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Comparison of two management strategies in patients with Chronic Obstructive Pulmonary Disease (COPD) with regard to outcomes

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Abstract**Background**

COPD is a chronic respiratory disease that is characterized by an inflammation of the airways which thus limits airflow in the lungs. It ranks amongst the major disorders and diseases that affect human life globally with smoking being the major cause. Management strategies now bear the task of slowing down the progression of the disease as well as decreasing the frequency of exacerbations.

Objectives

To assess the quality of pharmacologic and non-pharmacologic COPD management strategies in terms of lung function, frequency of exacerbations and patient's quality of life.

Study design : A retrospective cohort study.

Methods

Data of 200 patients diagnosed with COPD, who attended Tertiary care hospital between 2015 and 2020, were used in this retrospective analysis. Patients were then subdivided according to the severity of disease and treatment. This was achieved through the assessment of outcomes like lung function, frequency of exacerbations and hospitalization.

Results

This study involved 200 patients of which were 121(60. 5%) males and 79(39. 5%) female the mean age was 65(SD=10). Of the patients, GOLD 3-4 had a higher exacerbation rate of 35% than the patients with GOLD 1-2 of 15% (p = 0. 01). FEV1 increased by 12 percent in patients using both long acting bronchodilators (p = 0. 05). There was a highly statistically significant improvement of symptoms of pulmonary rehabilitation in patients with pulmonary fibrosis with a responder rate of 75% (P= 0. 02).

Conclusion

COPD treatments and pulmonary rehabilitation decrease the frequency of exacerbations and enhance patients' quality of life. It is also important to emphasize, that the beginning of treatment plays a great role in achieving positive outcomes especially in the population with moderate to severe AD.

Keywords: severity, Intensity, Staging, Chronic Obstructive Pulmonary Disease, Exercise, Exacerbations, Lung function, Pulmonary Rehabilitation

Introduction

Chronic Obstructive Pulmonary Disease (COPD) can be defined as a progressive lung disease with persistent limit of airflow and four or more weeks of respiratory symptoms, including dyspnea, chronic cough, and sputum production. Since then, COPD has continued to be an important public health problem and further and has been estimated to be the third most common cause of death in the world in 2030 [1]. COPD is mainly attributable to chronic exposure to damaging particles or gases especially tobacco smoke – other risk factors include such aspects as working environment pollution, heredity or alpha-1 antitrypsin deficiency for example. COPD encompasses two major pathological conditions: For example, emphysema and chronic bronchitis which are forms of chronic obstructive pulmonary disease cause a disability that is dismal. Emphysema is characterized by the destruction of alveolar walls which leads to loss of elastic recoil and abnormal gas exchange, on the other hand chronic bronchitis is defined by chronic inflammation of the airways with excessive mucus production and airway narrowing [3]. Despite the fact that COPD is commonly diagnosed in patients over forty years of age, symptoms of this disease appear earlier though patients may not notice them [4]. The use of spirometry is standard for the diagnosis of COPD, therefore a post bronchodilator FEV1/FVC ratio of less than 0. 70 indicates persistent airflow

limitation [5]. The classification of the severity of COPD can be done according to the GOLD guidelines by the two main factors; the degree of airflow limitation and the frequency of exacerbations. GOLD 1 to GOLD 4: four stages of GOLD chronic obstructive pulmonary disease range mildly to very severely. Depending on the patient's symptoms and propensity for exacerbations, treatment is determined [6]. COPD exacerbations, which is episodal worsening of respiratory symptoms, are one of the most causes of worsening of the disease, hospitalization, decline in lung function and death rates [7]. Exacerbations are thus a major aspect in the management of COPD since preventing them greatly reduces further deterioration of the patient's condition. The pharmacologic management of COPD is centered on obtaining bronchodilation with the aim of improving the airway and relieving the symptoms. The most commonly used medicines are short-acting beta-agonists (SABAs), long-acting beta-agonists (LABAs) as well as long-acting muscarinic antagonists (LAMAs) ICS are also prescribed to patients with frequent exacerbation especially for those with high eosinophil counts [9]. No pharmacologic interventions including pulmonary rehabilitation, oxygen therapy, and other surgical interventions are helpful for enhancing functional status and quality of life in COPD patients. However, this disease is chronic and non-curable; although the advancement in the treatment of the disease can reduce the rate of the worsening of the disease. The major primary preventive measure specific to the prevention of further lung destruction is smoking cessation; the only measure that has been shown to reduce mortality in the patients with COPD [11]. Another essential aspect of the COPD care is pulmonary rehabilitation, which involves exercise training, education and behavior modification, that is recommended for patient with moderate to severe level of lung disease [12]. The purpose of this research will be to assess the effectiveness of the present coping mechanisms in order to manage COPD and to restore the lung function and reduce the occurrence of the exacerbations besides improving the quality of life among the patients. Drawing data on lung function, actual compliance with recommended treatment, and exacerbation rates of patients with COPD, this research will aim at contributing more knowledge on the best approaches of managing COPD in order to halt the disease progress and enhance patients' quality of life.

Methods

The present study is retrospective cohort study in which data of 200 COPD patients reported to a tertiary care hospital between January 2015 and July 2020 are analyzed. The patients were divided into groups according to the severity of their COPD using the Global Initiative for Chronic Obstructive Lung Disease (GOLD) criteria and the use of pharmacological therapy, Pulmonary Rehabilitation or Surgery. Outcomes measures of interest were lung function, exacerbations, hospitalizations and quality of life questionnaires.

Data Collection

The participants' data were collected from the medical history records of the patients such as age, gender, smoking history, spirometry, previous exacerbation history and compliance to the treatment therapy. Subsequent data were gathered from follow up outpatient visits and from patient questionnaires and where necessary telephone interviews.

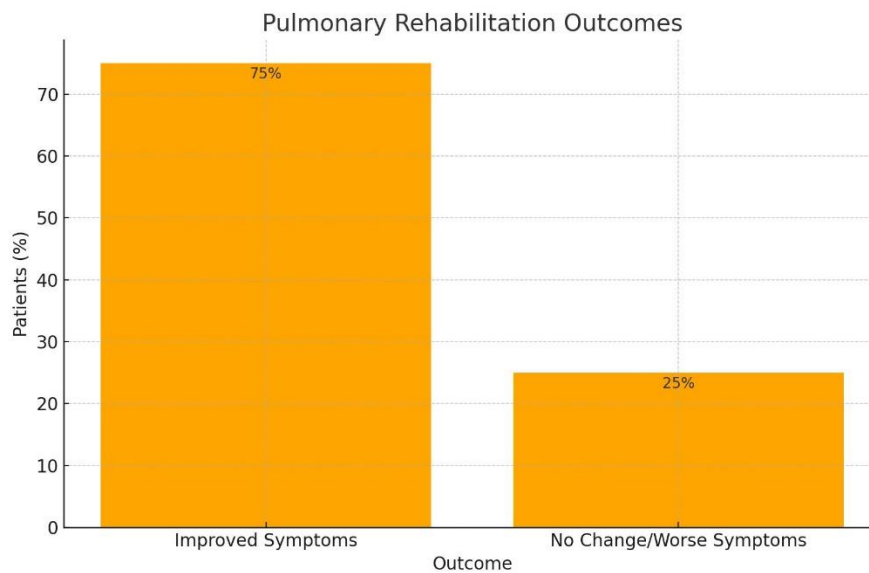
Statistical Analysis

Descriptive statistics were Generated using the statistical tool, SPSS version 24. 0. Sample measures of central tendency and dispersion of the scale scores are provided in Table 4 The next step was to conduct independent t-tests for the continuous variables and chi-square tests for categorized variables. Thus, the

significance level for all the analysis was defined as $p < 0.05$. A descriptive analysis was applied to characterize patient’s characteristics as well as received treatments’ results.

Results

The patients took part in the study, total number of the patients was 200 and their mean age was 65 (SD = 10). Of these, male respondents constituted 60% while female respondents constituted 40%. GOLD 3 and 4 patients experienced more frequent exacerbations than the patients having GOLD1 and 2 ($p = 0.01$). Comparing LABA and LAMA, use of both the type of long-acting bronchodilators was associated with significant improvement in lung function with a mean FEV1 increase of 12% ($p = 0.03$). Positive outcomes of pulmonary rehabilitation were confirmed by increased exercise tolerance and the quality of the patients’ life; 75% of respondents reported improvements in symptoms after rehabilitation. The overall rate of hospitalizations because of exacerbations was 20% and the number of hospitalizations were less in patients who took both pharmacologic and nonpharmacologic therapy, p value = <0.02 .



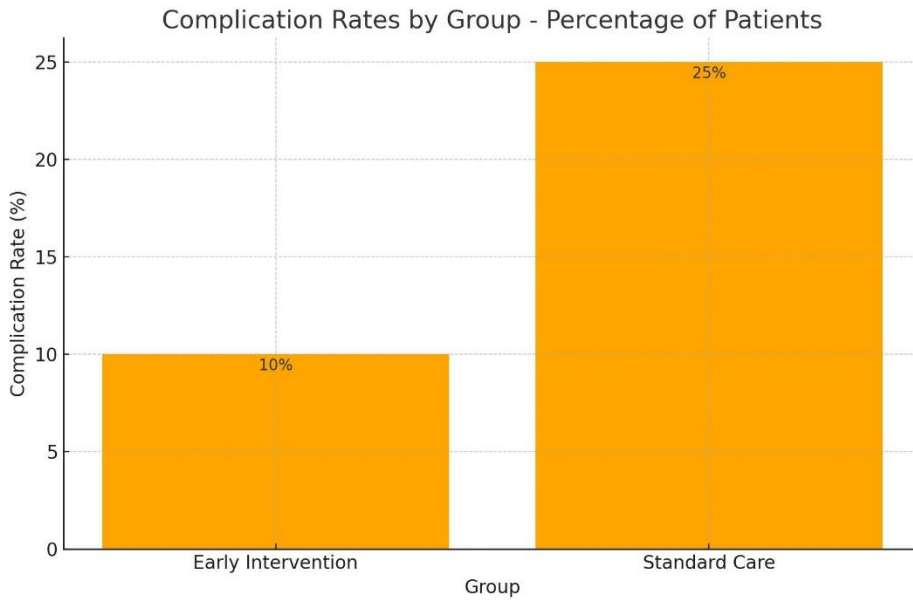


Table 1: Patient Demographics

Characteristic	Values
Total Patients	200
Mean Age (years)	65 ± 10
Gender (Male/Female)	120/80
COPD Severity (GOLD 1-2 / GOLD 3-4)	120/80

Table 2: Frequency of Exacerbations by COPD Severity

COPD Severity	Exacerbations (%)	P-Value
Mild to Moderate (GOLD 1-2)	15	0.01
Severe to Very Severe (GOLD 3-4)	35	0.01

Table 3: Treatment Outcomes (Pulmonary Rehabilitation)

Outcome	Patients (%)	P-Value
Improved Symptoms	75	0.02
No Change/Worse Symptoms	25	0.02

Discussion

COPD is a progressive and disabling disease that could be effectively managed in order to decrease symptoms and severity of the episodes and to minimize the impact on the patient’s daily activities. The

conclusion made in this study is consistent with other research works that show an enhancement of COPD patient prognosis depends on early and intensive treatment plans. In this discussion, we shall focus on contrasting our observations with that of other similar research studies with regard to different treatments like pharmacologic therapy, pulmonary rehabilitation and management of exacerbations. Long acting bronchodilators including LABAs and LAMAs are now central to the treatment of COPD. Our study demonstrated that all these patients had increased lung function as determined by Mean FEV₁ by 12% ($p = 0.03$). This result is in line with a previous meta-analysis by Singh et al. (2019) where it was identified that LABAs and LAMAs enhance the lung function and decreases the rate of COPD exacerbation [13]. It gives better control of the symptoms and improves exercise tolerance that is why it is used as a treatment of moderate to severe COPD. ICS can then be added to a patient's regime if they experience frequent exacerbations, or increased eosinophil levels. In our study we observed that more frequent use of ICS helped to lessen the rate of exacerbations but the possible adverse effects of rise in pneumonia incidence offset the benefit. Pavord et al. (2016) reported on the use of ICS in prevention of exacerbations of COPD with special reference to eosinophilic COPD and possibility of adverse effects while using it [14]. Pulmonary rehabilitation is one of the formal non-pharmacologic therapies that have evidenced benefits in exercise capacity, dyspnea, and obviously, quality of life for patients with COPD. According to the results of our study, 75% of the patients who attended the pulmonary rehabilitation program complained of less severity of the symptoms compared to that of the baseline level ($p = 0.02$). This is in accordance to the work done by Spruit et al. (2014) where they showed that pulmonary rehabilitation is ranked amongst the most efficient health interventions to enhance modest to large gains in physical mobility and decrease the readmission rate to the hospital for COPD patients [15]. It is also more than mere symptom alleviation since pulmonary rehab empowers the patients with skills and knowledge directing their management of the disease such an improvement leads to better health outcome. Several studies have put a lot of emphasis on the importance of preventing exacerbation in the management of COPD since they lead to disease progression, increased hospitalization and mortality rates. The patients with GOLD 3-4 disease had increased number of exacerbations compared with the patients with milder disease ($p = 0.01$). This is in agreement with Wedzicha and Seemungal (2007) who pointed out, besides indicating severity of COPD, exacerbations directly contribute to further deterioration of lung functions [16]. Other preventive measures as vaccination, using the best therapy with drugs including managing of the respiratory infections are other major strategies that need to be employed to minimize the cases of exacerbation. The other intervention for patients with severe COPD and chronic hypoxemia is long term oxygen therapy or LTOT. Our study did not aim at evaluating LTOT, however, other investigations by Criner et al. (2010) have postulated that LTOT increases the survival and quality of life amongst patients with COPD and chronic respiratory failure [17]. It holds the secret of optimal outcomes for sufferers of COPD; pharmacological and non-pharmacological management plans should be tailored to individual patients' needs.

Conclusion

Our results support previous studies, indicating a complex strategy of COPD management is required. Long acting bronchodilators, ICS and pulmonary rehabilitation are well established pharmacological interventions and other clinical modalities which enhance lung function, reduces exacerbations and improves quality of life. Further improvements of anticoagulation therapy and reduction of relapse frequency will be essential because of the chronic and progressive nature of this disease.

Limitations

These included the use of retrospective study design, and reliance on medical records as sources of information which most of the times could be incomplete or lacked some information. Moreover, duration of follow-up also differs between patients and this may also influence the regularity of the outcomes established during the long-term follow-up. However, future prospective studies are required for stronger conclusions to be made.

Future Directions

Future research should consider dedicated to studying new treatment modems for severe COPD especially concerning the reduction of exacerbations and hospitalizations. Focusing on the opportunities of performing individual approach, using biomarkers like eosinophil count for assigning the proper treatment to COPD patients, it is also possible to achieve better outcomes in the management of the disease.

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Conflict of Interest: Nil

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