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Original article

AN OBSERVATIONAL STUDY ON THE RELATIONSHIP BETWEEN NUTRITIONAL STATUS, SERUM IL-6 AND CRP LEVELS IN PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE AND ITS CORRELATION WITH DISEASE SEVERITY.

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Abstract

Background :

Chronic obstructive pulmonary disease (COPD) is an inflammatory disease that affects the entire body. We examined whether serum inflammatory markers, C-reactive protein (CRP), leptin, and nutritional status (as measured by serum levels of prealbumin and anthropometry) were associated with COPD severity.

Methods :

This hospital-based observational study was conducted on patients with chronic obstructive pulmonary disease (COPD) from Barpeta and the adjacent areas who were attending the Medicine Department of Fakhruddin Ali Ahmed Medical College and Hospital. From September 1, 2020, to August 31, 2021, a total of 60 cases were examined.

Results :

The majority of the cases were between the ages of 51 and 70. The preponderance of the 60 cases in the study, or 71.67 percent, were male. In the age range of 61 to 70, the prevalence of exertional dyspnea and the severity of COPD were the highest.

Conclusion :

As the severity of COPD increased, so did the concentration of inflammatory markers in the serum and the nutritional status of the patients.

Keywords: Chronic obstructive pulmonary disease, C-reactive protein, inflammation, leptin, nutrition, prealbumin, Submitted: 2023-06-23 Accepted: 2023-06-25

1. Introduction:

COPD is a systemic inflammatory disorder associated with extrapulmonary effects that affect the disease's progression and prognosis [1, 2]. Systemic inflammation is responsible for a variety of COPD complications, including atherosclerosis, cachexia, anorexia, and osteoporosis. The procedure leading to the development of COPD is diverse. Several mechanisms, including apoptosis, cell proliferation, the release of metalloproteinases, and fibrosis of the small airways, contribute to the development of advanced diseases, autoimmune disease, and activation of dendritic

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cells and T-helper cells [3, 4]. During the period of exacerbation, macrophages cannot consume apoptotic cells and bacteria. Inflammation results in the activation of inflammatory cells and the release of various inflammatory mediators, including IL-8, IL-6, and TNF-a [5, 6]. These mediators can degrade lung structure and stimulate neutrophil inflammatory response. In order to prevent these complications, suppression of inflammation is one of the primary stages in COPD treatment [7].

Studies of available data indicate that COPD-related morbidity increases with age, and that patients with COPD may develop comorbidities at an earlier age. Other chronic conditions, such as musculoskeletal disorders, cardiovascular disorders, and diabetes mellitus, which are associated with smoking, ageing, and COPD, may influence COPD morbidity [8, 9, 10, 11]. These are the leading causes of hospitalisations and substantially deteriorate patients' health, making COPD management even more challenging [12].

Patients with COPD are more likely to develop cardiac problems, lung cancer, and a variety of other conditions. COPD, despite being a progressive disease that worsens over time, is treatable. With proper treatment, the majority of patients can attain symptom control. Newer therapeutic targets for the treatment of chronic inflammatory states and the early management of exacerbations may reduce systemic effects and organ injury [13]. This observational study aimed to determine whether disease severity was associated with a significant rise in CRP and serum IL6 levels [14]. Additionally, the various parameters of a patient's nutritional status are evaluated, and changes in these parameters are noted as disease severity increases. This may result in a consensus on treatment protocols based on these levels during acute or chronic COPD, which may lead to the early detection and rehabilitation of these patients.

2. Methods:

2.1. Study sample and location:

It is a hospital-based retrospective observational study of patients with chronic obstructive pulmonary disease from Barpeta and the adjacent areas who attend the Medicine Department of Fakhruddin Ali Ahmed Medical College and Hospital in Barpeta, Assam, India. In the Department of Medicine, FAAMCH, Barpeta, the collected data were compiled and evaluated. The study's methodology and the materials utilised in the study are described in detail below.

The inclusion and exclusion criteria were applied to 60 COPD cases attending the Department of Medicine that met the inclusion and exclusion criteria. The sample size was determined using purposive sampling, with consideration for the study's purpose and practicability (since the study requires lab labour). From September 1, 2020, to August 31, 2021, this study was conducted in the FAAMCH Department of Medicine on both OPD and IPD patients.

2.2. Inclusive criteria:

- Patients above 40 years of age attending the Medicine Department, FAAMCH and giving consent for study.
- COPD patients diagnosed by physical examination and radio imaging and confirmed by spirometric examination. On spirometry, patients with FEV1/FVC <0.7 and <12% Broncho reversibility post bronchodilation were taken in the study.

2.3. Exclusive criteria:

- Patients below 40 years of age
- Patients in exacerbation.
- Patients with comorbid conditions that can affect the nutritional status like hypothyroidism and hyperthyroidism, malignancies and diabetes mellitus
- Patients with established diagnosis of bronchial asthma, bronchiectasis, TB, pneumonia, interstitial lung disease or other inflammatory conditions like arthritis, liver cirrhosis and end stage renal disease.
- Immunocompromised states

- Congestive cardiac failure
- Patients with trauma history in recent past.

2.4. Statistical Analysis:

The collection, revision, coding, and entry of data into the JASP software version 0.15. Quantitative data were presented as mean, standard deviation, and ranges for parametric data, while qualitative data were presented as numbers and percentages. The chi-square test was used to compare qualitative data from two groups, and the Fisher exact test was substituted for the chi-square test when the expected count in any cell was less than 5. One-way analysis of variance (ANOVA) was used to compare quantitative data with parametric distribution across more than two independent groups. If $p<0.05$, the p value was considered significant.

3. Results:

The initial count of patients who were included for this study were 127 patients, however only 60 patients were considered as the final sample. The other patients were rejected from this study based on the exclusion criteria.

From this table, it is seen that majority of the cases belonged to age group of 51-70 years. It is also evident that majority of the cases belonged to geriatric group i.e above 60 years (64.62%). It was also seen that out of 60 cases in the study, majority of them were male i.e 71.67% (Table 1).

The highest frequency was seen for exertional dyspnea which accounted for 60% of COPD cases. The second highest frequency was in cough with expectoration which accounted for 55% of COPD cases. Effort intolerance accounted for 51.67%, winter exacerbation of cough for 48.33%, weight loss for 33.33%, both cough without expectoration and waking at night accounted for 30%, ankle swelling for 13.33% and there were no cases of hemoptysis reported (Table 2).

evealed highest frequency of COPD severity in the 61-70 age group, which accounted for 36.35% of the total cases. In this group, moderate COPD cases had the highest frequency. The second highest frequency of COPD severity was seen in 51-60 age group with 28.35%. In this group, the highest frequency was seen in severe COPD.

lso revealed highest numbers of COPD cases in males as compared to females, with 71.67% as opposed to 28.33%.

4. Discussion:

The present study was a hospital-based observational study in which 60 cases of chronic obstructive pulmonary disease were sampled serially and a relationship between nutritional status, serum IL-6 and CRP levels and disease severity of COPD was determined. Spirometry confirmed the diagnosis of COPD with a test of reversibility using 400g of short-acting beta- agonist, 160g of short-acting anticholinergic, or a combination of the two in those who were determined to have obstructive lung disease. Patients with FEV1/FVC 0.7 and 12% bronchodilator reversibility on spirometry were considered to have COPD. According to the Gold Guidelines, 2020, they were classified as mild, moderate, severe, and very severe based on their FEV1% [15, 16].

In the present study, the largest proportion of participants (36.35%) were between the ages of 61 and 70. In addition, the research reveals that 64.62 percent were older than 60 years old. The sample population's average age was 62.11 years. Sharath K SC et al. [17] made comparable observations in their 2020 study of 38 stable COPD patients, where the mean age was 63.47 years and 79% of the patients were over 60 years old.

In our study, 71.67 percent of COPD patients were male. Similarly, in a 2011 study on the demographic and clinical profile of COPD patients conducted by Eva AC et al., 90.2% of the patients were male.

The relative prevalence of different COPD clinical symptoms was determined by screening the study population. Chronic cough with expectoration and exertional dyspnea were found to be the most prevalent symptoms of COPD in our study population. The second most prevalent symptom was COPD exacerbation during the winter, followed by weight loss. It was found in 33.33 percent of patients. In their study, Miravittles M et

Table 1: **Age and sex distribution**

Age	Frequency	Percentage
41-50	6	7.03
51-60	19	28.35
61-70	21	36.35
71-80	10	19.52
81-90	4	8.75
Gender	Frequency	Percentage
Male	43	71.67
Female	17	28.77

Table 2: **Prevalence of symptoms of COPD**

SYMPTOMS	Frequency	Mild	Moderate	Severe	Very Severe
Cough without expectoration	18	2	10	3	3
Cough with expectoration	33	3	10	9	11
Winter exacerbation of cough	29	1	7	9	12
Exertional dyspnea	36	3	10	11	12
Weight loss	20	0	6	2	12
Effort intolerance	31	0	10	10	11
Waking at night	18	0	3	5	10
Ankle swelling	8	0	0	2	6
Hemoptysis	0	0	0	0	0

Table 3: **Distribution of COPD cases according to age and sex**

Age	MILD	MODERATE	SEVERE	VERY SEVERE	Total
41 - 50	4	2	0	0	6
51 - 60	3	5	8	3	19
61 - 70	6	7	6	2	21
71 - 80	1	1	2	6	10
81 - 90	1	1	1	1	4
Sex	**MILD**	**MODERATE**	**SEVERE**	**VERY SEVERE**	**Total**
F	3	5	6	3	17
M	12	11	11	9	43

al found that the most prevalent symptoms were dyspnea (75%) and cough (72.2%) [18].

The most significant pathology underlying COPD is inflammation of the airways. There is an accumulation of inflammatory cells, including neutrophils and macrophages, in the airways. Important pro-inflammatory cytokine involved in the pathogenesis of COPD is serum IL-6. It is produced predominantly by T cells and macrophages [19]. The presence of IL-6 in COPD patients' airways is associated with persistent inflammation. According to GOLD spirometric grading criteria, 15 out of 60 COPD cases manifested with mild disease, 16 with moderate disease, 17 with severe disease, and 12 with very severe disease [20]. It has been observed that the value of IL-6 increased as the severity of COPD increased. Statistically, the value was also significant (p0.001). In COPD, spirometric grading is predictive of mortality. As there is a correlation between serum IL-6 levels and spirometric grading, it can be considered a significant and reliable marker for predicting COPD mortality. In a 2006 study by Hacievliyagil SS et al., it was found that IL-6 levels increased with disease severity [21]. In addition, a 2010 study by Attaran et al. [22] revealed that concentrations of circulating serum IL6 increased with disease progression. Another study by de Moraes MR et al. in 2014 found a higher level of serum IL-6 in stable COPD patients than in controls, indicating systemic inflammatory activity [23].

Plasma C reactive protein is a plasma acute phase reactant protein produced by the liver in response to inflammation. It reflects the individual's total systemic inflammation burden. CRP is elevated in patients with both stable and exacerbating COPD, irrespective of disease stage. In the present investigation, nearly all patients have elevated CRP levels. The value of CRP increased as disease severity increased [24]. This correlation was determined to be significant ($p < 0.001$) using the ANOVA test. Therefore, it was determined that the CRP level and FEV1% level was negatively correlated. Therefore, it is prudent to conclude that the level of CRP increases with the severity of COPD, indicating that the microinflammatory process in COPD is becoming more severe. Milacic N. et al. [25] discovered similar outcomes. According to their research, the higher the CRP concentration, the more severe the disease, as determined by the GOLD Guidelines ($p < 0.001$). In another study, Kumar R. et al. [26] discovered a correlation between CRP levels and lung function. They discovered that the CRP level in COPD patients was elevated and correlated with lung function. In a separate study, de Torres et.al [27] found that CRP levels increased with the severity of COPD.

5. Conclusion:

Chronic obstructive pulmonary disease has been a significant public health issue and a primary cause of death around the world. The present study concludes that the nutritional status, serum Interleukin -6, and CRP levels have a direct correlation with the severity of the disease. This may aid in modifying treatment protocols based on these levels, leading to early detection and rehabilitation of these patients. In this regard, however, there is an imperative need for studies employing a similar protocol with a large sample size.

6. Limitations:

A limited sample size was one of the study's limitations. As this was a hospital-based observational study, the results cannot be generalised to the general population.

7. Recommendations:

To increase sensitivity, additional studies involving a larger number of patients in numerous centres are required.

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9. Conflict of Interest:

None declared

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12. References:

1. GBD 2015 Chronic Respiratory Disease Collaborators. Global, regional, and national deaths, prevalence, disability-adjusted life years, and years lived with disability for chronic obstructive pulmonary disease and asthma, 1990–2015: a systematic analysis for the Global Burden of Disease Study 2015. The Lancet. Respir Med. 2017 Sep;5(9):691.
2. Dandona L, Dandona R, Kumar GA, Shukla DK, Paul VK, Balakrishnan K, Prabhakaran D, Tandon N, Salvi S, Dash AP, Nandakumar A. Nations within a nation: variations in epidemiological transition across the states of India, 1990– 2016 in the Global Burden of Disease Study. The Lancet. 2017 Dec 2;390(10111):2437-60.
3. ICMR PI, PHFI I. India: health of the nation's states: the india state-level disease burden initiative. New Delhi, India. 2017.
4. Hurd S. The impact of COPD on lung health worldwide: epidemiology and incidence. Chest. 2000 Feb 1;117(2):1S-4S.
5. Global Initiative for Chronic Obstructive Pulmonary Disease, Chapter1, Definition and Overview , 2020;4-19
6. Fabbri LM, Hurd SS. Global strategy for the diagnosis, management and prevention of COPD: 2003 update.
7. Silverman E K, Crapo J D, Make B J . Chapter286 . Chronic Obstructive Pulmonary Disease. In:Ed: Jameson JL, Kasper DL, Longo DL, Fauci AS, Hauser SL, Loscalzo J. Harrison's Principles of Internal Medicine . 20th Edition.New Delhi . Mc Graw Hill Education.2019:1990-8.
8. Global Initiative for Chronic Obstructive Pulmonary Disease, Chapter2, Diagnosis and Initial Assessment, 2020;4-19
9. Ross R. Atherosclerosis—an inflammatory disease. N. Engl. J. Med. 1999 Jan 14;340(2):115-26.
10. Kotler DP. Cachexia. Ann Intern Med 2000;133:622–34.
11. Johnson PM, Vogt SK, Burney MW, Muglia LJ. COX-2 inhibition attenuates anorexia during systemic inflammation without impairing cytokine production. Am J Physiol Endocrinol Metab. 2002 Mar 1;282(3):E650-6.
12. Pepys MB, Hirschfield GM. C-reactive protein: a critical update. J. Clin. Investig. 2003 Jun 15;111(12):1805-12.
13. Raisz LG. Physiology and pathophysiology of bone remodeling. Clinical chemistry. 1999 Aug 1;45(8):1353-8.
14. Tashkin DP, Altose MD, Bleecker ER, Connett JE, Kanner RE, Lee WW, Wise R. The Lung Health Study: airway responsiveness to inhaled methacholine in smokers with mild to moderate airflow limitation. Am. J. Respir. Crit. Care Med.1992 Feb 1;145(2):301-10.
15. History of COPD Treatment. (2018, April 10).
16. Laennec R. A treatise on the diseases of the chest. London, T. Underwood and C. Underwood, 1821

17. DEFINITION lN GP. Terminology, definitions, and classification of chronic pulmonary emphysema and related conditions. Thorax. 1959;14:286.
18. Fletcher C, Peto R. The natural history of chronic airflow obstruction. Br Med J. 1977 Jun 25;1(6077):1645-8.
19. Sembulingam K, Sembulingam P . Chapter 118 . Physiological Anatomy of Respiratory Tract, 6th Edition , Ed: Jaypee Brothers. Essentials of Medical Physiology. New Delhi. 2012: 673-77
20. American Thoracic Society. Standardization of spirometry. Am. J. Respir. Cri. Care Med. 1995;152:1107-36.
21. British Thoracic Society. BTS guidelines for the management of chronic obstructive pulmonary disease.
22. Lozano R, Naghavi M, Foreman K, Lim S, Shibuya K, Aboyans V, Abraham J, Adair T, Aggarwal R, Ahn SY, AlMazroa MA. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010. The lancet. 2012 Dec 15;380(9859):2095-128.
23. Vos T, Flaxman AD, Naghavi M, Lozano R, Michaud C, Ezzati M, Shibuya K, Salomon JA, Abdalla S, Aboyans V, Abraham J. Years lived with disability (YLDs) for 1160 sequelae of 289 diseases and injuries 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. The lancet. 2012 Dec 15;380(9859):2163-96.
24. Yang X, Zhang T, Zhang Y, Chen H, Sang S. Global burden of COPD attributable to ambient PM2. 5 in 204 countries and territories, 1990 to 2019: A systematic analysis for the Global Burden of Disease Study 2019. Science of The Total Environment. 2021 Nov 20;796:148819.
25. Cortesi PA, Fornari C, Madotto F, Conti S, Naghavi M, Bikbov B, Briant PS, Caso V, Crotti G, Johnson C, Nguyen M. Trends in cardiovascular diseases burden and vascular risk factors in Italy: the Global Burden of Disease study 1990–2017. Eur. J. Prev. Cardiol. 2021 Apr;28(4):385-96.
26. Mathers CD, Loncar D. Projections of global mortality and burden of disease from 2002 to 2030. PLoS medicine. 2006 Nov 28;3(11):e442.
27. Lamprecht B, McBurnie MA, Vollmer WM, Gudmundsson G, Welte T, Nizankowska-Mogilnicka E, Studnicka M, Bateman E, Anto JM, Burney P, Mannino DM. COPD in never smokers: results from the population-based burden of obstructive lung disease study. Chest. 2011 Apr 1;139(4):752-63.

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