CoV-2 infection and diabetes, support basement membrane thickening. Consequently, alveolar gas exchange through the blood-gas barrier becomes deficient, which is also relevant in response to damage to pneumocytes resulting from the release of cytokines in COVID-19. As a result, changes caused by the virus itself and diabetes possibly accelerate the progression of SARS-CoV-2 infection associated with greater odds of needing mechanical ventilation and increased morbidity and mortality (MONTEIRO *et al.*, 2020). A cross-sectional study carried out with people who were hospitalized in Espírito Santo showed that preexisting health conditions in patients hospitalized for COVID-19 were the factors responsible for the occurrence of deaths in hospital units. It is essential to report that the reasons related to deaths from the COVID-19 virus were the patient's age group, the existence of comorbidities and other pathologies, regardless of the institution model, public or private. Examples of comorbidities aggravated by COVID-19 are: obesity, diabetes mellitus, smoking, hypertension, among others (MACIEL *et al.*, 2020). The risk of spreading the virus concerns the local transmission capacity, directly and indirectly affected by socioeconomic factors. In the case of large cities and urban centers, dissemination is enhanced due to the high socioeconomic connectivity of their activities and services, such as public transport and the concentration of people and high population density, especially in the periphery. In addition, ensuring access to basic sanitation and piped water services is essential for the population to be able to follow basic hygiene recommendations that prevent the transmission of the virus (GUIMARÃES, ELEUTÉRIO, SILVA, 2020).

It is well known that obesity is already associated with several underlying risk factors for COVID-19, including hypertension, heart disease, type 2 diabetes, kidney disease and chronic liver disease. Obese patients may have chronic inflammation and a high level of pro-inflammatory cytokines, which impair the immune response and affect the lung parenchyma and bronchi, aggravating factors of COVID-19 mortality (MARTELLETO *et al.*, 2020). The decree of social isolation by public management caused the closure of commerce and places intended for the practice of physical activities. In order to avoid agglomerations to minimize and extinguish contagion by the COVID-19 virus, physical exercise practices were also prohibited. Together, federal, state and municipal governments, in the unbridled search for solutions to contain the devastating impacts of COVID-19, did not pay attention to an extremely important issue: physical inactivity. The practice of physical activity results in several health benefits, as it favors the strengthening of the immune and cardiometabolic system. In addition, it fights the emergence of cardiovascular, psychological and metabolic diseases. Amid the pandemic, there was a significant increase in people with obesity, a metabolic disease with a high rate of worsening by COVID-19. This is due to the fact that physical activity is a great ally in the prevention and treatment of diseases, including COVID-19.

Practitioners of physical activities have an immune, metabolic, cardiovascular and mental health system that is more resistant and protected against any type of infection. The practice of physical exercises helps in weight loss and maintenance, in the control of blood levels, in the increase of serotonin levels among other essential benefits in the fight against obesity, diabetes and mental health. Therefore, despite the legal determinations of social isolation, it is recommended to practice physical exercises at home or in places open to this type of activity, such as walking, cycling, running, among others. You should pay attention to the use of mask and alcohol. Thus, to avoid a sedentary lifestyle, you can practice physical exercises two or three times a week with the inclusion of simple activities such as push-ups, squats and sit-ups (PITANGA, BECK, PITANGA, 2020, SILVA, 2020). Elderly individuals, patients with

diabetes mellitus, hypertension, cardiovascular diseases, obesity, cancer, lung or chronic kidney disease are more prone to the aggravation of COVID-19 and consequently death. This vulnerability is related to several factors, including depressed immunity in the elderly and cancer patients, overweight and obesity, enzyme inhibitors used in the treatment of diabetes and hypertension, carelessness in health and genetic and hormonal issues. Therefore, it is essential to practice physical activity, healthy eating, especially for the elderly with prevalence of obesity and associated diseases, in addition to complying with the rules of isolation and prevention of contagion, due to the weakness presented in the body of these people (MERCÊS *et al.*, 2020).

CONCLUSION

By carrying out the present research, it was possible to perceive that patients with obesity have greater complications when infected with COVID-19, which can worsen the condition of the disease since they are more likely to develop infections and also die. In this sense, this group of patients requires greater care, being necessary in several cases the use of mechanical ventilation due to the aggravating increase in chronic diseases caused by obesity. It is also considered that nutritional factors are fundamental in the patient's immunity. The practice of physical activity is essential to combat obesity and, in addition, provides improvement in mental health and immune function. Based on the current study, it emphasizes the need for greater public health promotion by offering food education actions where the population learns in a more assertive way to practice healthy eating habits. It is essential that people also find it easier to access physical activities, and in this way a greater number of people are better prepared to deal with the current and/or future pandemic. This study may support new studies on obesity/COVID-19, thus providing knowledge to nurses and other health professionals about COVID-19. In addition to contributing to strategies to prevent complications from COVID-19 through prevention and treatment of obesity and associated complications. The study has limitations due to the low number of studies that address the topic. The number of articles, mainly in Portuguese, that address the complications that obesity can cause COVID-19 is still scarce. More studies are needed to correlate obesity with COVID-19, especially in the context of underdeveloped and developing countries.

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