

# Chronic Obstructive Pulmonary Disease and Its Management

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## Abstract

Chronic obstructive pulmonary disease (COPD) is a highly prevalent, life-threatening lung disease worldwide. It represents a complex respiratory disorder characterized by chronic airflow limitation that interferes with normal breathing and is not fully reversible. More than 3 million people died of COPD in 2012, which accounts 6% of all global deaths. More than 90% deaths occur in low- and middle-income countries. World Health Organization predicts that it will become the third leading cause of death worldwide by 2030. The primary cause of COPD is tobacco smoking. The patients present with a variety of symptoms primarily dyspnea, chronic cough and sputum production that impact health-related quality of life. Co-morbidities associated with COPD increases morbidity and mortality. The management of COPD requires integrated care programs based on the individual assessment of the severity of the disease. Most outcomes in COPD can be modified by pharmacological, non-pharmacological and nursing interventions. Therefore, this article aims to provide information about COPD, its causes, symptoms, co-morbidities, exacerbations and its management.

## Introduction

Chronic obstructive pulmonary disease as, “a common preventable and treatable disease, is characterized by airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the airways and the lung to noxious particles or gases. Exacerbations and co-morbidities contribute to the overall severity in individual patients.” Globally, 10%–20% of the populations older than 40 years are COPD sufferers, resulting in more than 3 million deaths each year (Global Initiative for Chronic Obstructive Lung Disease, [GOLD], 2014). It is a highly prevalent disease worldwide. The prevalence is variable between countries i.e. 0.2%–37%, but varied widely across countries and populations by COPD diagnosis and classification methods. Prevalence,

incidence and mortality were greatest in men and those aged 75 years and older. Incidence of disease is rising in the developing world. Almost 90% of COPD deaths were estimated to occur in low and middle income countries. In Nepal, COPD accounts for 43% of the non-communicable disease burden, and 2.56% of hospitalizations (Nepal Health Research Council, 2010). It was found in higher proportions among women (60%), between the aged of 60–69 years (37%) and upper caste groups, during the cold months, and among residents of areas near the hospital in the mid-western region of Nepal (Bhandari & Sharma, 2012).

## Causes

The development of COPD is multi-factorial and the risk factors of COPD include genetic and environmental factors. Alpha1-antitrypsin deficiency is the genetic cause of COPD especially

in the young and it occurs in 1-2 per cent of individuals with COPD (Gooptu, Ekeowa, & Lomas, 2009). The primary risk factor for COPD is chronic tobacco smoking. In the United States, 80 to 90% of cases of COPD are due to smoking. Studies have shown that smokers in Nepal have a 70% greater chance of developing COPD (Nepal Health Research Council, 2010). Though tobacco smoking is established as the primary cause of COPD, indoor air pollution from biomass and/or traditional fuels is estimated to be associated with 0.4 million deaths from acute symptoms. In Nepal, more than 85% of households (98% in rural areas) still rely on biomass fuel (Winrock International Nepal, 2004). Nepalese women are at higher risk of developing COPD through exposure to indoor air pollution; additionally, about 15% of women also smoke tobacco (Ministry of Health and Population, 2012). Outdoor air pollution mainly from emission of pollutants, from motor vehicles and industries are an important public health problem. Other risk factors associated with COPD are occupational exposure to dusts and fumes, previous tuberculosis, maternal smoking, childhood asthma and childhood respiratory infections (Decramer, Janssens, & Miravittles, 2012).

### **Symptoms of COPD and their impact on everyday life**

Pathophysiological changes in COPD are due to the pathological changes seen in central airways, small peripheral airways, pulmonary parenchyma and pulmonary vasculature. Mucus hypersecretion is common in patients with predominant central airway involvement.

The common signs of COPD are barrel chest, pursed-lip breathing, productive cough, cyanosis, tachypnoea, wheezing sound, accessory muscle breathing and clubbing of finger (Nettina, 2011). Patients with COPD present with a variety of symptoms that significantly impair health-related quality of life. The characteristic respiratory symptoms include dyspnea (at rest and during

exercise), chronic cough, sputum production, wheeze and chest tightness (Molen, Miravittles, & Kocks, 2013). Patients report dyspnea to be the most bothersome symptom of COPD, and this is the primary reason for patients seeking medical care. It is also the major cause of anxiety and disability in patient. Symptoms are often worst in the mornings compared with other times of the day causing difficulty in performing daily activities. Patients with COPD also complain frequently difficulty in initiating and maintaining sleep (Scharf, Maimon, Simon-Tuval, & et al., 2011). Generally, patients seek medical help when their COPD symptoms begin to have a substantial impact on their daily lives, either directly or indirectly. Low self-confidence or self-efficacy is also common, which may lead to worsened ability to cope with chronic disease (Pumar, Gray, Walsh and et al, 2014).

### **COPD with Co-morbidities and exacerbations**

Co-morbidities are frequent in COPD that are result from the chronic inflammatory state present in COPD and it significantly impact on patients' quality of life, exacerbation frequency, and survival. It affects more than 80% of older patients with COPD. But the co-morbidities are often under-recognized and under-treated. The majority of studies agree that the most prevalent co-morbidities include anxiety/depression (6% - 74% and 8% - 80%), heart failure (5.3%-24.4%), ischemic heart disease (6.1% - 53%), pulmonary hypertension (10.2% - 91%), metabolic syndrome such as diabetes(10%- 25%), hypertension (2% and 55%), hyperlipidemia (36% and 52%) and obesity (23%). Similarly, osteoporosis ranges from 8.4% to 69%, gastroesophageal reflux disease (7.7% - 30%), lung cancer (9.1%), pulmonary fibrosis (6.1 %), and chronic kidney disease (1.5% - 43%). Several co-morbidities are associated with increased exacerbations (Smith & Wrobe, 2014).

An exacerbation of COPD is an acute event characterized by worsening of the patient's respiratory symptoms that is beyond normal day-day variations and leads to change in medications.

Age and co-morbidity often affect patients' abilities to respond to, adhere to, and tolerate treatment of disease. About 1 in 5 patients hospitalized for exacerbations in the United States are readmitted within 30 days. About 50% of acute exacerbations of COPD are unreported, leading to deterioration in quality of life and contribute significantly to disease burden (Seemungal, Hurst, & Wedzicha, 2009). Patients recovering from COPD exacerbations need interventions to promote self-management skills specific to COPD, address common co-existing clinical conditions and coordinate care.

### Management of COPD

There are two major goals in the management of COPD. The first is to reduce symptoms, resulting in improved exercise tolerance and improved health status. The second is to reduce risk of disease progression, exacerbations and death. The common problems in the clinical management of COPD include recognizing new co-morbidities, determining the impact of co-morbidities on patient symptoms, the concurrent treatment of COPD with co-morbidities, and accurate prognostication. The combination of dyspnea, decreased physical activity, and patients' perceptions of the abnormalities lead to a reduction in health-related quality of life with the most significant factors being dyspnea, depression, anxiety, and reduced exercise tolerance. Therefore, from a patient's perspective, improvement in symptoms and the ability to engage in activities of daily life are extremely desirable goals of COPD management (Molen, Miravittles, & Kocks, 2013).

### Pharmacological therapy:

Pharmacological therapy is used to reduce symptoms, frequency and severity of exacerbations. The drugs for treatment of COPD are inhaled bronchodilators which are the main pharmacological agents that improve symptoms, decrease exacerbations and improve quality of life. Inhaled corticosteroids also reduce the risk of early relapse, treatment failure and

length of hospital stay. Oral theophylline and oral phosphodiesterase-4 inhibitor are also used. Oxygen therapy is indicated for patients with chronic respiratory failure with hypoxemia. Currently, antibiotics are only use for treating infectious exacerbations of COPD and bacterial infections. Antibiotics for 5 to 10 days are prescribed if two of the three cardinal symptoms are observed (Vijayan, 2013). Influenza vaccine can reduce the risk of serious illness and death in COPD patient. Treatment of COPD should follow a stepwise approach in symptomatic patients. Noninvasive ventilation is associated with improved quality of life. Global Initiative for Chronic Obstructive Lung Disease (2014) proposed the model for pharmacological management according to individualized assessment of symptoms and exacerbation based on four different group such as; Group A-patients with few symptoms and low risk of exacerbation. Group B-patients with more significant symptoms but still a low risk of exacerbation. Group C- patients have few symptoms but high risk of exacerbation. Group D- patients have many symptoms and a high risk of exacerbation.

### Non-pharmacological Therapy

Smoking cessation is the pivotal and most effective intervention. It is also well established that pharmacologic treatment together with non-pharmacologic interventions, can effectively reduce the intensity of dyspnea and improve exercise capacity in moderate-to-severe COPD (O' Donnell & Gebke, 2014) and it should be implemented in all patients as early as possible. It has been reported that even 3 min counseling to a smoker enables smoking cessation rates of 5- 10 per cent. For reducing exposure to risk, health care provider is the important to delivery of smoking cessation message and interventions. Advice patient to avoid continue exposure to occupational hazards, reduction of exposure to smoke from biomass fuel, particularly among women and children are the crucial goal to reduce the prevalence of COPD worldwide. Efficient ventilation, non-polluting cooking stoves, use of

fuels and similar interventions are recommended by GOLD (2014).

World Health Organization has stated that patient with COPD should receive integrated care programs which are centered on the patient rather than just the disease. Pulmonary rehabilitation is an integral part of the clinical management and health maintenance of those patients with chronic respiratory disease who remain symptomatic or continue to have decreased function despite standard medical treatment. It is a specific treatment for COPD and also has beneficial effects on anxiety and depression. It reduces symptoms, optimizes functional status, improves activity and daily function, and restores the highest level of independent physical function thereby improving HRQoL (Health related quality of life) even more than pharmacological treatment. Individual counseling is effective in increasing physical activity in inactive people. During hospitalization, most patients spend the majority of time in bed and nutritional status often deteriorates, accelerating muscle wasting. Hospitalization for acute exacerbation of COPD causes marked inactivity and a loss of muscle strength. Therefore, early mobilization, early rehabilitation and providing nutritional support may reduce the incidence of hospitalization-associated disability by improving exercise capacity (Almagro & Castro, 2013).

### Psychological Therapy

Psychosocial factors play an important role in COPD. Due to the chronic and progressive characteristics of disease, patients are not only physically limited, but often show great reductions in their psychological and social functioning. Management of psychological problems in COPD remains poor. The psychological therapy includes relaxation, cognitive behavioral therapy (CBT) and self-management. These are useful in the treatment of depression and anxiety (Pumar, Gray, Walsh, and et al., 2014). Additionally, patient education for self-management at hospital, discharge planning from hospital to home, and exercise prescription during hospital stay

have demonstrated benefits in patients hospitalized for COPD (Monnikhof, Valk van der, Palen, & Van der, 2003). Self-management programs includes “any formalized patient education programme aimed at teaching skills needed to carry out medical regimens specific to the disease, guide health behavior change, and provide emotional support for patients to control their disease and live functional lives.” to develop patients’ coping skills to maintain as active lifestyle as possible, promote correct use of drugs, and encourage the early identification of increasing symptoms including an exacerbation so that they can be treated early (Almagro & Castro, 2013).

Non-adherence is a common behavioral pathway of co-morbid psychological symptoms in COPD. According to WHO, adherence to long-term therapy for chronic illnesses in developed countries averages 50%. Strategies to enhance adherence include simplifying the dose, choosing the inhaler device on the basis of patient characteristics, involving caregivers or family members as a useful support to care, providing information in both written and verbal forms, and establishing a good patient–physician relationship (WHO, 2003). Beside this routine follow up, monitoring for development of complications and exacerbations are also essential as lung function can expected to be worsening over time even with best available care. These different strategies for disease management have shown a 40% reduction in COPD hospitalizations and consultations at the emergency department (Almagro & Castro, 2013).

### Nursing Interventions

Nurses play a key role in the accurate diagnosis, initiation of appropriate interventions; assess the response to and acceptance of therapy, discharge planning, post-discharge care and in the development of patient education protocols. The assessment of COPD is required to determine the severity of disease, its impact on the health status and the risk of future events (e.g. exacerbations, hospital

admissions or death) and this is essential to guide therapy. Nursing assessment includes obtaining history regarding smoking, exposure history, positive family history of respiratory disease, onset of dyspnea, noting amount, color and consistency of sputum. Assess the use of accessory muscle breathing. Auscultate for the decrease or absent of breath sound, crackles and decreased heart sound. Determine oxygen saturation, pulse and respiratory rate at rest and with activity and provide oxygen therapy. The nursing interventions should focus on: Improving airway clearance, breathing pattern and gases exchange, controlling infection, improving nutrition, increasing activity tolerance, improving sleep pattern, enhancing coping and educating the patient and visitors (Black & Hawks, 2009 and Nettina, 2010). Beside this nursing care includes risk-reduction measures like smoking cessation, influenza and pneumonia vaccinations, pulmonary rehabilitation, self-management support and follow-up care.

### Conclusion

COPD is a chronic respiratory disease characterized by a decline in lung function over time and accompanied by respiratory symptoms, primarily dyspnea, cough, and sputum production. It is a multi-component, multi-factorial and heterogeneous disease. The presence of symptoms and exacerbations have significant impacts on mortality rate, exacerbation rates, hospital length of stay, quality of life and functional status. The treatment of COPD includes bronchodilators, inhaled corticosteroids, oral theophylline and oral phosphodiesterase-4 inhibitor and antibiotics are used for patient with exacerbations. In addition to drug treatment, several non-pharmacological therapies have been found to be useful in improving symptoms and quality of life in patients with COPD having multiple co-morbidities. Psychological therapies with nursing interventions are the key in the management of disease. A more multidisciplinary approach including pulmonary rehabilitation and individualization of these interventions is crucial in

the management of COPD patients. It is achieved by considering the patient's current symptoms, the severity of spirometric abnormality, the exacerbation risk and the presence of co-morbidities separately.

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