REVIEW

Post-COVID in Patients with Obesity: A Narrative Review

Post-COVID en pacientes con obesidad: Una revisión narrativa

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ABSTRACT

Objective: this study aims to conduct a brief literature review on post-COVID-19 complications in obese patients.
Design: a literature review based on a narrative synthesis.
Data Sources: the databases consulted include Science Direct, Scopus, Scielo, Google Scholar, and PubMed.
Study Selection: multiple articles were selected, applying inclusion criteria focused on post-COVID-19 complications in obese patients, with publications ranging from 2020 to 2024. Irrelevant studies were excluded. The final selection included articles from 10 different countries.
Data Extraction: from each study, key data were extracted, including research design, population characteristics, and main reported complications. The information was organized narratively to facilitate comparison of findings across studies.
Results: out of 261 357 articles, 15 relevant articles were selected for the review. These articles were published in 10 countries, as follows: Spain (3 middle-income and 1 lower-middle income), Italy (1 lower-middle income, 1 high-income, and 1 mixed-income), India (2 middle and lower income), Russia (1 middle income), Japan (1 high, middle, and low income), Germany (1 middle income), United States (1 middle income), Mexico (1 middle income), Brazil (1 middle income), and China (1 high and middle income). The findings indicate that socioeconomic inequalities tend to increase the risk of COVID-19-related mortality.
Conclusion: COVID-19 is associated with type 2 diabetes, an increased risk of coronary problems, hypertension, and nerve damage such as polyneuropathy, affecting muscle strength and increasing the mortality rate in respiratory diseases such as COPD, leading to lung damage and fibrosis. Treatment should be comprehensive, including vaccines, respiratory exercises, and physiotherapy, where the drug Veklury (remdesivir) has shown efficacy in accelerating recovery and strengthening the immune system. Additionally, post-COVID conditions such as anxiety, depression, and persistent respiratory issues should be addressed.

Keywords: Post-COVID-19 Complications; Obesity; Literature Review; Socioeconomic Inequalities; Risk Factors.

RESUMEN

Objetivo: este estudio pretende realizar una breve revisión bibliográfica sobre las complicaciones post-COVID-19 en pacientes obesos.
Diseño: revisión bibliográfica basada en una síntesis narrativa.
Fuentes de datos: las bases de datos consultadas incluyen Science Direct, Scopus, Scielo, Google Scholar y PubMed.
Selección de estudios: se seleccionaron múltiples artículos, aplicando criterios de inclusión centrados en complicaciones post-COVID-19 en pacientes obesos, con publicaciones comprendidas entre 2020 y 2024. Se

excluyeron los estudios irrelevantes. La selección final incluyó artículos de 10 países diferentes.

Extracción de datos: de cada estudio se extrajeron los datos clave, incluyendo el diseño de la investigación, las características de la población y las principales complicaciones reportadas. La información se organizó narrativamente para facilitar la comparación de los hallazgos entre los estudios.

Resultados: de 261 357 artículos, se seleccionaron 15 artículos relevantes para la revisión. Estos artículos se publicaron en 10 países, a saber: España (3 de renta media y 1 de renta media-baja), Italia (1 de renta media-baja, 1 de renta alta y 1 de renta mixta), India (2 de renta media y baja), Rusia (1 de renta media), Japón (1 de renta alta, media y baja), Alemania (1 de renta media), Estados Unidos (1 de renta media), México (1 de renta media), Brasil (1 de renta media) y China (1 de renta alta y media). Los resultados indican que las desigualdades socioeconómicas tienden a aumentar el riesgo de mortalidad relacionada con la COVID-19.

Conclusiones: la COVID-19 se asocia a diabetes tipo 2, mayor riesgo de problemas coronarios, hipertensión y daños nerviosos como la polineuropatía, afectando a la fuerza muscular y aumentando la mortalidad en enfermedades respiratorias como la EPOC, provocando daño pulmonar y fibrosis. El tratamiento debe ser integral, incluyendo vacunas, ejercicios respiratorios y fisioterapia, donde el fármaco Veklury (remdesivir) ha demostrado su eficacia para acelerar la recuperación y reforzar el sistema inmunitario. Además, deben tratarse trastornos posCOVID como la ansiedad, la depresión y los problemas respiratorios persistentes.

Palabras clave: Complicaciones Post-COVID-19; Obesidad; Revisión de la Literatura; Desigualdades Socioeconómicas; Factores de Riesgo.

INTRODUCTION

The COVID-19 pandemic has spread worldwide (De Amicis et al., 2021a), with obesity and post-COVID conditions being closely linked due to complications and comorbidities (Fontana et al., 2023). This disease induces a low-grade pro-inflammatory state, which dysregulates the immune system, reducing its ability to respond to SARS-CoV-2 respiratory infections (Pino et al., 2022). Symptoms resemble seasonal flu, facilitating viral spread among older adults with chronic conditions (Rodríguez, 2023), leading to increased in-hospital mortality and ICU admissions (Rubio Herrera et al., 2021).

Studies have shown that obesity increases the risk of severe COVID-19, leading to a compromised immune response and multisystem inflammation (Cava et al., 2021). Among comorbidities, hypertension is the most prevalent in infected and hospitalized patients, and severe obesity, advanced age, and male sex have been associated with higher COVID-19 mortality rates (Pino et al., 2022). A retrospective, multicenter observational study of 5 206 hospitalized COVID-19 patients with overweight found that these patients required longer ICU stays (Rodríguez et al., 2024). Patients were categorized into four groups: type 2 diabetes patients, overweight patients, type 2 diabetes and overweight patients, and normal-weight patients without type 2 diabetes. The study revealed different treatments for each group, highlighting prolonged hospitalizations and observational rehabilitation (Kirbiš et al., 2023).

The objective of this research is to conduct a brief literature review on post-COVID complications in obese patients, focusing on associated diseases, risk assessment, and treatment.

METHOD

A comprehensive literature review was conducted to explore existing scientific studies, using the following databases: Scopus, PubMed, Scielo, Science Direct, and Google Scholar. To refine the search, keywords included "COVID," "post-COVID," "obese individuals," and "associations with obesity." Boolean operators "AND" and quotation marks were used to narrow and expand the search scope. The search period spanned from August to November 2024, considering studies published between 2020 and 2024. The review included texts in any language, explicitly excluding case reports, interviews, letters to the editor, theses, and books, as these were deemed less empirical or too specialized. Using the search strategy, an initial 261 357 articles were identified from the databases: 2 758 from Science Direct, 12 434 from Scopus, 1 915 from Scielo, 219 000 from Google Scholar, and 150 from PubMed. Subsequently, duplicate articles were removed, and 235 553 articles were excluded for not aligning with the study objectives. Another 235 536 articles were excluded for not meeting the inclusion criteria. Ultimately, 15 relevant articles were selected for review.

RESULTS

For data analysis, 15 selected articles were classified as follows: 1 observational study, 4 statistical analyses, 1 observational review, 1 review article, 2 systematic reviews, 1 retrospective cohort study, 1 follow-up study, 2 descriptive method studies, 1 observational cohort study, and 1 special article.

The study populations included mostly adults, but also older adults, young adults, and children. The studies were conducted in European countries, India, China, Japan, the United States, and Brazil.

The clinical conditions of the participants were characterized by pre-existing diseases, COVID-19, diabetes, cardiopulmonary issues, hypertension, and obesity. The participants belonged to high, middle, and low socioeconomic levels.

Table 1. Descriptive analysis

Study Title	Methodology	Objective / Sample	Main Findings
The effects of diabetes and being overweight in patients with Post COVID-19 syndrome. (Kirbiš et al., 2023)	Observational study	Evaluate the influence of type 2 diabetes and overweight in COVID-19 patients. Sample: 466 patients (269 men and 197 women), mean age: 65 years.	Patients with type 2 diabetes required prolonged hospitalization and treatment. Women with type 2 diabetes showed a higher incidence of secondary infections.
Exercise in an overweight patient with COVID-19. (Hekmatikar et al., 2021a)	Statistical analysis	Examine treatment processes in hospitalized patients receiving intensive care and medication. Sample: A 20-year-old overweight woman infected with COVID-19.	Practitioner-guided breathing exercises helped improve the patient's respiratory function.
Association of obesity on the outcome of critically ill patients affected by COVID-19. (Rodríguez et al., 2024b)	Observational review	Assess the impact of obesity on ICU mortality. Sample: 5206 patients: 20 underweight (0,4 %), 887 normal weight (17,0 %), 2 390 overweight (46 %), 1 672 obese (32,1 %), and 237 with class III obesity (4,5 %).	Hospital mortality was higher in non-obese patients (6,6 %) than in obese patients (4,6 %). Patients with class III obesity had a hospital mortality rate of 7,8 %.
Patients with Severe Obesity during the Pandemic COVID-19. (De Amicis et al., 2021)	Review article	Assess the frequency of BMI increase in ICU-admitted patients due to SARS-CoV-2 infection.	Obese patients represent a high-risk population requiring continuous support to manage the disease during the pandemic.
Mortality risk in patients with obesity and COVID-19 infection: a systematic review and meta-analysis. (Haber et al., 2024a)	Systematic review	Analyze how obesity increases the risk of mortality due to COVID-19. Sample: 199 studies, participants aged 41,8 to 78,2 years, metabolic comorbidities prevalence: 20 %-80 %.	Obese patients had a 34 % mortality rate.
Assessment of nutritional status, anthropometry, and sleep patterns of obese patients during the pre- and post-COVID-19 period. (Sharma et al., 2024a)	Statistical analysis	Examine obesity prevalence in adults, healthy eating behaviors, and weight loss during COVID-19. Sample: 70 adults aged 18-39 years.	Nutritional interventions significantly improved body mass and sleep quality.
Influence of obesity on mortality, mechanical ventilation time, and mobility of critical patients with COVID-19. (Martinato et al., 2024)	Retrospective cohort study	Identify the impact of obesity on mortality in COVID-19 patients. Sample: 429 patients, 36,6 % overweight and 43,8 % obese.	Overweight patients had a 36 % lower risk of death, while obese patients had a 23 % lower risk.
Effect of pulmonary rehabilitation in post-COVID-19 patients: a systematic review and meta-analysis. (Chen et al., 2022)	Systematic review	Assess the effect of pulmonary rehabilitation (PR) on lung deterioration in post-COVID-19 patients. Sample: 3 studies, 233 post-COVID-19 patients.	40 % of post-COVID-19 patients exhibited persistent respiratory dysfunction.
Persistent symptoms and clinical findings in adults with post-acute sequelae of COVID-19/post-COVID-19 syndrome in the second year after acute infection. (Peter et al., 2024)	Statistical analysis	Evaluate risk factors for symptom persistence vs. improvement and describe clinical characteristics and diagnostic assessments of COVID-19. Sample: Cases of post-COVID-19 syndrome (PCS) among individuals aged 18-65 years, with age- and sex-matched controls without PCS.	Phase 2 findings: Persistent cases: 67,6 %, Stable controls: 78,5 %. Worsening linked to SARS-CoV-2 reinfection. Main symptoms: fatigue, respiratory issues, anxiety, post-exertional malaise (35,6 %), ME/CFS (11,6 %).
Quality of Sleep and Mental Symptoms Contribute to Health-Related Quality of Life after COVID-19 Pneumonia: A Follow-Up Study of More than 2 Years. (Jáuregui-Renaud et al., 2024)	Follow-up study	Assess physical signs, sleep quality, mental symptoms, and health-related quality of life after COVID-19 pneumonia. Sample: 72 adults (mean age: 52,5 ± 13,7 years).	Daily logs revealed delays in symptom recovery. Increased dyspnea scores correlated with pulse oximetry and heart rate records.

Rehabilitative treatment of COVID-19 infection: Characterization and follow-up of hospitalized patients in Granada, Spain. (Di Caudo et al., 2022)	Descriptive study	Identify factors influencing the evolution and recovery of hospitalized COVID-19 patients. Sample: 30 patients (mean age: 62,8 years). 80 % had comorbidities: hypertension (66,7 %), obesity (36,7 %), diabetes (33,3 %).	Critical illness polyneuropathy/myopathy was common. Greater deterioration was observed in COPD and hypertensive patients, while patients with higher D-dimer and lymphocyte levels at admission showed a more favorable evolution.
The Influence of Obesity on Bone Health in Post-COVID-19 Recovery: Single-Center Experience. (Chaturvedi et al., 2024)	Retrospective observational study	Determine the effects of COVID-19 on bone health in obese vs. non-obese Indian individuals. Sample: Post-COVID-19 recovered individuals, divided into obese and non-obese groups. Mean age: 36,08 ± 15,81 years, male-to-female ratio: 1,6:1.	Post-COVID-19 differences include lower hemoglobin levels in obese individuals compared to non-obese patients.
Studying the impact of COVID-19 mitigation policies on childhood obesity, health behaviors, and disparities in an observational cohort: Protocol for the COVID-19 Family Study. (Dou et al., 2024)	Observational cohort study	Determine the effects of COVID-19 on childhood obesity. Sample: 697 families with obese children/adolescents.	Excessive weight gain or obesity increased over time (Cohen's d ≥0,13), with a dropout rate of 20 %.
Obesity as a risk factor in COVID-19: Possible mechanisms and implications. (Petrova et al., 2020)	Special article	Analyze obesity as a public health priority in the context of COVID-19. Sample: A recent study of 16 749 British patients confirming obesity as a risk factor for COVID-19 mortality.	The prevalence of obesity was 40 % among hospitalized patients, compared to 15 % among non-hospitalized patients.
COVID-19: Research and Treatment. (Puerro-Vicente MF, 2022a)	Descriptive method	Evaluate studies identifying treatments for COVID-19. Sample: 44 325 participants, randomly assigned in a 1:1 ratio to receive either the Janssen COVID-19 vaccine or a placebo.	In July 2020, Veklury (Remdesivir) was authorized as the first drug indicated for COVID-19 treatment.

DISCUSSION

The purpose of this research is to examine diseases associated with post-COVID complications in obese patients, including risk evaluation and treatment.

COVID-19 Association

COVID-19 is linked to type 2 diabetes patients, who often experience complications and secondary infections (Kirbiš et al., 2023), which can lead to critical illness polyneuropathy/myopathy, with a higher prevalence of chronic obstructive pulmonary disease (COPD) deterioration (Di Caudo et al., 2022). During COVID-19, hemoglobin levels were lower in obese individuals compared to non-obese individuals (Chaturvedi et al., 2024).

COVID-19, when associated with type 2 diabetes, presents additional complications and secondary infections (Kirbiš et al., 2022). Factors such as age, sex, hypertension, and dyslipidemia contribute to coronary issues (Blasco et al., 2024), with significant increases in glucose, triglycerides, and cholesterol in affected patients (Rawaa et al., 2024). As a result, it has been proposed that type 2 diabetes patients should undergo MDE screening following COVID-19 hospitalization (Gasnier et al., 2024).

COVID-19 has been linked to the development of polyneuropathy and myopathy in critically ill patients (Di Caudo et al., 2022). Immune system-induced polyneuropathy affects peripheral nerve roots, and although initially dismissed as a diabetic complication, it is now recognized for significantly affecting all extremities (Bahramy et al., 2024). After multiple cases, some patients have exhibited post-COVID neurological manifestations, including cranial neuropathies, which often go undiagnosed due to their rarity (Khajavi et al., 2024). It is important to highlight that polyneuropathy is a demyelinating disease, meaning it involves the loss of myelin in the nerves. Additionally, cerebrovascular disorders have been identified as one of the most common neurological complications associated with COVID-19 (Bahramy et al., 2024). COVID-19 has significantly affected individuals, leading to chronic obstructive pulmonary deterioration (Di Caudo et al., 2022). The long-term consequences of COVID-19 infection in COPD patients remain largely unknown (Kwok et al., 2024), making this an ongoing area of research, particularly regarding long-term effects and pulmonary sequelae development (Rodríguez et al., 2024). The disease has also caused multiorgan damage, particularly pulmonary tissue fibrosis (Mosavat et al.,

2023).

During COVID-19, hemoglobin levels were lower in obese individuals compared to non-obese individuals (Chaturvedi et al., 2024). This analysis was adjusted for factors such as age, sex, and income level (Kim et al., 2024). Additionally, hemoglobin oligomerization was studied by comparing structural changes when exposed to different ozone concentrations (Mahlooji et al., 2025). Primary analysis results showed a significant association between mortality and reduced hemoglobin levels, as well as elevated white blood cells, platelets, D-dimer, LDH, ferritin, blood urea, and increased prothrombin time (Gharib et al., 2025).

Treatment

The treatment for COVID-19 may include breathing exercises, which benefit the respiratory capacity of affected patients (Hekmatikar et al., 2021b). Additionally, appropriate nutritional interventions have been shown to positively impact body mass and sleep quality (Sharma et al., 2024). Furthermore, in July 2020, Veklury was approved as the first drug specifically authorized for the treatment of coronavirus disease 2019 (Puerro-Vicente MF, 2022b).

The treatment for COVID-19 may include breathing exercises, which improve respiratory function in affected patients (Hekmatikar et al., 2021b). Moreover, physiotherapy not only reduces complications and facilitates recovery (Luis et al., 2021a, 2021b) but also enhances airway opening and oxygen circulation (Jaldín et al., 2021). This improves patient care, reduces immobilization-related complications, and ultimately shortens hospitalization times (Inoue et al., 2019).

Additionally, nutritional interventions have been observed to significantly improve body mass and sleep quality (Sharma et al., 2024b), providing nutritional support that enhances patient health outcomes (Vásconez-García & Moyón-Constante, 2020). In fact, a complete and balanced diet helps maintain a healthy immune system (Velázquez-Alva et al., 2020). It is crucial to minimize malnutrition risks and monitor potential dangers associated with nutritional support, as well as metabolic alterations related to COVID-19 (Pinzón-Espitia & Pardo-Oviedo, 2021).

Moreover, in July 2020, Veklury was approved as the first drug specifically authorized for COVID-19 treatment (Puerro-Vicente MF, 2022b). This medication inhibits the replication of multiple coronaviruses in respiratory epithelial cells (Soto Vázquez et al., 2021). It functions by binding to the RNA-dependent RNA polymerase, preventing viral replication through premature transcription termination (EVIDENCE-BASED UPDATES, n.d.). Clinical results indicated that the average recovery time was 11 days for patients treated with remdesivir (Saavedra et al., 2020).

Risk Evaluation

During COVID-19, mortality was 6,6 % in non-obese patients (Rodríguez et al., 2024), while obese individuals were considered a high-risk population during the pandemic due to excessive visceral adiposity (De Amicis et al., 2021). Obesity contributed to a 34 % mortality rate, and the first reported case of COVID-19 pneumonia was recorded on December 31, 2019 (Haber et al., 2024b). COVID-19 led to respiratory function deterioration (Chen et al., 2022), linked to SARS-CoV-2 infection (Peter et al., 2024), with increased dyspnea prevalence (Jáuregui-Renaud et al., 2024). Hospitalization rates reached 40 % for hospitalized patients and 15 % for non-hospitalized individuals as part of clinical treatments for acute respiratory syndrome due to COVID-19 (Petrova et al., 2020), contributing to excessive weight gain, anxiety, and depression over time (Dou et al., 2024). Overweight patients had a 36 % mortality risk, while obese patients had a 23 % mortality risk (Martinato et al., 2024).

Excess visceral adiposity during the pandemic contributed to increased risks (De Amicis et al., 2021), reducing muscular strength during the acute phase. A study concluded that COVID-19 played a significant role in this condition (Carvalho J et al., 2023). Findings suggest that obesity and increased visceral adiposity are strongly correlated with adverse outcomes and mortality (Dalamaga et al., 2021). Among 165 patients, a body mass index (BMI) of 26,1± was associated with subcutaneous weight (Favre et al., 2021).

COVID-19 has significantly impacted respiratory function deterioration (Chen et al., 2022), leading to systemic body impairments that contribute to physical and mental disorders (Bai et al., 2024). Symptoms may persist for months (Schwart et al., 2024), while severe respiratory deterioration often requires extracorporeal membrane oxygenation (ECMO) treatment (Peer et al., 2024).

SARS-CoV-2 infection requires early diagnosis and enhanced pandemic prevention tools (Shames & Kamil, 2024). A study of 258 patients with similar diseases provided immunity through vaccination, generating COVID-19 antibodies (Xie et al., 2023). Additionally, multiple cases of ischemic optic neuropathy have been documented following coronavirus infection (Mambretti et al., 2024).

During the COVID-19 pandemic, obesity was a significant mortality factor (Martinato et al., 2024). This condition posed severe oxygenation challenges for extracorporeal membrane oxygenation (ECMO) treatment, where a 180-day evaluation of 41 patients (mean age: 55 years) was conducted (Nogueira J et al., 2024). Regular follow-up for patients is essential to combat obesity, which is a primary contributor to numerous health issues (Ergün, Uçman et al., 2024). The pandemic also highlighted lifestyle-related issues, poor dietary habits,

and physical inactivity (Monye et al., 2024).

This research study acknowledges certain limitations, including the broad initial research scope that was later refined based on result analysis. Conclusions were drawn from specific studies focusing on selected populations. Additionally, specialized health databases were not consulted, except for PubMed.

CONCLUSION

COVID-19 is associated with type II diabetes, with various factors contributing to coronary issues and increased hypertensive indicators, making MDE testing necessary after hospitalization. It also leads to polyneuropathy, which involves the loss of myelin in the nerves, affecting the extremities of diabetic patients and presenting neurological manifestations such as cranial neuropathies. COVID-19 causes destructive pulmonary deterioration in COPD patients, with long-term recovery unknown, leading to multiorgan damage, particularly fibrosis. Furthermore, low hemoglobin levels in obese individuals are linked to a higher mortality risk, accompanied by increased inflammatory markers, reflecting greater clinical deterioration in COVID-19 patients.

Treatment for COVID-19 may include breathing exercises and physiotherapy, which help improve respiratory capacity and accelerate patient recovery, reducing hospitalization time. Additionally, a complete and balanced diet is essential, as it strengthens the immune system, improves body mass and quality of life, and reduces the risk of malnutrition and metabolic disorders associated with COVID-19. Moreover, the use of Veklury (remdesivir) has demonstrated efficacy in inhibiting viral replication, leading to a faster recovery, representing a major advancement in the treatment of this disease.

During the pandemic, patients experienced excess visceral adiposity, which reduced muscle strength during the acute phase, contributing to a 34 % mortality rate, marking the first known case of COVID-19 pneumonia. Additionally, COVID-19 significantly impacted respiratory function deterioration, leading to physical and mental disorders, including symptoms that persist for months. In severe cases, extracorporeal membrane oxygenation (ECMO) treatments were required for SARS-CoV-2 infection. Immunity was provided through vaccination, generating antibodies, and cases of ischemic neuropathy were identified along with increased dyspnea in groups with primary biliary cholangitis (PBC). This also led to a higher frequency of severe exacerbations, increased respiratory mortality, and acute respiratory syndrome, which involves aerosol particles and excreted droplets containing infectious virions.

Patients experiencing excessive weight gain developed emotional problems, such as anxiety and depression, as obesity remains a key mortality factor, causing significant oxygenation difficulties in affected individuals.

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