

The Effect of Halotherapy in Chronic Respiratory Disease: An Adjunct to Physiotherapy-A Narrative Review

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ABSTRACT

Halotherapy is the use of dehumidified oxygen or salt aerosol microparticles attached to a face to treat pulmonary conditions. It was first reported as a substitute to oxygen masks for speleo-therapy, a healing technique utilized in saline in Eastern Europe since the early nineteenth century. Micronized NaCl (1-5 m) is effortlessly inhaled by the proximal and distal respiratory tracts. At this juncture, it disintegrates in the mucosal sol layer of the upper airways that coats the respiratory epithelium. The objective of this study was aimed to determine the effectiveness of halotherapy in chronic respiratory disease as an adjuvant to physiotherapy. Literature search engines-PubMed, Google Scholar, and Cochrane were used to select articles that reviewed or used halotherapy as the key point in the publications. Database searches were performed to assess the literature available on halotherapy for chronic respiratory disease. 8 studies were included in the narrative review. Studies included in the review held strong evidence for using halotherapy as an alternative to traditional physiotherapy measures. The synthesis of this study shows fair support for the use of halotherapy as an adjunct to physiotherapy in Chronic Respiratory Disorders (CRD), by including salt rooms, Halogenerator and traditional halotherapy managements as accustomed to the patient in relieving and resolving symptoms of the same.

Keywords: Halotherapy, Chronic Respiratory Disorders, Salt-Rooms, Halogenerator.

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INTRODUCTION

The Global initiative on Obstructive Lung Disease (GOLD) has clearly defined the respiratory disorders as restrictive and obstructive based on the FEV1 and FVC ratio. Chronic Respiratory Disorders (CRD) includes a vast variety of pulmonary disorders of either restrictive or obstructive nature such as allergies, bronchial asthma, Chronic Obstructive Pulmonary Disease (COPD), interstitial lung diseases and pulmonary artery hypertension.¹

A category of illnesses known as chronic respiratory disease predominantly affect the lungs and airways. Significant morbidity and mortality are linked to it. World Health Organization (WHO) states that, chronic respiratory diseases cause an estimated 4.6 million premature deaths year, or more than 5% of all fatalities worldwide. Nearly 90% of these deaths take place in low- and middle-income countries.² Clinical signs and symptoms included coughing and expectoration, recurrent wheezing, hemoptysis,

failure to thrive, chest discomfort, phlegm, fever and dyspnoea, and decreased activity tolerance.³

Macrolide antibiotics, often known as "macrolides," are a class of chemicals that are distinguished chemically by having a 12-element macrocyclic lactone ring. Macrolides are frequently employed as first-line treatments in the treatment of respiratory infections due to their superior oral absorption, high tissue penetration, and broad effectiveness against various lung pathogens. It may take several weeks for the immunomodulatory effects of macrolides to become apparent. These effects include decreased mucus secretion and viscosity in the airways as well as decreased airway neutrophil accumulation due to a decrease in the expression of pro-inflammatory cytokines and adhesion molecules.²⁻⁴ These effects are only seen with 14-member macrolides (erythromycin, clarithromycin, and roxithromycin) and 15-member macrolides (azithromycin). Roxithromycin, clarithromycin, and azithromycin are further macrolide antibiotics that have demonstrated efficacy.⁴ Ceftazidime, metolazone, and inhaled anti-toxins like aztreonam lysine, colistin, liposomal amikacin, etc. are frequently used to treat cystic fibrosis.⁵ Azithromycin 500 mg three times a week for six months in a 1:1 ratio or placebo for Non-Cystic Fibrosis bronchiectasis. The most common forms of treatment involve the use of drugs including (Phosphodiesterase Inhibitors) PDE inhibitors, steroids, and



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bronchodilators. Salmeterol and formoterol, the two (Long Acting Beta Agonists) LABAs that are currently on the market, have been demonstrated to significantly improve lung function, general health, and symptom relief when compared to placebo and ipratropium.⁶ Rarely are Cystic Fibrosis patients subjected to pulmonary resections such as lobectomy, segmentectomy, and pneumonectomy. The most common indications are localized bronchiectasis/atelectasis, severe hemoptysis, and bronchopleural fistula that is resistant to medical therapy in patients with FEV1 that is larger than 30% anticipated. The primary advantages include a reduction in symptoms and pulmonary exacerbations, as well as an enhancement of quality of life.⁷

Through manual procedures like traditional breathing techniques and breathing strategies like ACBT and Diaphragmatic Breathing technique, which help people with CRD expectorate respiratory secretions and encourage lung ventilation, physiotherapy has traditionally centered on airway clearance therapy. Additionally, a variety of tools may be used, including intrapulmonary percussive ventilation and, more recently, Positive Expiratory Pressure (PEP) devices. There is a significant improvement in mucociliary clearance in individuals who exercise as it accentuates expectoration, improved ventilation, and better gas exchange along with improved aerobic exercise capacity, which has received increasing attention in recent years as an addition or even a replacement for, bronchial hygiene therapy for people with respiratory diseases. While fitness has a strong association with survival and quality of life, physical exercise has been linked to a drop in the rate of respiratory function deterioration over time.⁸

The earliest mention of a halotherapy spa resort dates back to Poland in the eleventh century. Halotherapy has found its way ever since and continues to do so. There are numerous salt treatments available today that can be used as an optional medication. These treatments have various benefits, including the ability to treat skin disorders like dermatitis and dermatitis as well as allergies and asthma.⁹ The bronchial ciliated epithelium's correct operation depends greatly on sodium chloride, which has been shown to have antibacterial, antimycotic, and anti-inflammatory properties. The effectiveness of halotherapy is primarily as a result of a couple of factors: salt has a significant antibiotic effect against several bacteria, fungus, parasites along with an anti-inflammatory effect; it has been proven that the environment in salt rooms is significantly more and salt contains an innate ability to emit negative ions, which balance a positive charge.¹⁰

The International Journal of Respiratory and Pulmonary Medicine published a study in 2015 that claimed the following claims: "In clinical preliminary studies, hypertonic saline inward breath enhanced respiratory symptoms and pneumonic capacity, decreased pneumonic intensifications, and lowered non-attendance from work or school, respectively. Halotherapy (HT; the Greek word "coronas" for salt) is a treatment that involves injecting salt vapor into the upper and lower airways.¹¹

Halotherapy for Chronic Respiratory Disorders (CRD)

Based on the extensive literature search, the following data was extracted pertaining to Halotherapy and its impact on Chronic Respiratory Disorders.

History of halotherapy

Halotherapy (from the Greek halos, meaning salt) utilizes sodium chloride aerosol microparticles to treat respiratory pathologies. It first developed in Salinas as an alternative to speleotherapy (from the Greek: speleos, meaning "cave therapy," which has been practiced in Eastern Europe from the early nineteenth century).^{12,13}

Aerosols that are forced under air pressure to nebulize are used in halotherapy (the Greek word for salt is halos). Halotherapy (from the Greek halos, meaning salt) is the use of dehumidified oxygen or salt aerosol microparticles attached to a face to manage respiratory conditions. It first appeared as a replacement to oxygen masks for speleotherapy (Greek: speleos=cave), a healing technique utilized in Salinas in the eastern part of Europe since the early nineteenth century. The Soviet Union creates and uses "halo chambers," which create the salina microclimates, in the 1980s. Then, the technique is made more widespread, notably in parts of America and Europe.¹⁴⁻¹⁷

The focus shifted to creating "portable" equipment that could be used in homes, hospitals, and even ambulances. Air was breathed and expelled nasally through a "ceramic pipe" that was invented in Hungary and included saline microparticles. A filter cartridge containing saline microparticles was created by the Romanian business TehnoBionic and is used in conjunction with a face oxygen mask to nebulize air or dehumidified oxygen.¹⁸⁻²⁰

Methods and Guiding Principles

Micronized salt (1-5 m) is readily inhaled by the proximal and distal respiratory tracts. At this juncture, it disintegrates in the mucus sol phase that coats epithelial layer of the airway. The targeted osmotic action pulls H₂O from the interstitial area to the airway lumen. As a result, the amount of mucus increases and the inflammatory edema subsides. A mucosal secretion loosens up to a more fluid state and is more readily transported to the cilia of pulmonary epithelial cells, where it is expelled at the pharynx level and expectorated through coughing. Through this straightforward method, Sodium Chloride (NaCl) benefits the respiratory system and reduces the number of symptoms connected to acute respiratory illnesses.^{21,22}

In order to treat CRD, nebulization of salt microparticles in the airway is a therapeutic approach. The approach appears to be effective in treating pulmonary infectious diseases by lowering staphylococcal contamination of the upper respiratory tract in children with respiratory allergies. The procedure's intricate immunomodulatory effects, which normalize the amount of

B lymphocytes, boost IgA levels, and enhance the number and activity of T lymphocytes, could account for the ability to kill bacteria. Even while studies on the impact of halotherapy on various respiratory conditions both acute and chronic have been conducted, the effect is not fully understood and has not been established, despite the fact that it seems to have a positive effect.²³

Based on this idea, halotherapy is a speleotherapy substitute that is used above ground. Inhaling minute salt granules in a regulated space, like a halochamber, is a treatment known as halotherapy. This space aims to replicate the salt cave's natural microclimate. CRD, as well as skin disorders like psoriasis and eczema, have all been shown to improve with halotherapy treatment.²⁴

Halotherapy (HT) imitates the conditions found in a natural salt cave by spreading salt flakes in a regulated air environment. HT varies from hypertonic saline in that it provides dry aerosol microparticles of sodium chloride (1-5 m) as opposed to a wet solution, despite the fact that the principles of the two are comparable. A person will often spend 30 to 60 min at a location that provides HT services, reading or doing something else soothing while getting halotherapy. The upper and lower airways are targeted by the treatment when breathing through the nose and mouth, respectively.^{12,20,14}

METHODOLOGY

The search for this narrative review of literature was conducted in the electronic data of Pubmed, Google Scholar, Science Direct, Medline, Cochrane Library since 2010 using the following terms "cystic fibrosis, halotherapy, physiotherapy management, respiratory disease, salt aerosols. The search yielded 12 studies of which 8 were relevant to the study and included in the review. Articles specifically addressing the effect of halotherapy in respiratory disease were included. In addition, the reference list from published original and review articles were searched manually to identify other published studies. Studies were included if they were performed on chronic respiratory disease patients and specifically treated with halotherapy. Studies were excluded if the full text was unavailable.

Indications for Halotherapy

- Patient of both sexes with age range from 7 to 60 years old; infants and children would require parental supervision.
- Recurrent exacerbations of chronic respiratory diseases, allergies and infections.^{8,10,14}

Contraindications for halotherapy

- A persistent, severe case of CRD without medication therapy.

- CRD characterized by persistent dyspnoea, violent, subintractant convulsions lasting 12-48 hr, resistance to treatment, lack of cough and expectoration, polypnoea, hypoxia, cyanosis, vascular collapse, and somnolence.
- Complex cases involving the heart, kidneys, lungs, and liver.
- Central or peripheral neurologic disorders, epilepsy, cerebral dysfunctions, neurological infections, and brain trauma.
- Severe ear, nose or throat infection.
- Anxiety, depression, and neurosis.
- Complications from comorbidities.²⁵

Positive Effects of Halotherapy

Natural NaCl aerosols are poly-dispersed systems with unique nano-structural features. Depending on the temperature, humidity, and, most crucially, the source, they might show a varied distribution and intensity in the environment. The effectiveness of NaCl sources in reducing respiratory symptoms is the subject of many theories. Some authors contend that natural salt environments, like salt caves and naturally occurring halo-chambers, are significantly more effective, while others think that controlled saline environments, like aerosol devices, provide more effectiveness.²⁶

Halotherapy and other forms of physical therapy can be used together successfully. When used in conjunction with traditional physiotherapy techniques, its efficacy is increased. A step toward a more all-encompassing strategy to treating respiratory and cardiovascular disorders is the synergistic action of halotherapy and physiotherapy. Special salt rooms are used for the treatment, and each one has a halogenerator that evenly distributes the salt throughout the space.^{12,27}

The air in the halotherapy chambers is dry and is comfortable 22° to 24°. Treatment is given in the salt chamber or cave for 45 min which involves breathing salt-infused air that travels to the airways, as well as the nasal cavity, pharynx and sinuses. It is impossible to exaggerate how crucial the low humidity in the space is. There are many different respiratory disorders that can be treated using halotherapy. Its side effects are minimal. It is conducted in a welcoming and friendly environment, which benefits the patients' psychoemotional state. The therapeutic benefits persist for over a year. It is a favoured treatment for a wide range of respiratory disorders since it may be used in conjunction with physiotherapy and drug therapy.^{10,28}

Efficacy of halotherapy

The osmotic effects of sodium chloride in the sinuses, nasal passages, and lower airways may work in HT's favour. Although treating the sinuses with hypertonic saline inhalation by lavage or

nebulization is a different process, it can be utilized to treat the lower airways as well. Hypertonic saline can cause bronchospasm in those who are vulnerable. The sinus problems' improvement could be explained by the salt particles that act on the sinuses and encourage mucus drainage.¹¹

Particularly in the paediatric population, Halotherapy (HT) may serve as an adjuvant in preventing exacerbations, lowering the requirement for repeated drug treatments. In respiratory medicine, halotherapy was first applied in the 19th century due to its useful advantages for patients with respiratory conditions. This discovery created the base for speleotherapy, which uses aerosol therapy in natural environments like salt caverns, and HT, which uses aerosol therapy in any setting that contains salt, like a home device or a surface halo chamber. Through an opposite process, HT can also be used to diagnose bronchial asthma through a bronchial challenge test, which is analogous to physical activity. Additionally, it enhances the local immunological response and possesses bacteriostatic qualities.²⁹ Additionally, HT is only mentioned in current asthma guidelines as a bronchial challenge agent for the diagnosis of asthma.

Limitations of Halotherapy

Several unexplained issues cast a shadow over the optimistic prospects. First of all, the findings' applicability to a larger population is constrained by the research' limited sample sizes. Even though the included studies showed that CRD patients treated with HT recovered quickly, spontaneously, and without the need for a bronchodilator, few studies cannot convincingly refute the concerns regarding the safety of using challenge tests, such as the risk of late exacerbations, uncontrolled infections and the risk of inadvertent bronchospasm with potentially fatal consequences.^{20,30}

Secondly, the majority of research, with a few exceptions, solely examined the short-term efficacy of HT in respiratory patients. As a result, the current recommendations only mention HT as a substitute for airway clearance and bronchial and offer no suggestions regarding the therapeutic or preventive effects of HT in CRD patients.²⁵

RESULTS

The studies included in this review fairly significant impact of Halotherapy on CRDs. Some articles concluded halotherapy as a significant single measure for resolving symptoms of Chronic Respiratory Disorders (CRD), While other studies used it in conjunction with alternative management techniques further improving the work of breathing in patients with CRDs. Significant changes have been seen in Chronic Obstructive Pulmonary Disease (COPD) patients, also improvement in sinus disease in cystic fibrosis patients along with positive effects in asthma.

DISCUSSION

Halotherapy may help CRD patients as a supplement along with the traditional management. There are also obvious tendencies in favour of improved dyspnoea perception, following halotherapy.¹¹

Through the Cl ion's antibacterial impact and activation of phagocytosis, halotherapy has the power to lower the frequency of respiratory infections. For individuals with COPD exacerbations, which are contagious and can be fatal, this is a huge benefit. Additionally, asthma patients who were participating in activities and attending meetings showed a significant reduction in IgE impact as well as an improvement in their humoral and immunological condition.

Halotherapy in mines

Halotherapy can help to improve FEV1 and lessen exacerbation bouts. A vast variety of pulmonary conditions have all been demonstrated to respond favourably to this form of treatment. Improvements in mucociliary movement and clearance, the control and eradication of infections, the regulation of inflammatory responses, the stimulation of the immune system, and the regulation of metabolic mediator activity (regulating and adjusting the serotonin secretion and reducing lipid peroxidation and the imbalance of the antioxidant system) are just a few of the mechanisms put forth to explain the observed therapeutic effects.^{23,24}

CONCLUSION

Halotherapy is a new, cutting-edge intervention that works to prevent respiratory infections by activating phagocytosis and the bactericidal effects of Cl ions. It has also shown promise in treating CRD like bronchial asthma, COPD, and bronchiectasis. This review suggests that halotherapy can be used to treat chronic respiratory diseases with the caveat that further research is needed to determine the mechanism.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

ABBREVIATIONS

CRD: Chronic Respiratory Disorders; **HT:** Halotherapy.

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