



REVIEW ARTICLE

Case study on COVID-19 infection in patients with pre-existing respiratory diseases

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ABSTRACT

Introduction: COVID-19 infection in patients with chronic respiratory diseases represents a clinical challenge, increasing symptom severity and the risk of complications.

Objective: to evaluate the impact of COVID-19 in patients with a history of chronic respiratory diseases, considering clinical evolution and complications.

Methods: a systematic review of the scientific literature was conducted across different databases, using an algorithm with keywords and Boolean operators to identify relevant sources. The selected studies, after applying rigorous inclusion and exclusion criteria, were critically assessed for timeliness, methodological quality, and thematic relevance, and coherently integrated into the final synthesis of the review.

Development: the mean age was 57,3 years, with relevant medical history present in 64 % of cases. The most frequent symptoms were fever (71 %), dyspnea (57 %), and dry cough (36 %). Twelve patients developed complications, mainly respiratory failure and the need for mechanical ventilation. Biochemical parameters showed anemia in some cases, elevated C-reactive protein and D-dimer, as well as high ferritin and lactate dehydrogenase levels. Treatment included antibiotics, antivirals, corticosteroids, oxygen therapy, and thoracic drainage, with admission to intensive care in more than half of the patients. Mortality was higher among those requiring prolonged ventilatory support.

Conclusions: Patients with pre-existing respiratory diseases present greater vulnerability to COVID-19, with a high frequency of complications and mortality. Early identification and comprehensive management are essential to improve prognosis and reduce pressure on healthcare systems.

Keywords: Covid-19; Respiratory Tract Diseases; Case Reports; Prognosis.

INTRODUCTION

In patients with COVID-19, the presence of chronic respiratory diseases significantly increases the risk of severe clinical manifestations. Conditions such as chronic obstructive pulmonary disease (COPD), asthma, and pneumothorax exacerbate COVID-19 symptoms, affecting millions worldwide, reducing quality of life, and increasing morbidity and mortality.⁽¹⁾ COPD—characterized by persistent airflow limitation—is one of the leading causes of death globally.⁽²⁾ Although asthma can be controlled with medication, inadequate management may lead to severe or even fatal consequences. Therefore, in patients with COVID-19, these pre-existing pulmonary conditions can worsen symptoms and substantially increase the risk of serious complications.⁽³⁾

Within the context of the COVID-19 pandemic, the situation becomes even more critical. Patients with a history of chronic respiratory diseases are more susceptible to respiratory infections and face a higher risk of severe complications upon contracting COVID-19.⁽⁴⁾ The need to investigate this interaction stems from the urgency to develop specific management and treatment strategies for this vulnerable population.⁽⁵⁾

The importance of this research lies in several factors. First, patients with chronic respiratory diseases constitute a large and diverse population whose healthcare requires tailored and personalized approaches.⁽⁶⁾ Second, the COVID-19 pandemic has exposed significant deficiencies in health system preparedness and response, particularly concerning vulnerable populations.⁽⁷⁾ By better understanding how COVID-19 affects patients with chronic respiratory diseases (CRDs), improved prevention and treatment strategies can be developed, reducing pressure on healthcare systems and improving outcomes for these patients.⁽⁸⁾

Current evidence shows that patients with CRDs who contract COVID-19 experience more severe forms of the disease.⁽⁹⁾ Studies have demonstrated that these patients face an increased risk of hospitalization, acute respiratory complications, and higher mortality compared to those without chronic respiratory conditions.⁽¹⁰⁾

Despite this, the reported prevalence of CRDs among patients with COVID-19 has been relatively low—a finding that may result from several factors, including underdiagnosis, strict adherence to preventive measures, or potential protective effects of inhaled therapies.⁽¹¹⁾ However, this apparent “low” risk may mask the true burden faced by these patients.⁽¹²⁾ Based on the above, this review was conducted with the objective of evaluating the impact of COVID-19 in patients with a history of chronic respiratory diseases, considering clinical evolution and complications.

METHODS

Study Design

A systematic literature review was carried out following PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. The aim was to identify and analyze available evidence on the interaction between COVID-19 infection and chronic respiratory diseases—including COPD, asthma, and pneumothorax. The search period spanned from January 2010 to June 2024, encompassing both pre-pandemic studies on respiratory diseases and those published during the SARS-CoV-2 pandemic. The design adopted a descriptive and comparative approach, integrating clinically, epidemiologically, and therapeutically relevant findings for medical practice.

Information Sources and Search Strategy

The bibliographic search was conducted in major biomedical and multidisciplinary databases: PubMed/MEDLINE, SciELO, ScienceDirect, Google Scholar, LILACS, and BVSALUD. These sources were selected for their international coverage and relevance in disseminating scientific literature in Spanish, English, and Portuguese. Secondary references from bibliographies of relevant articles were also reviewed, and gray literature (theses, technical reports, institutional documents) was considered when meeting methodological quality criteria and offering full-text access. Inclusion of gray literature broadened the evidence base and reduced publication bias, especially for regional Latin American studies.

The search strategy employed a structured algorithm with keywords and Boolean operators. Terms included: "COVID-19" AND "chronic respiratory diseases," "SARS-CoV-2" AND "COPD OR asthma OR pneumothorax," "respiratory comorbidities" AND "COVID-19 prognosis," and "chronic respiratory disease" AND "COVID-19 outcomes." Boolean operators AND and OR were used to combine and expand results, while truncation and quotation marks refined precision. Articles in Spanish, English, and Portuguese were included without geographic restriction to ensure broad and representative coverage.

Selection Process

Studies published within the defined timeframe (2010–2024) that directly addressed the interaction between COVID-19 and chronic respiratory diseases were included. Original articles, systematic reviews, meta-analyses, and case reports with relevant clinical, prognostic, and therapeutic data were accepted. Duplicates, articles without full-text access, irrelevant publications, studies outside the temporal range, and those lacking verifiable clinical data were excluded. Rigorous application of these criteria ensured information validity.

The selection process followed PRISMA recommendations. Initially, approximately 600 records were identified across consulted databases. After duplicate removal and title/abstract screening, the sample was reduced to 280 potentially relevant articles. Full-text reading subsequently excluded studies lacking clinical or methodological relevance. Ultimately, 65 articles meeting established quality and relevance criteria were included. The process was illustrated using a PRISMA flow diagram (Figure 1), depicting identification, screening, eligibility, and inclusion phases.

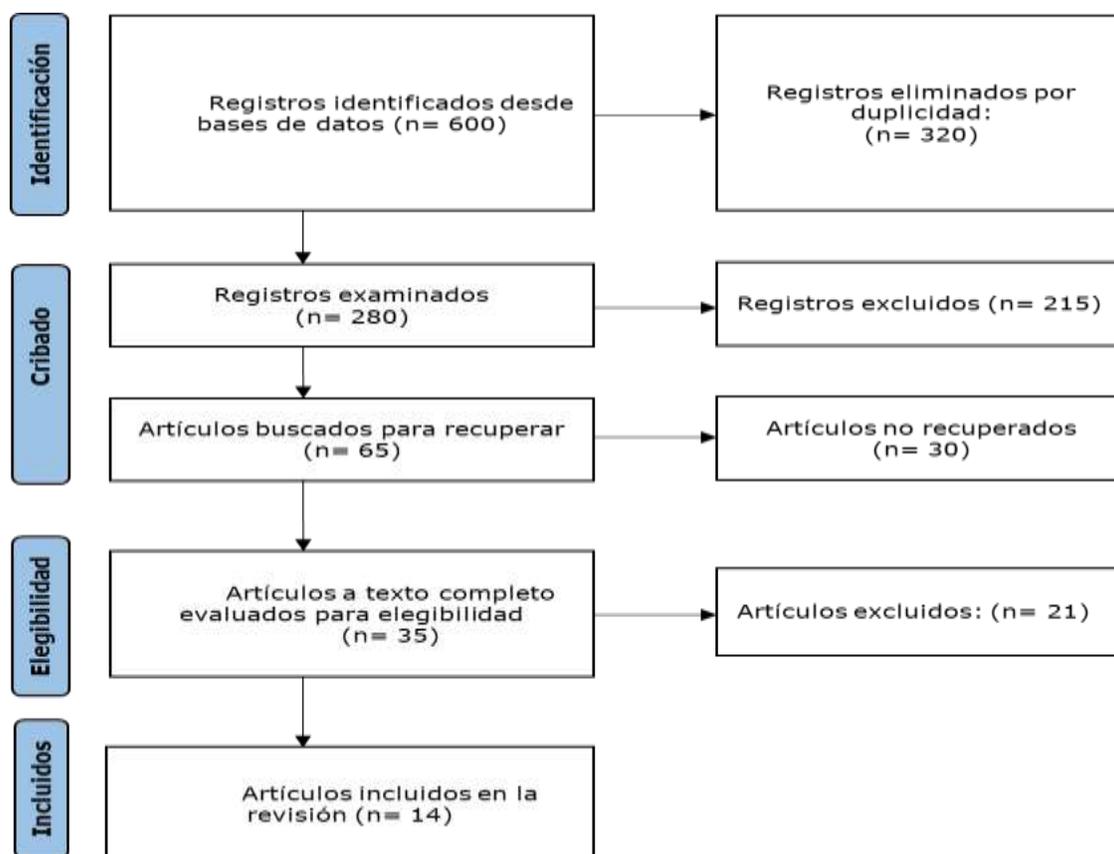


Figure 1. Flow diagram of the selection process.

Data Extraction and Analysis

Data extraction was performed systematically using an analysis matrix designed to collect key variables: author, publication year, study design, sample size and characteristics, clinical parameters assessed, main results, and conclusions. A qualitative synthesis of findings was conducted, integrating information into thematic categories (COPD, asthma, pneumothorax, respiratory complications, mortality). Where studies presented homogeneous quantitative data, an exploratory meta-analysis was considered; however, methodological and population heterogeneity limited this approach, leading to a comparative narrative synthesis. Integration of results enabled identification of common patterns, discrepancies, and knowledge gaps, offering a critical and updated perspective on the topic.

DEVELOPMENT

Previous research has addressed various aspects of this interaction, providing a valuable foundation for critical analysis.⁽¹³⁾ Some studies suggest that common CRD treatments—such as inhaled corticosteroids—may exert a protective effect against severe viral infections, including COVID-19.⁽¹⁴⁾ Other works have emphasized the importance of vaccination and proactive management of chronic respiratory diseases during the pandemic.⁽¹⁵⁾ Nevertheless, significant knowledge gaps remain, particularly regarding optimal therapeutic and preventive approaches for these patients in the context of COVID-19.⁽¹⁶⁾

A study published in *The Lancet* analyzed the impact of inhaled corticosteroids in COPD patients and suggested these medications may reduce viral replication and airway inflammation, potentially mitigating COVID-19 severity.⁽¹⁷⁾ However, another study in *The New England Journal of Medicine* reported contradictory results, indicating corticosteroids might increase the risk of secondary infections due to immunosuppression.⁽¹⁸⁾ These findings underscore the need for further research to determine best clinical practices.⁽¹⁹⁾

The literature reveals a variety of approaches and outcomes.^(17,18,19) Managing patients with a history of CRDs during the COVID-19 pandemic presented numerous challenges. The need to minimize hospital visits to reduce infection risk led to increased use of telemedicine and virtual consultations.^(20,21,22,23) However, this also raised issues regarding access and quality of care—especially for low-resource patients or those with technological limitations.⁽²⁴⁾ Additionally, shortages of personal protective equipment (PPE) and medical resources further complicated patient management.⁽²⁵⁾

Implementation of specific preventive measures is crucial to protect CRD patients during the pandemic. Vaccination against SARS-CoV-2 has proven vital in reducing disease severity and lethality.⁽²⁶⁾ Studies show that CRD patients who received the vaccine had a significantly lower risk of severe complications and hospitalization.⁽²⁷⁾ Furthermore, use of inhaled therapies and adherence to prescribed regimens play an important role in managing these diseases during the pandemic.⁽²⁸⁾

This study aims to examine in detail the interaction between COVID-19 and CRDs, evaluating risk factors, complications, and the most effective preventive measures to protect these vulnerable patients.⁽²⁹⁾ It seeks not only to describe and quantify the immediate impacts of COVID-19 in CRD patients but also to provide a solid foundation for developing management and treatment strategies that improve health outcomes.⁽³⁰⁾

By exhaustively reviewing existing literature and critically analyzing prior studies, this research aims to fill knowledge gaps and offer evidence-based recommendations applicable to clinical practice and public health policy.⁽³¹⁾ The ultimate goal is to improve prognosis and well-being for patients with chronic respiratory diseases in the context of the COVID-19 pandemic.⁽³²⁾

The interaction between COVID-19 and chronic respiratory diseases represents a critical area of research with significant public health implications. Understanding how these conditions affect susceptibility to and severity of COVID-19 is essential for designing effective prevention and treatment strategies.^(33,34,35,36)

These conditions may increase susceptibility to pneumothorax due to pulmonary fragility. However, cases in younger individuals also highlight the influence of other factors—such as thoracic trauma or certain physical activities—that may precipitate this condition.^(37,38,39,40,41)

From a clinical perspective, it is crucial to consider these age differences and associated comorbidities when developing treatment plans for pneumothorax patients, as older individuals may require a more cautious approach due to coexisting chronic diseases and age-related frailty.⁽⁴²⁾

This indicates that all patients with pneumothorax in the analyzed cases had relevant medical histories, suggesting a possible correlation between pre-existing conditions and pneumothorax occurrence. However, the balanced gender distribution and presence of some patients without notable medical histories highlight that pneumothorax can occur in individuals with or without prior medical conditions, underscoring the importance of considering multiple factors in evaluation and treatment.^(43,44)

Symptom variability suggests patients may experience a wide range of clinical manifestations, which must be considered during assessment and management. Symptom duration varies considerably, indicating diverse clinical presentations—some patients experience short-term symptoms, while others have prolonged courses. Lack of specification in some cases highlights the need for more detailed follow-up to better understand disease progression and optimize clinical management.^(45,46)

Potential complications include infections, incomplete lung re-expansion, or cardiovascular issues, among others. Timely identification and treatment of these complications are crucial to improving clinical outcomes and reducing associated morbidity.⁽⁴⁴⁾

Several therapies have been employed to address both the primary condition and associated complications. Hydrocortisone—a corticosteroid—was used to reduce pulmonary inflammation and edema, critical in managing severe inflammation accompanying pneumothorax. Supplemental oxygen via reservoir mask improved oxygenation, especially in patients with significant respiratory compromise, ensuring adequate blood oxygen saturation.⁽³⁵⁾

Antibacterial and antiviral therapy was administered to treat potential concomitant infections—such as pneumonia or viral illnesses—that may complicate the clinical picture in pneumothorax patients. Antibiotics and antivirals are essential to control and eradicate infections that can exacerbate patient condition. Prone positioning was used to improve ventilation and oxygenation, particularly in severe cases with compromised breathing. Vasoconstrictors helped maintain blood pressure and improve tissue perfusion in hypotensive patients.⁽³⁸⁾

Closed thoracic drainage is a key intervention in pneumothorax management, allowing evacuation of accumulated air from the pleural space and facilitating lung re-expansion. Additional corticosteroids—such as tocilizumab—were used to mitigate severe pulmonary inflammatory responses. Convalescent plasma, rich in antibodies, was administered in some patients to provide passive immunity and aid recovery from severe viral infections. Other treatments included anticoagulants to prevent clot formation, immunoglobulins to strengthen immune response, and hydroxychloroquine—though its efficacy in pneumothorax is limited and more relevant in viral infection contexts.⁽⁴³⁾

Surgical procedures—such as video-assisted thoracoscopic surgery (VATS) and wedge resection—were employed in more complex cases to repair pulmonary damage and prevent recurrences. These therapeutic approaches reflect an integrated, multidisciplinary management of pneumothorax and its complications, tailored to each patient's specific needs.⁽³¹⁾

Data reveal that intensive care admission and complication development are associated with prolonged hospitalization and extended recovery times. Moreover, patients requiring intensive care have a significantly worse prognosis, with markedly higher mortality rates compared to those not needing ICU admission. These findings underscore the importance of aggressive and vigilant management of pneumothorax patients with severe complications or ICU requirements.⁽⁴⁶⁾

Analysis of these elements has the potential to provide valuable insights to guide clinical decisions and public health policies, thereby improving health outcomes for one of the most vulnerable populations—patients with a history of CRDs—during this pandemic.⁽³⁴⁾

CONCLUSIONS

The interaction between COVID-19 and chronic respiratory diseases has revealed high vulnerability in these patients to severe forms of infection, with greater need for hospitalization and intensive care, demanding specific and personalized management strategies. In these cases, routine treatments such as inhaled corticosteroids show protective effects, while SARS-CoV-2 vaccination has emerged as a key tool to reduce mortality and severity. In pneumothorax, therapies including corticosteroids, supplemental oxygen, and antibacterial/antiviral agents have been essential, complemented by telemedicine—which, although useful for reducing contagion risk, faces access limitations. Clinical data show a high prevalence of complications, especially in older patients with comorbidities, necessitating rigorous and multidisciplinary management to alleviate strain on healthcare systems.

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