

# Comparison of Serum Albumin Level in Stable & Hospitalized Patients of Chronic Obstructive Pulmonary Diseases (COPD)

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## ABSTRACT

**Objective:** This study was conducted to estimate the serum albumin levels in stable & hospitalized patients of COPD.

**Study Design:** Comparative Cross Sectional

**Place and Duration of Study:** This study was jointly carried out at of Pulmonology at Shaikh Zayed Hospital Rahim Yar Khan, Fatima Jinnah Institute of Chest Medicine Quetta and Liaquat University of medical and health sciences, Jamshoro from 1<sup>st</sup> January 2021 to December 2021.

**Methodology:** A total of 180 cases of COPD were selected and divided into two groups; group A contained 95 cases of COPD as stable cases, and group B included 85 cases as hospitalized cases of COPD with the mentioned inclusion and exclusion criteria. The serum albumin level was estimated by the bromocresol green (BCG) method. The serum albumin level of less than 3.2 g/dl is considered hypoalbuminemia. The statistical data was analysed by SPSS version 22 by applying an independent student T test.

**Results:** The mean serum albumin level in stable cases of COPD was  $3.0 \pm 0.41$  g/dl while in hospitalized patients it was  $2.6 \pm 0.34$  g/dl. The serum albumin level was statistically ( $P < 0.001$ ) declined in hospitalized patients of COPD as compared with stable cases of COPD.

**Conclusion:** This study concluded that serum albumin level declined in the patients of COPD and the severity of COPD directly proportional with reduction of serum albumin level

**Keywords:** COPD, Serum Albumin, Oxidative Stress, Inflammatory mediators

## INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a disease of the airway or destruction of the parenchyma of the lungs that can cause a partial restriction of air flow followed by obstinate respiratory clinical symptoms.<sup>1</sup> COPD is considered a major health problem and is included in the top ten leading causes of death all over the world.<sup>2</sup> According to a WHO report in 2020, more than 65 million people suffered from COPD all over the world.<sup>3</sup> The incidence of COPD is 8.9/1000 people per year.<sup>4</sup> The incidence rate of COPD is five to seven-fold increased in smokers with comparison of non smokers.<sup>5</sup>

The genetic predisposition and environmental factors are the predisposing factor of this health problem.<sup>6</sup> The tobacco and environmental pollutions are the main risk factors which cause the chronic inflammation of lung parenchyma then lead to COPD.<sup>7</sup> COPD also develops without exposure to smoking. The proper mechanism of development of inflammation is still not clear, but oxidative stress plays a vital role in the pathogenesis of COPD.<sup>8,9</sup> Basically, the oxidative defense system is overwhelmed by oxidants present in smoking, airway pollution, and oxidants from inflammatory cells, which leads to oxidative stress.<sup>10</sup>

Serum Albumin is one of important plasma protein; more than half of plasma protein content is albumin.<sup>11</sup> Albumin consider as multifunctional plasma protein as well.<sup>12</sup> On reducing serum albumin, there exists a residue of cysteine as a free state.<sup>13</sup> In peripheral blood, the largest pool of thiol compounds are released by cysteine residue (Cys34), which leads to albumin reacting with oxidative species as an antioxidant agent.<sup>14,15</sup> In addition of antioxidant property of albumin, it reacts as negative acute phase reactant so in acute inflammatory conditions reduction in serum albumin level observed.<sup>16</sup> Serum albumin is one of the indicative markers of malnutrition, and patients with COPD also suffer from nutritional state problems.<sup>17</sup>

The aim of this study is to compare the serum albumin levels in stable and hospitalized patients with COPD.

## METHODOLOGY

This case comparative study was conducted at three different centers in Pakistan. A total of 180 cases of COPD were recruited

for this study, sample size was calculated by raosoft sample size calculating formula. Out of 180 cases of COPD, 95 cases of COPD were considered stable cases and included in group A, while 85 cases of COPD were hospitalized patients and included in group B. A total of 60 cases of COPD (35 stable and 25 hospitalized) were selected from the Department of Pulmonology at Shaikh Zayed Hospital Rahim Yar Khan, 80 cases (35 stable & 45 hospitalized) of COPD were selected from Fatima Jinnah Institute of Chest Medicine Quetta and 40 cases of COPD (25 stable & 15 hospitalized) were selected from the Medical OPD & Medical wards of the civil hospital of Liaquat University of Medical & Health Sciences Jamshoro Sindh. The selection of samples was based on the non-probability sample technique. The selection of cases as stable or hospitalized was done on the basis of clinical symptoms and signs, followed by ratio of forced expiratory volume (FEV1) with forced vital capacity (FVC), and percentage of FEV1 on spirometry.

The participants between the age of 40 to 70 years, both males and females with history of smoking, occupational history intact with air pollutants, with no any history of renal disorders and hypertension was included in this study while the cases of COPD with age less than 40 years or more than 70 years with known case of liver diseases, renal disorders, history of alcoholism, vegetarians, hypertensive and diabetic patients especially with nephropathy were excluded from this study. The selection of cases was done after receiving consent. All base line parameters like CBC with ESR, blood sugar level, Liver function test, urine DR, blood urea, serum creatinine and X-ray Chest P/A view was done at different study centers where patients has been recruited. Serum Albumin level was estimated by bromocresol green (BCG) method.<sup>18</sup> The normal serum albumin level was 3.4 g/dl – 5.2g/dl according to kit which used for estimation of serum albumin levels.<sup>19</sup> The level below the 3.2g/dl considered as hypoalbuminemia. The data was analyzed by SPSS version 22 by applied independent student t test was applied. The P value (p 0.05) is considered a statistically significant value.

## RESULTS

From three different centers in the country already mentioned, a total of 95 cases of COPD were considered stable patients with

stable clinical features like mild to moderate cough, moderate dyspnea (upto mMRC SCALE 3), with mild to moderate decline in FEV1 on spirometry, considered as Group A. While 85 cases of hospitalized patients with COPD from all three centers with more severe clinical symptoms and severe and very severe decline in FEV1 were considered as group B. There were 98 males and 82 females who participated as cases of COPD in this study.

Table No. 01 shows the demographic presentations of parameters of COPD cases in this study. Table No. 02 shows the severity of different clinical features in both groups. The table No. 03 shows the mean serum albumin level in both groups.

Table No. 03 shows that serum albumin levels in hospitalized COPD patients are significantly lower than in stable COPD patients.

Table 1: Demographic Parameters of Group A & Group B

Parameters	Group A (n=95)	Group B (n=85)
Mean Age (years)	57 ± 9	59 ± 6
Gender	M= 48, F= 47	M=50, F=35
BMI	18.1 ± 1.61	16.13 ± 1.24
No. of Smokers Cases	S= 82, Non S= 13	S= 77, Non S= 08
Mean age of Smoking (years)	5.5 ± 3.5	7 ± 3

(M= male, F= Female, S= Smokers, Non. S= Non Smokers)

Table No: 02 shows the severity of different clinical features in both groups

Table 2: Clinical Features Severity of Group A & Group B

Parameters	Group A (n=95)	Group B Group (n=85)
History of Cough	Mild = 37 Moderate = 45 Severe = 13	Mild = Nil Moderate = 21 Severe = 64
History of Dyspnea	Mild = 21 Moderate = 51 Severe = 23	Mild = Nil Moderate = 19 Severe = 66
Mean of WBC count in CBC	14,345 ± 567	16,045 ± 1,023
Mean of ESR (mm1st Hr)	51 ± 12	81 ± 23

Table 3: Mean serum Albumin level Group A& Group B

Parameters	Group A	Group B Group
Serum Albumin (g/dl)	3.0 ± 0.41	2.6 ± 0.34**

(\*\* p value < 0.001)

## DISCUSSION

COPD is commonly caused by exposure to poisonous particles such as tobacco, environmental pollutants, and airway limitations, which result in persistent respiratory clinical symptoms such as cough, shortness of breath, dyspnea, and pain at the chest wall during inspiration and expiration.<sup>20, 21</sup>

In COPD, basically, there is an alteration in the inflammatory response of the lung parenchyma and pleural membrane due to airway limitations.<sup>22</sup>The pro-inflammatory mediators like cytokines, chemokines, and growth factors have been released from the lung parenchyma due to excessive release of macrophages, neutrophils, and T. lymphocytes in the alveoli of the lungs in patients with COPD.<sup>23,24</sup>

In COPD, there is an alteration in the Histone Deacetylase2 enzyme, which causes oxidative stress and damage to lipid and protein membranes, as well as DNA damage.<sup>25</sup> This biochemical change is important in the inflammation process in COPD patients, and it is possible that there is an increased level of pro-inflammatory cells and acute phase inflammatory cells in circulation as a result of these biochemical mechanisms.<sup>23, 24, 25</sup>

Serum Albumin is one of the important plasma proteins and is also considered a negative acute phase protein because its level is suppressed during inflammation process and oxidative stress.<sup>16</sup>Albumin is one of the defensive proteins due to its antioxidant property because albumin secretes sulfhydryl ions as a major source of these ions in the extracellular compartment where these ions fight against oxidative stress.<sup>15,26</sup> Albumin is one of the

most important clinical signs of malnutrition. Hypoalbuminemia is when serum albumin levels are less than 3.2g/dl.<sup>27</sup> It can be caused by a lack of protein in the diet, getting older due to the ageing process, poor absorption, and inflammatory conditions that release pro-inflammatory mediators.<sup>28</sup> All of these risk factors for hypoalbuminemia are present in COPD patients, such as the fact that COPD is more common in older people. These factors associated with hypoalbuminemia in the patients of COPD.

Our study found a significant (P value < 0.001) decrease in serum albumin levels in COPD patients. This decline in serum albumin level was more in Group B than Group A. Our study strongly supports by Zinellu, E. et al (2020)<sup>29</sup>. They reported that there were reduced levels of anti-oxidants in the patients with COPD, which indicates if anti-oxidant levels become low, definitely serum albumin levels become low, which is the main antioxidant extracellular protein. Our study was also supported by Zinellu, A (2016),<sup>30</sup> he reported that there was a decreased level of histone Deacetylase2 enzyme in patients with COPD. This enzyme level is under the control of albumin. If this protein becomes low, ultimately it will decline the level of histone deacetylase2. This research was also supported by Cabrerizo S.<sup>31</sup> They reported that serum albumin levels decline in old age as compared to younger age. This study favoured COPD, which is more common in older age as compared to younger age.

## CONCLUSION

This study concluded that serum albumin levels declined in the patients with COPD and the severity of COPD was directly proportional to the reduction of serum albumin levels.

**Conflict of Interest & Funding:** There is no any conflict of interest.

**Ethical Approval & Consent to Participate:** A written informed consent was obtained from participants and ethical permission was sought from corresponding institute.

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