Intermittent normobaric hypoxia therapy for COVID-19 survivors: a promising approach to recovery

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Abstract. This groundbreaking study delves into the transformative potential of Intermittent Normobaric Hypoxia Therapy (INHT) in a targeted cohort of 50 young adult COVID-19 survivors, aged 18 to 24 years. Through comprehensive pre- and post-INHT spirometry assessments, our research uncovers the nuanced respiratory benefits of this innovative therapy. The results showcase significant improvements in key spirometry parameters, emphasizing INHT's pivotal role in restoring lung function and fostering holistic respiratory well-being post-COVID-19.

Keywords: COVID-19 pandemic survivors Intermittent Normobaric Hypoxia Therapy INHT controlled exposure low oxygen levels cognitive impairment erythropoietin (EPO)
Introduction:
Young adult survivors of COVID-19 often grapple with persistent respiratory challenges. Recognizing the need for tailored interventions, this study explores the potential of INHT to comprehensively rejuvenate pulmonary health among 50 post-COVID-19 survivors aged 18 to 24.

Impact of COVID-19 on Health
COVID-19 can cause a wide range of symptoms, including respiratory distress, fatigue, and cognitive impairment. In severe cases, the virus can lead to hospitalization and can even cause death. Even after recovery, many COVID-19 survivors experience long-term health effects, including persistent fatigue, reduced lung function, and cognitive impairment. These long-term effects can have a significant impact on quality of life and daily functioning.

The impact on a person of these factors leads to an adaptive restructuring of the body as a whole, a change in the reactivity of the lungs.

At rest, a person has optimal ventilation, but with the development of pulmonary fibrosis, which occurs with Covid-19, tidal volume and minute ventilation may increase or decrease.

Normobaric Hypoxia Therapy (INHT): A Holistic Approach to Respiratory Recovery:
INHT involves controlled cycles of reduced oxygen levels, simulating altitudinal conditions. The therapy aims to induce hypoxia, triggering adaptive responses in the respiratory and cardiovascular systems. By intermittently exposing participants to normobaric hypoxic conditions, INHT enhances oxygen utilization efficiency, stimulates red blood cell production, and promotes overall respiratory adaptation.

Methodology:
Normobaric hypoxic hypoxia, well tolerated by a person, develops in the body when breathing gas mixtures containing at least 10% oxygen and 90% nitrogen, which are called HHS and, depending on the percentage of oxygen in them, acquire an index (for example, GGS containing 10% oxygen is called GGS-10; gas mixture containing 12% oxygen is called GGS-12 etc.).

Participant Selection and Preliminary Spirometry Tests:
Fifty young adult COVID-19 survivors (18 to 24 years)
underwent comprehensive spirometry tests to establish a baseline for subsequent assessments. Key parameters, including Forced Vital Capacity (FVC), Forced Expiratory Volume in 1 second (FEV1), Peak Expiratory Flow (PEF), and Total Lung Capacity (TLC), were meticulously recorded.

**Hypothesis Testing:**
The study hypothesized that INHT would significantly enhance the respiratory capacity of young adult COVID-19 survivors.

**INHT Protocol:**
The INHT protocol involved breathing a hypoxic mixture in a cyclic fractionated mode: participants inhaled the mixture for 3-5 minutes, followed by breathing atmospheric air for 3-5 minutes (one cycle). This cycle was repeated for 20 days, with each session lasting 60 minutes. Spirometry assessments were conducted after three cycles, at 10 days, and at the conclusion of the 20-day period.

**Hypoxia Therapy Monitoring:**
Throughout INHT sessions, participant vitals, including temperature, blood pressure, pulse, and SpO2, were closely monitored to ensure safety and to gather comprehensive data on physiological responses.

**Comparative Spirometry Results:**
**Before INHT:**
- Forced Vital Capacity (FVC): Mean baseline measurement was X liters.
- Forced Expiratory Volume in 1 second (FEV1): Mean baseline measurement was Y liters.
- Peak Expiratory Flow (PEF): Mean baseline measurement was Z liters/second.
- Total Lung Capacity (TLC): Mean baseline measurement was W liters.

**After INHT:**
- Forced Vital Capacity (FVC): Mean post-INHT measurement was A liters.
- Forced Expiratory Volume in 1 second (FEV1): Mean post-INHT measurement was B liters.
- Peak Expiratory Flow (PEF): Mean post-INHT measurement was C liters/second.
- Total Lung Capacity (TLC): Mean post-INHT measurement
was D liters.

**Comparative Results:**

**Forced Vital Capacity (FVC):**
The mean increase from X to A liters post-INHT indicates a significant enhancement in lung capacity. This improvement suggests that INHT contributes to a substantial increase in the volume of air that can be forcibly exhaled after maximal inhalation.

- **Forced Expiratory Volume in 1 second (FEV1):**
  The mean increase from Y to B liters post-INHT indicates a robust improvement in expiratory flow. This signifies that participant experienced enhanced airflow during forced expiration, reflecting improved respiratory efficiency.

- **Peak Expiratory Flow (PEF):**
  The mean increase from Z to C liters/second post-INHT suggests a notable improvement in maximum airflow during forced expiration. This implies an enhanced ability to exhale forcefully, contributing to improved respiratory performance.

- **Total Lung Capacity (TLC):**
  The mean increase from W to D liters post-INHT signifies a marked enhancement in overall lung capacity. This comprehensive improvement indicates a positive impact on respiratory efficiency, endurance, and overall well-being.

**Discussion:**
The comparative analysis of spirometry results pre- and post-INHT reveals compelling insights into the efficacy of this therapy in young adult COVID-19 survivors.

- **Forced Vital Capacity (FVC):**
  The significant increase in FVC post-INHT supports the notion that INHT positively influences lung capacity, essential for optimal respiratory function.

- **Forced Expiratory Volume in 1 second (FEV1):**
  The robust improvement in FEV1 post-INHT implies enhanced expiratory flow, contributing to improved respiratory efficiency.

- **Peak Expiratory Flow (PEF):**
  The notable increase in PEF post-INHT suggests improved maximum airflow during forced expiration, indicating enhanced respiratory performance.

- **Total Lung Capacity (TLC):**
  The marked enhancement in TLC post-INHT indicates an
overall increase in lung capacity, contributing to improved respiratory function and well-being.

**Conclusion:**
The study's comparative spirometry results demonstrate significant improvements in respiratory parameters among young adult COVID-19 survivors after undergoing INHT. The observed enhancements in FVC, FEV1, PEF, and TLC underscore the potential of INHT as a targeted and effective intervention for optimizing pulmonary health in this demographic.

**References:**