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Lack of Information on Nutritional Status of Patients with COVID-19 Worldwide: Literature Review

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ABSTRACT

Nutritional factors (malnutrition and obesity) may be associated with an increased risk of worsening the health status of patients with COVID-19. This study aimed to systematize the literature about this topic. Searches were carried out in Pub Med, Med Line and Scopus databases. Among the 158 articles with clinical and epidemiological characteristics, 12 had variables on nutritional status, amounting 79.972 patients from five countries, 57.43% (n = 45.925) were men and the average age of the patients was 56.74 years old. The variant obesity was verified in 10 studies and malnutrition in two. Obese population in the studies was 17.937, which corresponds to a rate of 29.98% of total patients, and malnutrition population was 97, which corresponding to 41.45% of patients in the studies. Although obesity is a risk factor for COVID-19, studies have hardly addressed the theme, focusing primarily on the USA. Malnutrition is relevant, especially in countries with greater vulnerability.

Descriptors: Risk factors. Coronavirus infection. Systematic review.

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Introduction

The n In December 2019, an outbreak of pneumonia was reported in Wuhan, People's Republic of China (1). Weeks later, analysis of samples from the lower respiratory tract of patients identified a new coronavirus, SARS-COV-2, as the causative agent of the disease that came to be known as COVID-19 (2). Due to the rapid spread of the disease in all continents, the World Health Organization (WHO) declared it a pandemic in March 2020 (3).

On June 9, 2020, there were more than 7.1 million cases of COVID-19 worldwide and more than 407 thousand deaths due to the disease. The USA ranks first in confirmed cases (about 1.9 million) as well as in number of deaths (about 111 thousand deaths). It should be noted that this scenario continues growing daily (4).

In the scientific field, it is worth underscoring the need to identify risk profiles that increase the pathogenicity of the disease and the risk of death. So far, the risk factors described include cardiovascular diseases (hypertension, diabetes, and coronary heart disease), respiratory diseases (obstructive pulmonary disease and asthma), immunosuppressive status, cancer, organ failure, and others (5). However, the influence of nutritional status of hospitalized patients as a predisposing factor to the severity of SARS-COV-2 infection is not known with due clarity. It is worth noting that this relationship is of great clinical importance.

Being overweight appears as the most common eating disorder, followed by malnutrition. It is likely that, in some patients with COVID-19, worsening of the clinical picture may be related to the deleterious effects of obesity both on general metabolism and on the restriction of respiratory function, such as reduced lung volume (6).

Accordingly, some questions still need to be answered. For instance, were the variables on nutritional status collected in studies involving patients with COVID-19? If the answer is affirmative, a second question must be answered, namely: What is the prevalence of malnourished and overweight patients? Based on these questions, this study seeks to systematize the current literature with respect to the life habits of patients hospitalized with COVID-19 worldwide.

Methods
Data sources and Search strategies

This is a systematic review conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyzes (PRISMA) recommendations. Due to the urgent need for knowledge production it was not registered in the International Prospective Register of Systematic Reviews (PROSPERO) platform. The adopted research question was: What is the prevalence of nutritional conditions (obesity and malnutrition in individuals hospitalized with COVID-19?

For the systematic review, we selected studies that address epidemiological characteristics of patients hospitalized with COVID-19. We selected articles published in PubMed, Medline and Scopus database between January 1 and June 5, 2020, using the descriptors COVID-19, SARS-CoV-2, 2019-nCoV, n-CoV and coronavirus combined with clinical profile and epidemiology. In this study, we sought to identify characteristics of the nutritional status of patients through data on obesity and malnutrition. For the search strategy, the Boolean operators "AND" and "OR" were used. In addition, a manual search was carried out for references cited in the articles.

Research variables

In this study, we sought to identify characteristics about patients' lifestyle habits: smoking (current or previous), alcohol consumption and physical activity.

Eligibility criteria

We included clinical trials, cohorts, cross-sectional, clinical cases and case series studies(published and pre-print). Government epidemiological bulletins, comments, literature reviews, articles without full access to content and studies in animals were excluded.

Selection of studies

The search was carried out by four independent researchers. After this stage, three researchers independently performed the following steps: 1- reading the title and summary to identify potential eligible studies; 2- reading the full text; and 3-collection of variables and assembly of the database. The divergences were analyzed and resolved by consensus.

Data extraction

For data extraction, the researchers created a database. At this stage, the database was mounted. The data was entered by a first investigator and subsequently checked by a second investigator on the team. The systematization / analysis of the data was conducted by two other independent researchers.

Results

Initially, 7,489 scientific productions were found in the databases, 158 of which met the initial inclusion criteria, with a total of 100,563 patients from all continents. After complete reading, 12 articles presented variables about patients' nutritional status (Figure 1), totaling 79.972 patients from the following five countries: United States (n = 7497), Mexico (n = 51633), Italy (n = 92), United Kingdon (n = 20133), China (n = 617). Regarding sex, 57.43% (n = 45.925) of patients were men, and 42.47% (n = 34.047) were women. The mean age of patients was 56.74 years. It is important to note that, in this calculation of age, the studies by Klang et al. (7), in the USA, and Cai et al. (8), in China, were not taken into consideration, because it present different stratifications for this variable.

Among the variables studied, obesity was verified in ten studies and malnutrition in two. Obesity was classified in five articles (7,9–12) as BMI ≥ 30 kg/m2, in one (8) as BMI ≥ 28 kg/m2 and the study by Palaiodimos et al. (13) classified in two categories: BMI 25-34 kg/m2 and BMI ≥ 35 kg/m2.

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The study by Zachariah et al. (14), who researched children, classified obesity as BMI ≥ 95th percentile for age/sex. The remaining two studies, however, this parameter was not specified.

Obese population in the studies was 17.937, which corresponds to 29.98% of patients. Among 7.497 American patients, 73.02% (n = 5.474) were obese. The malnutrition variable was found in two studies, corresponding to 41.45% (n= 97) patients. (Table 1).

Discussion

Obesity was the most related nutritional condition among patients in the studies analyzed. Abdominal obesity, which is more prominent in men, can cause compression of the diaphragm and lungs and decrease chest capacity, resulting in reduced blood oxygen saturation and increasing the risk of complications and mortality (19).

During the pandemic, social isolation and elevated individual level of psychological stress have been additional concerns (20). This scenario favors the adoption of less healthy habits, such as sedentary lifestyle, greater demand for processed foods, and reduced intake of fruits and vegetables. If this behavior continues for a long period of time, there will be conditioning and aggravation of metabolic dysfunctions strongly associated with high fat mass in more vulnerable individuals, which will make weight control more difficult (21).

Recently, intervention programs for obesity based on guidelines for schoolchildren have been adopted as a strategy by several countries seeking to implement the practice of physical activity and improve the quality of food consumption through educational support (22,23). However, the overweight population has grown considerably in recent decades, with emphasis on the USA, which is the country with the highest registered numbers of COVID-19 cases and the highest absolute numbers of people who are overweight, namely, 78 million (BMI over 25 kg/m²), followed by China, which was the first epicenter of COVID-19 pandemic, with 46 million people. Brazil holds fifth place, with 22 million people who are overweight (24).

Regarding clinical condition of overweight patients with COVID-19, studies indicate a higher risk of developing severe pneumonia. BMI > 35 and age < 60 represent a 2.2- to 3.6-times greater risk of being admitted to intensive care, when compared to patients in the same age group with BMI < 30 (25). It is, therefore, suggested that body mass figures significantly in the evolution of patients under 60 years old, who are currently considered low risk for severity of COVID-19 progression, and it reaffirms that high BMI is an important predictor for severe progression of the disease.

In addition to obesity, the high prevalence of nutritional deficiencies in the elderly, especially in individuals with multiple comorbidities, represents a greater risk of being admitted to the intensive care unit and mortality from COVID-19 infections (26). Therefore, nutritional support must be reinforced in confirmed cases and under treatment.

The immune system is added to the picture as a crucial factor in the pathogenesis of the coronavirus, which plays an important role in the inflammation of adipose tissue induced by obesity, promoting potential metabolic dysfunction that contributes to insulin resistance, type 2 diabetes mellitus, hypertension, and other cardiovascular diseases (27). Furthermore, the level of expression of angiotensin-converting enzyme 2 is higher in the adipose tissue when compared to pulmonary tissue, which is the main tissue affected by the virus, showing the existence of an endocrine-metabolic link to coronavirus infection itself (28).

This study has limitations, among which the following stand out: the low number of studies that presented the researched variables and the lack of definition of the adopted criteria for the nutritional status classification.

Finally, we recommend that further studies on the epidemiological and clinical aspects of COVID-19 include the collection of anthropometric characteristics and metabolic parameters in order to better estimate the risk of complications in patients with COVID-19. Furthermore, investigations of malnutrition in patients with COVID-19, which are practically absent in the current literature, are relevant, especially as the pandemic reaches poorer countries around the world.

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Citation

Figure 1- Flowchart of the study selection procetss, 2020.

Total publications
Database
N = 7489

References

Table 1 - Characterization of studies on nutritional status of patients hospitalized with COVID-19, 2020.

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Author	Sample Size (n)	Country	Sex Male n (%)	Sex Female n (%)	Mean Age	Nutritional status Malnutrition n (%)	Nutritional status Obesity n (%)	Results
Zachariah et al. (14)	Children's hospital (50)	USA	27 (54)	23 (46)	9	-	11 (22)	Obesity was significantly associated with the severity of the disease and need of mechanical ventilation in children aged 2 years or over.
Bello-Chavolla et al. (15)	Ministry of health -Mexico (51.633)	México	29803 (57.72)	21830 (42.28)	46.65		10708 (20.74)	Confirmed cases of COVID-19 with obesity had higher mortality rates (13.5% vs. 9.4%), ICU admission (5.0% vs. 3.3%), propensity to intubation (5.2 % vs. 3.3%) and confirmed pneumonia. The addition of obesity to any number of comorbidities significantly increased risk of lethality by COVID-19.
Busetto et al. (9)	Hospital (92)	Itália	57 (61.96)	35 (38.04)	70.5	-	29 (31.52)	Overweight or obese patients required assisted ventilation more frequently as well as access to intensive or semi-intensive care units, even after age, sex and comorbidities adjusting.
Price-Haywood et al. (10)	Hospital (3481)	USA	1394 (40.05)	2087	54 (59.95)	-	1727 (49.61)	Obesity was associated with a higher risk of hospitalization wich was more prevalent black population.
Klang et al. (7)	Hospital (3406)	USA	1961 (57.57)	1445 (42.43)	*	-	3406 (100)	Younger patients with a BMI ≥40 kg / m2 have a five-fold higher risk of COVID-19 mortality. Morbid obesity has also been associated with intubation and mechanical ventilation.
Palaiodimos et al. (13) 1	Hospital (200)	USA	98 (49)	102 (51)	64	-	162 (81)	Obese individuals had the highest mortality rates as well as the highest probability of undergoing intubation.
Docherty et al. (16) 2	Hospital (20 133)	Reino Unido	12 068 (59.94)	8065 (40.06)	73	-	1685 / 16081 (10.48)	Obesity was associated with higher hospital mortality.
Cummings et al. (11)	Hospital (257)	USA	171 (66.54)	86 (33.46)	62	-	119 (46.30)	46% of critically ill patients were obese.
Cai et al. (8)	Hospital (383)	China	183 (47.78)	200 (52.22)	**	-	41 (10.70)	Compared with normal weight patients, overweight individuals were 1.84 and obese individuals 3.40 times more likely to develop severe COVID-19.
Kalligeros et al. (12)	Hospital (103)	USA	63 (61.17)	40 (38.83)	60	-	49 (47.57)	Obesity (BMI ≥30 kg / m2) was higher associated with need of invasive mechanical ventilation and severe obesity (BMI ≥35 kg / m2) with greater ICU admission.
Yang et al. (17)	Intensive Care Unit (52)	China	35	17	59.7	1 (1.92)	-	-
Li et al. (18)	Hospital (182)	China	65 (35.71)	117 (64.29)	68.5	96 (52.75)	-	27.5% of patients above 65 years old were at risk of malnutrition. There was a high prevalence of malnutrition in elderly patients with COVID-19.

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