

# Effectiveness of Hyperbaric Oxygen Therapy and High Intensity Interval Training for Post Covid Patients: A Literature Review

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## Abstract

**Objective:** The study was aimed to find out whether the two interventions, (1) Hyperbaric Oxygen

Therapy (HBOT) and (2) High Intensity Interval Training (HIIT) are beneficial in improving the respiratory functions of the individuals who has been affected with post covid syndromes.

**Methods:** Articles with the keywords 'post-covid', 'hyperbaric Oxygen Therapy', 'High Intensity Interval Training' were screened through the search engines such as Google Scholar and pubmed, out of which 20 articles were selected which met the selection criteria.

**Results:** The literature study showed that patients who suffered from impaired respiratory functions after being affected with covid-19 showed significant improvements after undergoing either one of the modes of therapy.

**Conclusion:** HBOT and HIIT had a conspicuous effect in regaining the respiratory functions back to normal, decreased anxiety stress and also minimized the use of mechanical ventilator.

**Keywords:** COVID-19, HIIT, HBOT, RESPIRATORY IMPAIRMENTS, ARDS

## Introduction

In a Hubei province of China called Wuhan, a sudden increase in the number of pneumonias was noted on December, 2019. The number of cases spiked very quickly in the next two months and spread to different parts of the world and later in march the WHO declared the outbreak of coronavirus as a pandemic and named it as COVID-19<sup>[1]</sup>. The transmission of virus through either directly by the droplets or touching the infected surfaces made all those who had a contact with infected person prone to be affected.

The virus having an average of 6 days of incubation period made the affected person as a source to spread the virus till the affected person starts showing symptoms<sup>[2]</sup>. The most frequent symptoms being fever, dry cough shortness of breath, anosmia and ageusia, but may vary from person to person<sup>[3]</sup>. The WHO recommendation for COVID-19 treatment includes all kinds of atmospheric oxygen therapy except for hyperbaric oxygen therapy which has been in use since a long time for treating acute and chronic hypoxemia<sup>[4]</sup>. Similarly, the lockdown and home quarantines, all have led to a more of sedentary

lifestyle which further declines the cardiorespiratory health, increases the stress and anxiety level of people. Therefore, there is a decline in respiratory and cardiac functioning of the body and mental health as well.

The main aim of this literature study is to find out whether hyperbaric oxygen therapy and high intensity interval is use full in improving the cardiac and respiratory function of post covid-19 patients for early return to normal healthy life.

### Methodology

**Design:** we thoroughly searched and found the relevant articles using the keywords on the online search engines like PubMed and Google scholar published between the years 2020 to 2022. The articles received between these dates had undergone a two-step screening process, the first being screening the article title or abstract, and second one was screening examination of the full text. All irrelevant articles were excluded.

**Search strategy:** A thorough search was done on the search engines like google scholar and PubMed using the key words "hyperbaric oxygen therapy", "high intensity interval training", "post covid" "COVID-19",

**Inclusion and Exclusion criteria:** All articles were included, articles like literature review, clinical trials, meta-analysis, RCT were also included. The excluded articles were those which was published before 2020, paid articles or unavailability of full texts and abstracts.

### Results

We analysed the search engines as mentioned above and that search produced a total of 72 results for hyperbaric oxygen therapy and 46 results for HIIT and total of 118 results. Out of which 26 were duplicate records. The remaining 92 underwent the first screening and 55 records were eliminated, and after the second screening 25 articles were selected, of which 17 articles were finally selected which met all the inclusion and exclusion criteria.

All the studies were supporting the use of HBOT for covid-19 infected patients, because the study results showed an improved blood oxygen

saturation, reduce the use of mechanical ventilator and showed an overall improvement after receiving HBOT treatment. Few studies make it evident that HBOT is very much helpful in preventing systemic hypoxemia due to covid-19. There was few to no adverse reactions to treatment, some being claustrophobia and ear pain.

There was lack of studies which showed the effect of HIIT for covid-19 patients. The studies which were found showed that HIIT helped in reducing the stress, anxiety and depression that was seen during the covid-19 quarantine. In another study, HIIT for inspiratory muscles showed marked improvement in their functioning in patients mild COPD which led to reduction in the dyspnoea and fatigue they faced.

### Discussion

Maintaining oxygen saturation is the main struggle in treating covid-19 patients. The hypoxemia which follows the decreased blood oxygen saturation is one of the main clinical manifestations of covid-19, and high flow oxygen delivery is the recommended mode of treatment for covid patients by WHO. Though HBOT is one of the oldest and most powerful oxygen therapy known and with enough studies and articles pointing out the effectiveness of hyperbaric oxygen therapy on respiratory improvement, it is still not being added in the guidelines.

In Hyperbaric oxygen therapy the patient is given 100% concentrated oxygen at a high pressure, this helps the cells to assist oxygenation through out every level of perfusion ranging from pulmonary function to alveolar oxygen exchange<sup>[5]</sup>. This helps to prevent the lack of oxygen even at the tissue level (hypoxemia) by increasing the tissue oxygen intake by delivering oxygen at high pressure. The factor which makes HBOT stand out is the ability of HBOT to improve tissue perfusion exchange capability because of the increased oxygen diffusion rate. All investigations like ABG analysis, liver function test, CBC showed improvement.

HBOT is thought to be a safe and low risk procedure with no other main contraindications apart from untreated pneumothorax and respiratory failure which require mechanical ventilation<sup>[6]</sup>. One of the biggest challenges for HBOT is the accessibility

because of the existing limitation in regular oxygen distribution therefore it is less likely to be accessible in most rehab centre.

The recent studies have shown that covid-19 affected patients are at a higher risk for cardiopulmonary complications and physical disability. The physical inactivity and bed rest during the time of hospital admission for COVID-19 treatment is first step which leads to these complications. Only a few weeks of bed rest and physical inactivity can lead to decreased cardiopulmonary fitness and muscle wasting. In addition to these physiological impairments patients also suffer from stress, anxiety and depression due to confinement in the isolation rooms<sup>[7]</sup>.

Here exercise training plays a vital role as a powerful stimulator for fitness improvement. Exercise training aids in preventing muscle wasting, promoting a strong anti-inflammatory response and reduce the stress and anxiety due to isolation. Importantly HIIT was able to improve the resilience.

There is a mounting body of evidence backing up that HIIT is both efficient and safe for the cardiopulmonary rehabilitation of post covid patients. HIIT is a type of exercise which includes interspersing short bursts of intense exercise with rest periods. The main advantage is it requires no equipment so people can do it whenever or wherever they are comfortable. It had a marked effect in covid affected people by increasing the cardiovascular function, vasculature and reducing blood pressure. Other changes noted were lower resting heart rate, improved exercise tolerance, oxygen supply to the muscles, improved mental health, and reduced levels of depression and social avoidance. Due to the short duration of the exercise, people with less motivation or who procrastinate found it was helpful to overcome those.

### Conclusion

Overall, HBOT is seen to be an efficient and safe way to treat COVID-19 patients. The limitations for HBOT cannot also be neglected, HBOT chambers being big size and space occupying cannot be fit in every setup and the cost to setup the chamber is high therefore making it very difficult for small centres

to acquire it. There is still limited information and evidence on the effect of HBOT for covid-19 patients, further studies which include a larger sample size is required to access the outcomes of this modality and compare it other modalities.

This study has demonstrated that HIIT brings a meaningful improvement in the dyspnoea during normal activities of day-to-day life, improves cardiorespiratory fitness, improve mental health and reduce anxiety, stress and depression. There are very few studies that directly link HIIT for covid-19 patients. Hence more studies are required to establish that HIIT has a direct effect on post covid patients.

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