

Evidence-based Physiotherapy and Functionality in Adult and Pediatric patients with COVID-19

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Abstract

Introduction: The corona virus (2019-nCoV OR HCOV-19 or CoV2), has emerged in China as the main cause of viral pneumonia (COVID-19, Coronavirus Disease-19). Aim: To provide evidence-based Physiotherapy and functionality in patients with adult and pediatric COVID-19.

Methods: This is an integrative literature review using the MedLine / PubMed databases, library of Latin American and Caribbean Literature in Health Sciences (LILACS) and Physiotherapy Evidence Database (PEDRo).

Results: Part of the patients with covid 19 show signs of respiratory deficiency with hypoxemia, with low severity in children. Impaired functionality is also expected.

Conclusion: COVID-19 causes low pulmonary compliance and important changes in lung function with hypoxemia and cardiovascular repercussions. These changes lead to the need for Physiotherapy and the management of oxygen therapy and ventilatory support (invasive and non-invasive) for these patients.

Keywords: Physiotherapy, International Classification of Functionality, Disability and Health, hypoxia.

Authors summary

Why was this study done?

In view of the pandemic that also affects Brazil, a large number of patients with COVID-19 may have an important Respiratory System Deficiency. The Physiotherapist is the professional who is at the forefront of the process of assessment, diagnosis and intervention of the respiratory function. For this reason, it is necessary to better understand the evolution and therapeutic process of these patients, in order to provide management with greater expertise and quality.

What did the researchers do and find?

We seek to gather information through an integrative bibliographic review, in several databases and guidelines of the World Health Organization on COVID-19, with a focus on respiratory, muscular function, and on the functionality of these patients. As the moment is still little known by COVID-19, in this material we highlight the current knowledge processes for the assessment, diagnosis and Physiotherapeutic interventions.

What do these findings mean?

These findings confirm the dynamics, care and service provision for the professional Physiotherapist in a hospital and intensive care unit, for new practices that integrate the necessary advances in the quality of care, safety and prevention of patients with Respiratory Deficiency by COVID-19.

INTRODUCTION

The coronavirus infection pneumonia epidemic broke out in late December 2019 in the city of Wuhan in China, and spread rapidly across the country and all the continents of the world. Discovered through entire genome sequencing, the pathogen was considered a new beta coronavirus genus, and the pathology was called a new coronavirus pneumonia, defined by the World Health Organization¹⁻⁴.

Clinical conditions such as hypertension, respiratory, cardiovascular, and metabolic diseases seem to be important risk factors for the severity of covid-19⁵. Age is also an important unmodifiable risk factor. Patients with a mean age of 47 years had a mortality rate of 3 to 5%, oxygen therapy was necessary in 42% of these patients, 5% were admitted to the ICU, 2.3% underwent invasive mechanical ventilation (IMV), and of these, 1.4% died^{6,7}.

The coronavirus responsible for COVID-19, may have repercussions that go beyond the involvement of the respiratory system, harming several systems, including the cardiovascular system⁸. COVID-19 can trigger decompensation of the cardiovascular system, especially in people with previous disorders, such as heart failure and coronary artery disease. In addition, studies indicate the occurrence of acute myocarditis and severe acute respiratory syndrome (SARS), which favors systolic dysfunction and myocardial infarction^{8,9}.

Among the various professionals involved in the physical recovery of the patient with COVID-19, the physiotherapist stands out not for treating the disease but for preventing and rehabilitating respiratory deficiencies and the functional limitations of the daily life activity¹⁰.

COVID-19 is a disease that causes deficiency of respiratory tract structures, leading to impaired breathing functions¹¹. Not only, depending on the clinical severity presented, there may be impaired respiratory muscle function and exercise tolerance. Limitations, which make it difficult to carry out basic activities that involve the ability to move, affecting even routine tasks such as walking and performing self transfers¹².

As the Physiotherapist is in charge of the care process for these patients, there is a need to better understand the functional repercussions of COVID-19 in order to think about the best approach to the patient, thus,

the objective of this work is to evaluate scientific evidence about Physiotherapy and functionality in patients with adult and pediatric COVID-19.

METHODS

It is an integrative literature review using the MedLine/PubMed database, library of Latin American and Caribbean Literature in Health Sciences (LILACS) and Physiotherapy Evidence Database (PEDRo). The approach was through a methodology that provides the synthesis of knowledge and the incorporation of the applicability of results of significant studies in practice on the scientific evidence for the performance of Physiotherapy at COVID-19. The literature review was carried out in March and April of 2020.

Thus, this study investigates and presents the scientific evidence in Physiotherapy and functionality in COVID-19 that can guide Physiotherapists in their daily conduct with these respective patients with recommendations.

Search strategy

The electronic search was performed by well-trained researchers with experience in the subject of the articles. The search was performed in March 2020 with the combination of the following terms: First combination: Covid 19 and coronavirus and coronavirus (COVID-19) infection. Second Combination: Physiotherapy and Covid 19 and coronavirus and coronavirus (COVID-19) infection. Third combination: Cardiac Involvement and coronavirus (COVID-19) infection. Fourth combination: Diagnosis and treatment and prevention and Covid 19 and coronavirus. From this search, articles were selected for full reading that met the inclusion criteria for this review.

Eligibility criteria

Published studies in English or Portuguese about COVID-19 and aspects related to Physiotherapy, mechanical ventilation, oxygen therapy and cardiac alterations were included. Reviews, meta-analyzes, editorials, original articles and Consensus were also included.

Summary of data

The summary included the extraction of the following data: authors and year of publication of the evidence, instruments and/or assessment equipment, and effects of the Physiotherapeutic performance in patients with COVID-19, with a focus on functionality. Finally, the outcomes pertinent to the therapeutic intervention in COVID-19 in respiratory function were evaluated for the production of evidence.

Table 1: Evidence on Deficiency in Respiratory Function at COVID-19.

Author	Type of study	AIM	Evidence
Bouadma et al. 2020 ¹³	Review	Review practical considerations and management strategy for intensivists.	COVID-19 may have several cardiovascular repercussions, making continuous monitoring and a multidisciplinary approach necessary in the care of this patient becoming necessary.
Xu et al. 2020 ¹⁴	Case report	To investigate the pathological characteristics of a coronavirus 2 (SARS-CoV-2) patient by post-mortem biopsies.	The presence of myocardial infiltration by interstitial mononuclear inflammatory cells at autopsy, demonstrating the direct impact of the coronavirus on the myocardium.
Cai et al. 2020 ¹⁵	Case series	To describe 2019 coronavirus infection in 10 children from Wuhan.	Most children develop mild or symptom-free illnesses. In children with COVID-19, symptoms are generally less severe than adults and are mainly with cough, fever, pharyngeal erythema and more rare, diarrhea, fatigue, rhinorrhea, vomiting and nasal congestion.
Xia et al. 2020 ¹¹	Review	To discuss the different characteristics of clinical, laboratory and chest computed tomography in adult pediatric patients with new coronavirus infection 2019 (COVID-19).	COVID-19 is a disease that causes deficiency of respiratory tract structures, leading to impaired breathing functions.
Guanghai et al. 2020 ¹²	Review	To evaluate the effects of confinement at home on children during the COVID-19 outbreak.	The control of the infection spread leads to the restriction of participation, interfering in tasks, such as recreation and leisure activities.
Shen et al. 2020 ¹⁶	Consensus	Summarize current strategies for diagnosis, treatment and prevention of infection by 2019-nCoV in children.	The critical presentation of the children's COVID-19 which is characterized by respiratory failure requiring ventilatory support. Children with COVID-19 class 4 are suffering from Respiratory Deficiency due to severe pneumonia, presenting: tachypnea and dyspnea, in addition to the presence of hypoxemia. The critical presentation of children's COVID-19 is characterized by respiratory failure requiring ventilatory support.
Respiratory care committee of Chinese Thoracic Society. 2020 ¹⁷	Consensus	To recommend high-risk treatments, based on current evidence and limited resources in some areas.	To prevent the spread of the virus, the use of a closed suction system is recommended.
van den Boom et al. 2020 ¹⁸	Retrospective analysis	To determine the ideal range using real-world data.	About 41% of all patients hospitalized with COVID-19 use oxygen therapy in the course of their treatment, and this number rises to 70% among cases with very severe evolution.

RESULTS

Despite the scarcity of studies, Table 1 shows the evidence found on the Deficiency of Respiratory Function in COVID-19¹³⁻²⁵.

The recommendations in Physiotherapy for patients with Respiratory and Cardiac Disability by COVID-19 follow in an appendix to this study ([Click here](#)).

Continuation - Table 1: Evidence on Deficiency in Respiratory Function at COVID-19.

Author	Type of study	Aim	Evidence
Alhazzani et al. 2020 ¹⁹	Practical clinical guide	Guide the management of patients with Corona Virus and emergency unit. Recommend the practical action of Physiotherapy in the management of patients with COVID-19	Hypoxemia in acute conditions, SpO ₂ ≤ 92%, may favor dysfunction of organs and systems. The use of a high-flow nasal cannula should preferably be used with patients in beds with a negative pressure room using individual protective equipment.
Thomas et al. 2020 ²⁰	Guide clinical practice	Recommend the practical action of Physiotherapy in the management of patients with COVID-19.	Patients with increased need for oxygen are referred to Physiotherapy for airway clearance, especially in those with cough deficiency and use of protective equipment, and early optimization of care and ICU involvement is recommended.
Cheung et al. 2020 ²¹	Practical clinical guide	Guide personnel safety during emergency airway management.	Procedures with Non-Invasive Ventilation (NIV) should be performed with personal protective equipment, such as professional mask PFF2 (N95), goggles for protecting the eye mucosa, long-sleeved, fluid-resistant apron, clean gloves for protection and if possible in negative pressure room.
Meng. et al. 2020 ²²	Experience report	To report the experience during intubation and artificial ventilation in COVID-19.	COVID-19 shows that 14% of patients developed dyspnea, tachypnea, peripheral oxygen desaturation (Spo ₂) less than or equal to 93%, deficient oxygenation index with a Pao ₂ / Fio ₂ ratio <300 mmHg in 48 hours. Intubation and invasive mechanical ventilation may have been delayed in some patients, and this may have had a negative impact on mortality.
Murthy et al. 2020 ²³	Review	To discuss issues related to regions where intensive care units are able to provide mechanical ventilation.	NIV can be used in places where access to invasive mechanical ventilation is limited or before patients have severe hypoxemic respiratory failure.
Wax & Christian 2020 ²⁴	Practical clinical guide	Summarize important considerations about patient screening, environmental controls, personal protective equipment, resuscitation measures, and planning for intensive care unit operations.	It is important to be aware of the physiological signs of asymptomatic hypoxemic patients - referred to as silent hypoxemia.
Brewster et al. 2020 ²⁵	Consensus	Review airway management and tracheal intubation.	An occlusive face mask (well adjusted to the patient's face) must be used, coupled to a mask valve bag (AMBÚ, or similar brand), connected to an oxygen source.

Caption: SARS-CoV-2: COVID 19 respiratory distress syndrome; nCoV: New COVID 19; SpO₂: Peripheral oxygen saturation; Pao₂ / Fio₂: Ratio of arterial oxygen pressure and the inspired fraction of oxygen.

DISCUSSION

COVID-19 may have cardiovascular and myocardial repercussions^{13,14}, retrospective multicenter study using a database from Jin Yin-tan Hospital and Tongji Hospital in China, showed that 33% of deaths were caused by the association of heart and respiratory failure, with 7% of deaths caused exclusively by myocardial injury²⁵.

There is an indication for a closed suction system to perform bronchial hygiene therapy, as well as an occlusive face mask and in the pre-oxygenation of these hypoxemic patients¹⁹, as these protocols protect health professionals from contamination.

Exhaled air is known to increase virus dispersion and subsequently the risk of nosocomial infection²⁶ and spread of the virus^{12,16}. Procedures that enhance the aerosolization and contamination of health professionals are not indicated, associated with the absence of a proven benefit in the treatment of refractory hypoxemic respiratory failure²⁷.

Opportunistic airborne transmission generally occurs during aerosol-generating health procedures such as patient coughing and contact with surfaces²⁷, why 1716 healthcare workers were infected with SARS-CoV-2 in a hospital in China²⁸.

About 41% of all patients hospitalized with COVID-19 used oxygen therapy¹⁸. In the study performed during the SARS-COVID pandemic in 2002, administrative factors were identified for greater risk of an outbreak, including the O₂ flow rate > 6L / min, considered as “high flow”. In this study, the adoption of high O₂ rates increased the chances of providing a viral outbreak by 2.42 times than the adoption of low flow. Thus, the adoption of high oxygen flows should be discouraged in the absence of the respiratory isolation bed^{29,30}.

NIV procedures²³ should be performed with personal protective equipment and in those patients who develop dyspnea, tachypnea and peripheral oxygen desaturation. NIV can be used in those places where access to invasive mechanical ventilation is possible. Studies recommend only the use of a helmet with a double limb circuit, as they can reduce the risk of airborne transmission²¹.

In children with COVID-19, symptoms^{12,15} are usually less severe. COVID-19 is a disease that causes deficiency of respiratory tract structures¹¹, in addition to thinking that the control of the spread of infection leads to the restriction of children’s participation.

Infant COVID-19 is characterized by respiratory failure requiring ventilatory support. Neonatal and pediatric physiotherapy plays a fundamental role in multidisciplinary care, acting in order to identify, elaborate and develop kinetic-functional diagnosis in cardiorespiratory disorders caused by viral infection, through anamnesis, physical evaluation and complementary exams. In addition to developing promotion, prevention, rehabilitation and recovery strategies for children with risk factors for the development of problems and determinants of the health-disease process, at different levels of health care.

It is worth noting that patients who fail oxygen therapy, NIV, or have a direct indication for invasive

mechanical ventilation, should be intubated quickly, as the need for intubation and IMV is common during this outbreak³¹. The need for intubation vary from 2,3% 4%^{7,32,33}, to 42% e 47%^{30,32}, considering the studies available in the literature. With differing rates regarding the need for intubation, attention to the patient’s characteristics, specific care and a careful evaluation are essential at this time. Additionally, patients using invasive ventilation should be isolated in a single room¹² and it is important to pay close attention to their handling with professional protection²¹.

Scientific studies from professional experiences in other places that struggle to treat patients with COVID-19³⁴, it appears that due to the unsatisfactory results, high failure rate, higher risk of spreading the virus, and unavailability of the appropriate interface (helmet), in In most Brazilian intensive care units, NIV should be rethought and indicated with greater evaluative and diagnostic precision, and should not be a first-line ventilatory strategy, intended for patients with SARS / COVID-19 and that can be extrapolated to the nasal cannula of high flow.

Patients with tachypnea (respiratory rate > 30 ipm), hypoxemia, Spo₂ less than 93% at room air and a Ratio of arterial oxygen pressure and the inspired fraction of oxygen <300 mmHg³³, with progressive worsening of the clinical picture and with the prospect of continuing to worsen, and undergoing no clinical improvement at conventional oxygen therapy (face mask up to 5 liters or mask with reservoir, non-reinforced, up to 10 L/min)^{21,33,35,36}, orotracheal intubation²² should be performed which must be performed with an occlusive face mask (well adjusted to the patient’s face) coupled to a mask valve bag²⁴.

The need to carefully assess the physiological signs for indication of orotracheal intubation in asymptomatic hypoxic patients, referred to as silent hypoxemia²⁴, is emphasized, since the emergency intubation procedure poses a risk of cross infection³⁷.

CNAF²¹ can be used in respiratory deficiency due to severe hypoxemia as long as it presents a potential response in oxygenation in the first 30 minutes of therapy. The use of CNAF should preferably be used with patients in beds with a negative pressure room, in order to reduce the potential for contamination with the formation of aerosol. It is worth mentioning the need for the health care team to use individual protective equipment during the application of this therapy. To date, the literature does not provide a basis to support the routine use of CNAF for the treatment of patients with COVID-19^{20,38}.

Patients evaluated and prescribed for Physiotherapy²¹, must always promote Physiotherapeutic adaptations with the guidelines of the “Crisis Unit” and approved by the Directors of the Institutes that manage patients with COVID-19, in the specific professional environment of each hospital.

CONCLUSION

COVID-19 causes low pulmonary compliance and important changes in lung function with hypoxemia and cardiovascular repercussions. These changes lead to the need for Physiotherapy and the management of oxygen

therapy and ventilatory support (invasive and non-invasive) for these patients. The need for further updates to this document is anticipated as changes in functionality for Physiotherapy are better known.

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Brazilian Society of Physiotherapy - BSP

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Resumo

Introdução: O corona vírus (2019-nCoV OU HCoV-19 ou CoV2), emergiu na China como a principal causa de pneumonia viral (COVID-19, Doença do Coronavírus 19). Objetivo: Avaliar evidências científicas sobre Fisioterapia e Funcionalidade em pacientes com COVID-19 adulto e pediátrico.

Métodos: Trata-se de uma revisão de literatura do tipo integrativa utilizando a bases de dados do MedLine/PubMed, biblioteca da Literatura Latino-Americana e do Caribe em Ciências da Saúde (LILACS) e Physiotherapy Evidence Database (PEDRo).

Resultados: Os pacientes com COVID-19 apresentam sinais de deficiência respiratória com hipoxemia, com baixo impacto em crianças estas evoluem sem sintomas ou com quadro de baixa gravidade. além de observar impacto na restrição da participação. a fisioterapia atua na oxigenioterapia e ventilação dos pacientes.

Conclusão: A COVID-19 causa alterações na função pulmonar com formação de deficiência respiratória hipoxêmica e de complacência, com repercussões cardiovasculares que leva a necessidade da fisioterapia no desfecho desta pandemia, seja por meio da oxigenioterapia e/ou do suporte ventilatório (invasivo e não-invasivo).

Palavras-chave: Fisioterapia, Classificação Internacional de Funcionalidade, Incapacidade e Saúde, hipóxia.

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