Original Research Article

Evaluation of nutritional status in patients with chronic obstructive pulmonary disease in Government Dharmapuri Medical College, Dharmapuri

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Abstract

Introduction: Chronic Obstructive Pulmonary Disease (COPD) is a major cause of chronic morbidity and mortality throughout the world. It is a preventable and treatable disease with some significant extra pulmonary effects that may contribute to severity in individual patients. It is characterized by airflow limitation that is not fully reversible.

Aim of the Study: To determine whether Chronic Obstructive Pulmonary Disease is associated with malnutrition, to determine whether there is a relation between the degree of malnutrition and severity of airflow obstruction and to determine whether the severity of airflow obstruction correlates with biochemical markers of visceral protein stores (Serum albumin and Serum prealbumin).

Materials and methods: Out of 102 patients initially enrolled for the study, 50 patients were selected. Others were excluded as per exclusion criteria. The patients were defined as having COPD based on GOLD criteria with spirometer showing, post bronchodilator FEV1 / FVC ratio <0.70. The analysis was restricted to patients in the age group of 40 – 60 years. All the patients chosen were smokers and all the patients were males. For each subject, medical history was obtained and clinical examination was done. All subjects had a baseline blood sugar value and renal function tests. On the study day, height and weight were measured.

Results: Of the 50 patients in the study, 12 (24%) had mild airway obstruction, 25 (50%) had moderate airway obstruction, and 13 (26%) had severe airway obstruction. The difference in the degree of airway obstruction among the different age groups was not statistically significant. There

was a statistically significant difference between the Serum Prealbumin level and degree of airway obstruction among all three groups. 9 (18%) patients in the study were found to have a Serum albumin level of less than 3.5g%. Of these, 1 patient had moderate airway obstruction and 8 had severe airway obstruction.

Conclusion: As the study is designed as a cross sectional study, the present analysis will be unable to elucidate the prognostic indications of the nutritional indices. The patients were on different durations of treatment and different drugs. These may have an effect on the findings of the study. Spirometer is a user dependent method of assessment and may not always accurately assess the degree of airway obstruction.

Key words

Chronic Obstructive Pulmonary Disease, Serum albumin and Serum prealbumin, Spirometer.

Introduction

Chronic Obstructive Pulmonary Disease is a major cause of chronic morbidity and mortality throughout the world. Many people suffer from this disease for years and die prematurely from it or its complications [1]. COPD is the fourth leading cause of death in the world, and further increases in its prevalence and mortality can be predicted in the coming decades. Worldwide, cigarette smoking is the most commonly encountered risk factor for COPD, although in many countries, air pollution resulting from the burning of wood and other biomass fuels has also been identified as a COPD risk factor [2]. The chronic airflow limitation characteristic of COPD is caused by a mixture of small airway disease (obstructive bronchiolitis) and parenchymal destruction (emphysema), the relative contributions of which vary from person to person [3]. Nutritional depletion is a prevalent finding in patients who have COPD. Several studies have demonstrated that under nutrition is an independent predictor of all cause and respiratory morbidity and mortality in COPD and has an additive effect with other factors that increase mortality [4]. Investigators have identified a positive correlation between body weight and the Forced Expiratory Volume in the 1st second. Even among stable COPD patients there is a high proportion of under nutrition [5]. COPD patients are at risk of weight loss and nutritional deficiencies because of a 15 to 25% increase in resting energy expenditure from breathing; a higher energy cost of daily activities;

reduced caloric intake relative to need because of dyspnea; and the catabolic effect of inflammatory cytokines such as TNF-α5.At the same time, excessive weight gain must be avoided as excessive body weight can lead to a decreased pulmonary reserve. The exact prevalence of malnutrition in COPD is currently unknown because there is no diagnostic method that serves as a reference and no widely accepted definition. Various biochemical parameters that reflect the level of visceral protein in the body have also been used in assessing the severity of malnutrition [6]. The present study attempts to determine if there is an association between the degree of malnutrition and severity of airflow obstruction.

Materials and methods

The study was conducted in Outpatient clinics at Department of Thoracic Medicine Madras Medical College and Government General Hospital Chennai. Ethical Committee Approval obtained. Period of Study was from June 2007 To September 2008.Total Sample Size was around 50 Cases. Informed consent was obtained from all patients participating in the study.

Inclusion criteria

- Patients diagnosed to have Chronic Obstructive Pulmonary Diseases as per GOLD criteria.
- Patients in the age group 40 – 60 years.
- Patients on treatment for less than one year.

- Patients not on corticosteroid.

Exclusion criteria
- Patients with exacerbation of symptoms <2 months prior to study.
- Patients with diabetes mellitus. Critically ill patients.
- Female patients.
- Patients with pulmonary tuberculosis.
- Patients who are unable to perform spirometer.

Out of 102 patients initially enrolled for the study, 50 patients were selected. Others were excluded as per exclusion criteria. The patients were defined as having COPD based on GOLD criteria with spirometer showing, post bronchodilator FEV1 / FVC ratio <0.70.The analysis was restricted to patients in the age group of 40 – 60 years. All the patients chosen were smokers and all the patients were males. This was done to ensure uniformity of analysis (standards for variation of prealbumin between various age groups and gender are not available).For each subject, medical history was obtained and clinical examination was done. All subjects had a baseline blood sugar value and renal function tests. On the study day, height and weight were measured. Weight was measured to the nearest 100 g. Height was measured to the nearest mm using a stadiometer. Body Mass Index (BMI) was calculated using the formula: BMI = Weight (kg) / Height $(m)^2$. Spirometer was performed using standard equipment at the outpatient departments of Department of Thoracic Medicine, Government General Hospital and at Institute of Thoracic Medicine. FEV1 / FVC ratio of <0.70 was used to define airflow obstruction. Mild, moderate and severe airflow obstructions were defined as FEV1 >=80% predicted (stage 1 of GOLD classification), 50 – 80% predicted (stage 2a) and <50% of predicted (stage 2b and 3) respectively. Serum prealbumin was done at a private lab using standard immune turbid metric method100.The method gives a reference value of 20 – 40mg%. Serum albumin was measured using spectrophotometric method101.The reference value was 3.5-5 g/dl.

Table - 1: Study Population Characteristics.

Parameter	Mean	S.D
Age	51.32 years	5.85
Weight	55.1 kg	11.1
Height	1.60 m	0.07
Midarm circumference (MAC)	22.9 cm	3.6
Triceps skinfold (TSF)	1.31 cm	0.43
Body Mass Index (BMI)	21.40	3.56
Madam Muscle Circumference (MAMC)	18.9 cm	2.38
Mid arm Muscle Area (MAMA)	28.9 cm^2	7.40
Midarm Fat Area (MAFA)	14.2 cm^2	7.36
Fat/Muscle Ration (F/M)	0.47	0.11
Prealbumin	29.41mg%	7.98
Albumin	3.8g%	0.39
FEV$_1$	65.6%	15.52

Results

The average age of the study population was 51.32 years (**Table – 1**). Most of the patients (62%) were in the age group between 50 and 60 years. Of the 50 patients in the study, 12 (24%) had mild airway obstruction, 25 (50%) had moderate airway obstruction, and 13 (26%) had severe airway obstruction [7]. The difference in the degree of airway obstruction among the different age groups was not statistically significant. There was no significant difference in prealbumin value among different age groups. There was no significant difference in serum albumin among different age groups. There was a significant difference in BMI value in patients with severe airway obstruction as compared to those with mild and moderate obstruction. However, the difference between the first two groups (mild and moderate obstruction) was not statistically significant. There was a significant difference in MAMA value in patients with severe airway obstruction as compared to those

with mild and moderate obstruction. However, the difference between the first two groups (mild and moderate obstruction) was not statistically significant. There was a significant difference in MAFA value in patients with severe airway obstruction as compared to those with mild and moderate obstruction. However, the difference between the first two groups (mild and moderate obstruction) was not statistically significant. There was a statistically significant difference between the Serum Prealbumin level and degree of airway obstruction among all three groups. There was a statistically significant difference between the Serum Albumin level and degree of airway obstruction among all three groups. Out of the 50 patients, 14 (28%) were found to have a BMI<18.5 (under nourished status). Of these, 3 had moderate airway obstruction and 11 had severe airway obstruction [8].

Discussion

Several relevant observations were made in the present study. Comparisons of the present study with previous studies are difficult because the criteria for malnutrition are not universally accepted [9]. The average age of the study population in the present study was 51.32 years. In a similar study done by Soler, et al. [4], the average age was 69 years. The patients in the present study were in the age group of 40 to 60 years [10]. This was chosen because the FEV1 has been found to progressively decrease as the age advances. The selection of the patients within a narrower age group was done to ensure uniformity in the study group. IN the study, there was no statistically significant difference in the various nutritional parameters and biochemical parameters among the different age groups [11]. The average FEV1 of the population in the present study was 65.6 (percent predicted) compared with 44.6 (percent predicted) in the study by Soler et al The population was divided into mild, moderate and severe airway obstruction based on GOLD criteria1.In the present study, 12 (24%) patients were found to have severe obstruction with FEV130-50%, 25 (50%) patients had moderate airway obstruction

with FEV1 between 50-80%, and 13 (26%) had mild airway obstruction with FEV1 [12]. Patients with FEV1 of <30% were not selected as these patients had frequent exacerbations of symptoms FEV1 did not vary significantly among the different age groups [13]. In the present study, a correlation was found between a lower BMI and the severity of airway obstruction. BMI of less than 18.5, which is considered as under-nutrition in general population 102 was found in 14 (28%) patients. Of these 3 were having moderate airway obstruction and 11 were having severe airway obstruction There was no statistically significant difference in the BMI between groups with mild and moderate airway obstruction [14]. There was a significant difference in the mean BMI between the population with severe airway obstruction and the above two groups . The present study found a substantial correlation between low BMI and severity of airway obstruction of 0.75 [15]. The average triceps skinfold thickness in the present study population was 1.31 cm (**Table - 1**). Although there are no standards, population studies have found a value of 0.9 – 2.1 cm. Serum prealbumin and serum albumin was used as the measures of visceral protein in the present study [16]. The average prealbumin value in the study population was 29.41 mg/dl (**Table - 1**). The present study showed an inverse correlation between the level of prealbumin and the severity of airway obstruction (with a correlation coefficient of 0.76) [17]. There was a statistically significant difference in the average values between the three groups of airway obstruction (mild, moderate and severe) Studies done previously have demonstrated that prealbumin is not an accurate marker for malnutrition in various disease states, as it is influenced by other factors. The present study however, demonstrated that there is a significant correlation between severity of airway obstruction and decrease in serum prealbumin [18].

Conclusions

A significant number of outpatients with Chronic Obstructive Pulmonary Disease were found to be

undernourished. The anthropometric measures of nutrition (Body Mass Index, Body muscle mass, Body fat stores) were related inversely with the degree of airway obstruction. Measures of visceral protein stores (Serum prealbumin and Serum albumin) correlated inversely with severity of airway obstruction [19, 20].

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