



## Short Communication

## Role of Exercise and Nutrients on Chronic Obstructive Pulmonary Disease

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## ABSTRACT

The term COPD stands for Chronic Obstructive Pulmonary Disease is a rising major health problem affecting millions of people globally. It is in the third position globally leading to death in the elderly population. This has become the public health concern with social and economic issues. The various ways to prevent the disease are exercise, diet, pharmacological and non-pharmacological interventions. Hence, this review discusses the role of exercise and nutrients to prevent the disease.

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## 1. Introduction

The chronic obstructive pulmonary disease (COPD) affects the airflow in lungs leading to breathing difficulty. It is asymptomatic and occurs in two forms as chronic bronchitis and emphysema. In chronic bronchitis, breathing tubes were inflamed, cilia are formed on tubes making it harder to take away mucus. Thus, resulting in swelling and blockages in the air flow of lungs. In emphysema, alveoli in lungs were affected, the walls swell and makes the surface tough for air flow.

The symptoms of COPD are irregular shortness of breathing, wheezing, chest stiffness, long-lasting cough, flu, cold, respiratory infections, lack of energy, tiredness, puffiness of the feet, ankles or legs and also weight loss.<sup>1,2</sup> Globally, COPD is a leading causing of morbidity and mortality. It is the 5<sup>th</sup> most common cause of death. Women are more susceptible to COPD when compared to men. In India, COPD affects majority of the population. The prevalence varied from 2 to 22 % among men and 11.2 to 19 % among women.<sup>3,4</sup>

Among varied reasons, cigarette smokers contribute to 85-90 percent, during smoking. During smoking, 7000 chemicals were burned and it triggers the progression of COPD. This leads to wreaking of the lungs, narrowing the air passages, swelling in air tubes and destroys air sacs. Apart from this, air pollution, dust, fumes, chemicals also contribute to COPD.<sup>1,3</sup>

Physical activity leads to good health and is a non-pharmacological and functional intervention in the treatment of COPD. Physical exercise improves the use of oxygen in the body it is defined as any bodily movement produced by skeletal muscles that results in energy expenditure. Exercise training for COPD must be for four weeks to bring a significant change.<sup>5,6</sup> The primary goal of exercise is to restore the patients to the highest level of independent functions. The physiotherapeutic intervention involves physical exercise training, peripheral, respiratory muscle training and breathing exercises. The resistance activity includes progressive-weight training with wrist or ankle weight. Muscle weakness is a common problem and progressive resistance exercise improves the muscle strength but it is not recommended to all the patients who has comorbid conditions.<sup>7</sup> Among all the exercises, aerobic is better tolerated by COPD patients.<sup>8</sup> Therapeutic aquatic

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exercise intervention is known for its ability to prevent and treat different conditions. This intervention is a specialized field of physical training and therapy, used to achieve certain physical and functional goals using the properties of water. Exercise to be avoided during fever, nausea and chest pain.

Aerobic exercise such as walking, biking, swimming uses large group of muscles and during that period there is an increased demand for oxygen leading to increase in heart rate and lung functioning. The centre for Disease Control and Prevention says that, the adults must spend 150 minutes of aerobic exercise per week that allows use of oxygen more efficiently.<sup>9</sup>

Respiratory Muscle Training (RMT) is a technique used for patients suffering from lung related diseases. It involves specific exercises to increase strength and endurance of respiratory muscles. During normal conditions only 10 to 15 percent of lung capacity is used. The RMT exercise increases the lung capacity. The respiratory muscles are strengthened by performing breathing exercise for atleast six weeks.<sup>1</sup>

Pulmonary rehabilitation program is a comprehensive intervention for chronic pulmonary disease patients which include exercise training, education and behavioral changes and that brings positive adherence to both physical and mental wellbeing. It promotes the long-term adherence to health-enhancing behaviours. It is acknowledged as a core component of the integrated care of people with chronic respiratory disease. Pulmonary rehabilitation reduces dyspnea, increases exercise capacity, and improve quality of life.<sup>3</sup> It is an effective and safe method and decreases the frequency of hospital visits. The intervention is based on initial and ongoing assessments, severity, complexities and comorbidities of the disease. It can be started to the patients at any stage. The main goal of pulmonary rehabilitation is minimizing symptom burden, maximizing exercise performance, promoting autonomy, increasing participation in everyday activities, enhancing (health-related) quality of life, and effecting long-term health-enhancing behaviour change. The World Health Organization defines integrated care as “a concept bringing together inputs, delivery, management and organization of services related to diagnosis, treatment, care, rehabilitation and health promotion”.<sup>5</sup> Integration of services improves access, quality, user satisfaction, and efficiency of medical care. Less physical activity leads to loss of muscle function. It helps to overcome breathing difficulties. During exercises, muscles stretches and increases the lung capacity through deep breathing, moving diaphragm and breathing through the belly. purse-lipped breathing also stretches the lung muscles because mouth is larger than the nostrils and more air is taken in.<sup>9</sup>

There is no cure for COPD since, few treatments help to ease out the diseases. when not treated, it leads to heart problems and worsening of respiratory infections. Medications, surgery and oxygen therapy are other forms

of treatment. It is noted that reduction in physical activity contributes to COPD. Physical activities lower oxidative stress, promotes anti-inflammatory effect thereby reducing the respiratory tract infections. Regular exercise strengthens muscles, improve endurance, oxygen is effectively used and reduces shortness of breath. The patient with respiratory tract infections can opt for gardening, golfing and slow walking as these exercises don't overexert the lungs. Several studies found that weight loss improves the symptoms of COPD.<sup>2,9</sup>

In this situation, several studies investigated the role of nutrition in the treatment of COPD. Many experimental and observational studies evaluated the dietary intake of respiratory diseases and found the importance of diet in COPD patients. Epidemiological studies show a positive association of vitamin D and COPD. Sunlight is the major source of vitamin D. The Vitamin D defenses and fight against bacteria to protects the lung from inflammation. Several observational studies on the role of vitamin D in children found their protective role on respiratory diseases.<sup>10</sup>

The plant based dietary intakes such as cereals, beans, fruits, vegetables, nuts, seeds and low to moderate intake of poultry and dairy foods were found to have a protective role for respiratory disease. At present, western dietary pattern consisting of refined grains, red meat, desserts, sweets, high-fat foods, fries, fast foods, salty snack eating and all these patterns contributes to inflammation of the respiratory tract. Studies investigated the fruit and vegetable potential in respiratory conditions and the presence of antioxidants, vitamins, minerals, fibre and phytochemicals in them played a preventive role. Omega-3 polyunsaturated fatty acids from marine foods have anti-inflammatory properties. Experimental studies showed that omega -3 lowers the levels of inflammatory factors.<sup>11</sup>

The pollutants in the atmosphere triggers the formation of reactive oxygen species in the lungs. Similarly, studies clearly show that fruits, vegetables, fat and water soluble vitamins are source of antioxidants which works better on respiratory health by preventing oxidative stress. The varied physical activity also helps the patients to recover. Thus, this article, envisaged the role of nutrition and exercise on the prevention of COPD through various studies.

## 2. Source of Funding

None.

## 3. Conflict of Interest

None.

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