

The Impacts of Multifaceted Nutritional Indicators on Acute Exacerbation of Chronic Obstructive Pulmonary Disease

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Dear Editor,

Chronic Obstructive Pulmonary Disease (COPD), a common respiratory disease, is one of the leading reasons for high mortality, morbidity and hospitalization rate all over the world [1]. Patients with COPD have malnutrition ranging from 19% to 60% [1], moreover progressive malnutrition is not only one of the major causes leading gradual respiratory failure, but also can easily lead to immune dysfunction, affecting the treatment of COPD and prognosis. Acute Exacerbation of Chronic Obstructive Pulmonary Disease (AECOPD) is the leading cause of hospitalization and death in patients with COPD. Previous research has revealed that BMI has been an independent predictor of COPD, and showed significantly correlation with poor prognosis, especially in acute exacerbation, disability and morbidity [2]. Therefore, it is necessary to conduct a comprehensive assessment of the nutritional status of patients with AECOPD to prevent possible acute exacerbation and improve the quality of life.

BMI: Body mass index(BMI) equals to dividing weight in kilograms by the square of height in meters. As the calculation is easily available, it is commonly used in clinical practice to estimate the nutritional status of COPD patients. The risk in underweight group was three times higher than normal weight that might caused by losing appetite, depression and anxiety [2]. Underweight comorbidities in obesity group, such as diabetes or cardiovascular diseases are likely to be associated with metabolic disorder, then deteriorate the prognosis of COPD [3-4].

FFMI: The fat free mass index (FFMI) has a negative impact on respiratory muscle strength, acute exacerbation frequency, exercise capacity and deterioration of lung function. It can be used as an independent predictor of AECOPD. FFMI can accurately reflect the patient's muscle mass and low FFM reflects a decrease in muscle content, which can result in difficulty in breathing, eating difficulties, loss of appetite, decreased dietary intake, nutritional status deteriorated and immune dysfunction. Additionally, FFMI is associated with FEV₁. This is due to that malnutrition can lead to contraction of respiratory muscle strength, decreased tolerance and airway obstruction within the airway, as a result, it can cause excessive lung inflation, decreased respiratory muscle contraction, and decreased pulmonary ventilation function. Finally, it may increase the risk of acute exacerbation. However, using FFMI to measure the nutritional status exists some shortcomings because changes in some minor factors can cause fluctuations in FFMI. Consequently, We are supposed to standardize and optimize the method of measuring FFMI, aiming to increase the reliability of FFMI [5].

Serum Prealbumin: Studies have shown that there was a negative correlation between serum prealbumin and inflammatory response. During the illness, patients with **COPD are**

deficient nutritional intake, leading to reduced energy supply to the liver and reduced serum prealbumin levels, which may indirectly make the body's inflammatory response increased and lead to systemic inflammation, hence increasing the risk of acute exacerbation [6].

Hemoglobin: Because of inadequate intake of nutrients, the content of hemoglobin in patients with **COPD** is significantly decreased. Hemoglobin levels are associated with glomerular filtration rate and patients with low hemoglobin levels have severe lung damage. It can be explained by the followings. Patients with **COPD** have lower effective ventilation so that the body's oxygen partial pressure and levels of hemoglobin is low, causing reduction of carried oxygen and the oxygen partial pressure of the kidney. Ultimately, the degree of damage to the kidney tissue aggravates. Besides, reduction of hemoglobin can cause anemia and greatly reduce the quality of life of patients, increasing the risk of acute exacerbation [7].

There is a correlation between some other nutritional indicators and AECOPD. Free vitamin D can participate in the body's immune regulation and its lack of severity is closely related to acute exacerbation [8]. Studies have shown that as serum vitamin D levels increases by 10 nmol/L, the risk of respiratory infections decreases by 7%. Furthermore, cholesterol, albumin, and serum protein are negatively correlated with C-reactive protein. They could make the inflammation a high response state and increase the risk of acute exacerbation, while inflammatory hyperresponsiveness may lead to increased body energy consumption and malnutrition, affecting the prognosis [9].

Confirming multifaceted nutritional biomarkers and impacts on AECOPD have the following applications: (1). Identify the independent nutritional risk factors of prognosis and malnutritional patients, in order to further establish an optimal treatment strategy. (2). Set up a comprehensive rating scale for nutritional assessment in patients with COPD. (3). Establish individual nutritional support programs to improve the prognosis and survival rate. (4). Prospective multi-center randomized controlled clinical trial should be performed to initiate comprehensive nutrition interventions in COPD patients, so as to explore and identify the specific role of each nutritional indicator in AECOPD.

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