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THE EFFECT OF VAPOR/HUMIDIFICATION ON THE REHABILITATION OF ADULT PATIENTS DIAGNOSED WITH COPD: SYSTEMATIC REVIEW

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ABSTRACT

Introduction: Chronic Obstructive Pulmonary Disease (COPD) requires long-term oxygen use. Active humidification is required in patients receiving oxygen above 4 L/min to protect the mucosa.

Aim: The aim is to investigate the effect of vapor/humidification on the rehabilitation of adult, spontaneous breathing patients with COPD.

Method: The study is organized according to PRISMA-P standards. CINAHL, Web of Science, Cochrane Library, PUBMED, Science Direct databases were scanned from beginning to 27.12.2018 in English terms without language limitation. As Cochrane MeSH terms; 'COPD', 'steam', 'COPD and steam,' COPD and humidification ',' COPD and water vapor', 'COPD and moisture', 'COPD and high flow oxygen therapy' were used. 10963 articles have been reached. Repeated studies were conducted with the Mendeley program. Randomized, case-control studies were performed to evaluate. Inclusion criteria were patients who were older than 18 years of age, with COPD diagnosis, spontaneous respiration, the intervention of steam/humidification.

Results: 83 articles were examined in detail and four studies were included. Chatila et al. (2004) suggest that high-flow heat-moisture therapy improves exercise performance and oxygenation; Rea et al. (2010), the positive effects of long-term heat-moisture therapy; Francini et al. (2015), low-flow cold steam/humidification is useless; Cirio et al. (2016) showed that heat-moisture therapy during exercise increases exercise time and tolerance.

Conclusion: According to the findings; adult patients with COPD who had in long or short term hot water vapor have positive effects on respiratory function and mucosal activity in the case of exercise or resting.

1. Introduction

Humidity in the air helps to maintain mucociliary activity properly in the lung tissue. Therefore, the humidity in the air must be at certain values for the maintenance of a healthy lung. Studies investigating the moisture content of the air and humidification of the lungs started in 1965 (1). It is stated that decreased humidity in the air causes damage to the airways by impaired mucociliary activity. At the same time, oxygen is a caustic gas and in the absence of moisture, this effect damages the lung tissue. These situations result in an increase in mortality and morbidity (2).

Chronic Obstructive Pulmonary Disease (COPD) is the fourth most common cause of chronic morbidity (3,4). COPD requires long-term use of oxygen. It is known that oxygen is a caustic gas and damages the tissues. This negative effect is tried to be eliminated by humidification. When oxygen supplied without adequate humidification affects the nose, throat, and lungs. Dry air disrupts mucociliary activity. Dryness in the nose and throat causes nasal pain and intolerance of oxygen treatment. Suitable humidification to the airflow provides a maintain of the mucociliary activity. Mucociliary activity is important in stable COPD patients. In these patients, lung functions are already damaged in different degrees and achieving mucociliary activity is important. Therefore, active humidification is required in patients receiving oxygen above 4 L/min to maintain mucociliary

activity and mucosa. The humidification is applied as cold or hot steam with high or low flow (5,6).

2. Aim

The aim is to investigate the effect of vapor/ humidification on the rehabilitation of adult, spontaneous breathing patients with COPD.

3. Method

This study was organized according to PRISMA-P standards (Figure 1). CINAHL, Web of Science, Cochrane Library, PUBMED, Science Direct databases were used in the study. The databases were scanned from the beginning until 27.12.2018, without any language limitation, using English terms. In the scans, as Cochrane MeSH terms; 'COPD', 'steam', 'COPD and steam,' COPD and humidification ',' COPD and water vapor', 'COPD and moisture', 'COPD and high flow oxygen therapy' were used. 10963 articles were reached. Repeated studies were conducted with the Mendeley citation program. 83 articles were evaluated by a researcher for detailed examination with their headings and abstracts. In the last evaluation, 4 articles were discussed (Figure 1).

3.1. Inclusion Criteria

The articles in which the abstract or full text is reached are discussed. In the systematic review, inclusion criteria are defined according to PICOS (P: Population, I: Interventions, C: Comparisons, O: Outcomes, S: Study designs):

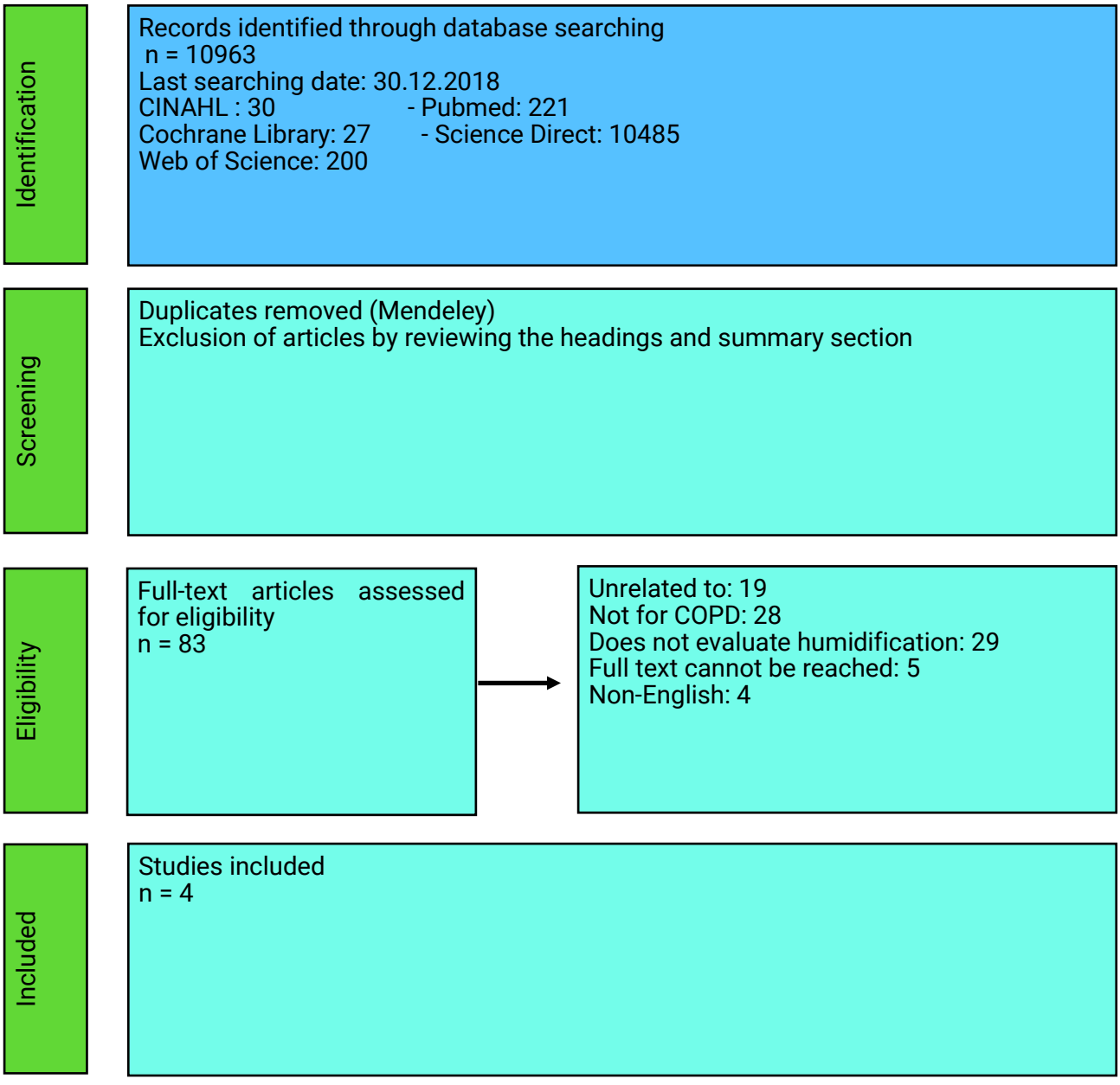

Figure 1: PRISMA flow chart.

Participants: The participants consisted of patients with COPD aged 18 years or older. There is no restriction on gender, socioeconomic status or ethnic origin.
Interventions: Vapor/humidification was applied to patients with COPD in spontaneous respiration.
Comparison groups: Intervention and control group COPD patients were included in the study.
Conclusions: Studies evaluating the status of COPD patients with and without steam/humidification were included.
Study patterns: Randomized, case-control studies are included.

3.2. Exclusion Criteria

Patients under 18 years of age, who were not diagnosed with COPD and had steam/ humidification contraindications, required invasive and non-invasive mechanical ventilation support, were excluded.

3.3. Evaluation of Evidence Quality

Studies taken into the systematic review were evaluated using the critical evaluation checklist (7) for the case studies of the Joanna Briggs Institute (JBI). The evaluation checklist consists of 10 questions and four answer options (yes, no, uncertain, unenforceable).

3.4. Analysis of Data

Data was observed that steam/humidification interventions were different in COPD patients. No meta-analysis could be performed as this diversity is too high. The results of the studies are included in the findings section.

4. Results

The studies included in the review are from 2004, 2010, 2015 and 2016. Chatila et al. (8) included 10 patients with advanced airway obstruction who were diagnosed with COPD, the mean age of the group was 54. They investigated the effect of humidification during the exercise with a 12-minute high-flow oxygen system. The amount of oxygen was kept to a minimum according to the exercise tolerance of the patient. At the end of the intervention, dyspnea complaints were decreased and exercise tolerance was increased. It was found that also the patients' oxygenation was better at rest (8). Rea et al. (9) randomized 108 patients with COPD and bronchiectasis with an average age of 68 years, followed for 3-12 months in terms of quality of life, lung function, exercise capacity, and airway inflammation. They were ventilated with nasal cannula from 20-25L/min with full saturation at 37 °C for 3-5 hours daily. Exacerbations of COPD were twice as high in the control group. People who received hot steam treatment were less hospitalized, but no significant difference was found between groups in pulmonary function tests. In the quality of life assessment, the practice group seems to be better with little difference due to advanced disease. The exercise capacity of the hot steam group was found to be much better than the control group. No treatment-related side-effects or complications were observed during or after treatment. This study of Rea et al. (9) is the longest follow-up study; they pointed out that high flow oxygen and hot steam improved mucociliary activity, increased exercise tolerance and had positive effects of the intervention. Francini et al. (10) observed the effects of long-term nasal low-flow oxygen therapy on mucus and mucociliary activity in 18 patients. In the study, 10 patients with COPD, with an average age of 68 were oxygenated with cold steam treatment and 8 patients without humidification. Patients were tested for mucus activity at 12 hours, 7 days, 30 days, 12 and 24 months. At the end of the study, it was reported that there was no statistical difference between the two groups receiving cold steam and non-humidified oxygen (10). In the study of Cirio et al. (11), 12 patients with COPD underwent high flow oxygen, heat, and moisture therapy with nasal cannula during exercise for 6-10 days for 3 days. At the end of the study, it was observed that the hot steam oxygen therapy during exercise reduced the

complications and symptoms during exercise and the exercise time was increased (11).

In two of the studies, the effect of humidification in the long term was investigated. In the studies, humidification was provided by high flow hot water vapor devices and in one study, low flow cold steam was included. According to the findings of these four studies included in the systematic review; in adult patients with COPD, in the case of exercise or resting, it is observed that the intervention of hot water vapor in the long or short term has positive effects on respiratory function and mucosal activity (Table 1).

5. Conclusion

In this systematic review, we aimed to investigate the effect of vapor/humidification in the rehabilitation of adult, spontaneous breathing patients who were diagnosed with COPD. The study is arranged according to PRISMA-P standards. Inclusion criteria were determined by PICOS. At the end of the evaluations, 4 articles were discussed in detail. According to the findings of the studies included in the systematic review; in adult patients with COPD, hot water vapor support for humidification has positive effects on respiratory function and mucosal activity in the case of exercise or resting, in long or short term technics.

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Table 1. Characteristics of the studies included in the systematic review.

Studies	Total number of cases and control groups	Mean Age	Type of steam/ humidification	Duration of intervention	Intervention time	After intervention	Outcome
Cirio et al. Italy, 2016 (11)	12	70 ± 8	High flow oxygen, heat and moisture therapy with nasal cannula 37 °C medium flow: 58.7 L/ min (Optiflow, Fisher and Paykel Healthcare, New Zealand)	3 days, 6-10 min/day	During exercise	Longer exercise time with less symptom	In adult patients with COPD, heat and moisture therapy during exercise increases exercise time and tolerance.
Francini et al. Brazil, 2015 (10)	18	68	Cold humidification: 2-3 lt/min with low flow nasal cannula	7-30 days, 15-20 hours/day	During rest and daily activities	No difference between cold humidification and control group	The benefit of low-flow cold steam/ humidification was not found in patients with COPD.
Rea et al. New Zeland, 2010 (9)	108	68 ±2	High flow oxygen, heat and moisture therapy with a nasal cannula. 37 °C, 20-25 L/min. (Optiflow, Fisher & Paykel Healthcare, New Zealand)	3-12 months, 3-5 hours/ day	During rest and daily activities	18% fewer exacerbations of COPD, FEV_1 value improvement in pulmonary function tests	Long-term heat and moisture therapy have positive effects in patients with COPD.
Chatila et al. USA, 2004 (8)	10	54 ± 6	Through the mouth, high flow oxygen, heat, and moisture therapy. 37 °C, 20-40 L/min. (Vapotherm device) Low flow oxygen, heat and moisture therapy with nasal cannula: 2-6 L/min	12 min/day	During exercise	Patients with COPD experience less dyspnea during exercise, longer exercise time	In patients with COPD, high-flow heat and moisture therapy improve exercise performance and oxygen levels.

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