

Determination of total antioxidant status in chronic obstructive pulmonary disease

Emre AVCI

Department of Molecular Biology and Genetics,
Faculty of Science and Arts, University of Hitit,
Corum, Turkey,
emreavci@hitit.edu.tr, avci.emre@yahoo.com

Abstract— Chronic obstructive pulmonary disease is one of the most common chronic diseases and represents an important cause of morbidity and mortality. This is a characterized disease with progressive and fixed airflow obstruction, and is a treatable and preventable disease to which occurs chronic exposure environmental factors of patients with genetic predisposition. It was also seen that oxidative stress level had been important in terms of the disease level of patients who had been diagnosed with chronic obstructive pulmonary disease, and the course of the disease. Creation of an imbalance between oxidants and antioxidants (oxidative stress) is considered to be important in the pathogenesis of chronic obstructive pulmonary disease. Experimental studies have provided evidence about an imbalance between oxidants/antioxidants, in favor of reactive oxidizing species (oxidative stress), associated with chronic obstructive pulmonary disease. To determine of total antioxidant status values in the patients who had been diagnosed with chronic obstructive pulmonary disease was aimed this study. In our study, the total antioxidant status values were determined as $\mu\text{mol Trolox Equivalent/L}$ spectrophotometrically by using Erel's method in the patients who had been diagnosed with chronic obstructive pulmonary disease, and in serums of healthy control individuals. Twenty patients with chronic obstructive pulmonary disease and 20 healthy non smokers control group included in the study total antioxidant status values were been found significantly high compared to healthy non smokers control group. These results showed that the total antioxidant capacity of serum is the part of a tightly regulated homeostatic mechanism and predominant oxidative stress. An inequity between oxidative stress and antioxidant capacity has been proposed to play an important role in the development and progression of chronic obstructive pulmonary disease and it is related to the severity of disease.

Keywords—component; Chronic obstructive pulmonary disease, oxidative stress, total antioxidant status.

I. INTRODUCTION

Chronic obstructive pulmonary disease is one of the most common lung diseases in our country and in the world [1]. And also, chronic obstructive pulmonary disease is an important cause of morbidity and mortality in all the world country. Indeed chronic obstructive pulmonary disease is a disease characterized by progressive airflow limitation, not fully reversible [2]. This disease develops in result of inflammatory a process that occurs against harmful gases and particles especially as cigarette smoke. Moreover, the inflammatory is not limited to only lung [3]. The inflammation has a direct or indirect potential for disturbing the equilibrium between oxidant and antioxidant systems in humans. The formation of free radicals could be accelerated and toxic reactions could occur once this equilibrium is disturbed [4].

The oxidative stress plays an important role in the pathogenesis of chronic obstructive pulmonary disease [5]. The oxidants substances that are released from inflammatory cells such as cigarette smoke, the activated neutrophils and macrophages are source of increased oxidant activity in chronic obstructive pulmonary disease [6]. The antioxidants such as superoxide dismutase, glutathione and vitamin C in found in the lungs of healthy individuals shall protect from oxidative stress to organisms. In some studies has shown decreased antioxidants occurring against increasing oxidative stress in chronic obstructive pulmonary disease [5]. Contrary some studies reported increase antioxidants occurring against increasing oxidative stress in chronic obstructive pulmonary disease [5,7]. Therefore, to determine of total antioxidant status values in the patients who had been diagnosed with chronic obstructive pulmonary disease was aimed this study.

II. MATERIAL AND METHODS

A. Samples

This study was included 20 patients who were followed standing or hospitalized and outpatient thorax diseases hospital and 20 healthy non smoker adults as control group.

B. Determination of total antioxidant status in chronic obstructive pulmonary disease

In our study, the total antioxidant status values were determined using a novel automated colorimetric measurement method developed by Erel [8].

In this method, a hydroxyl radical is produced by the Fenton reaction and reacts with the colorless substrate odianisidine to produce the bright yellowish-brown dianisyl radical. The results are reported as micromol Trolox equivalents per liter ($\mu\text{mol Trolox Eq/L}$) (E1).

$$\text{Result} = (\Delta\text{Abs Std}_1 - \Delta\text{Abs sample}) / (\Delta\text{Abs Std}_1 - \Delta\text{Abs Std}_2) \quad \text{E1.}$$

$$\Delta\text{Abs Std}_1 = (\text{Second Absorbance of Std}_1 - \text{First Absorbance of Std}_1)$$

$$\Delta\text{Abs Std}_2 = (\text{Second Absorbance of Std}_2 - \text{First Absorbance of Std}_2)$$

Std, Standard

III. RESULTS

Twenty patients with chronic obstructive pulmonary disease and 20 healthy non smoker control group included in the study. The total antioxidant status values were been found significantly high compared to healthy non smokers control group.

TABLE I. AGE AND TOTAL ANTIOXIDANT STATUS VALUES OF IN PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)

Parameters	Healthy Control	COPD
Age (year \pm S.D.)	52.0 \pm 7.0	61.0 \pm 5.0
TAS ($\mu\text{mol Trolox Eq/L} \pm$ S.D.)	0.65 \pm 0.32	1.054 \pm 0.40

SD: Standard deviation

There was no difference between the two groups in terms of age ($p > 0.05$). And also, the patient group with chronic obstructive pulmonary disease, total antioxidant status levels were significantly higher than the healthy control group ($p < 0.001$).

IV. DISCUSSION

The systemic inflammatory markers and airways in patients with chronic obstructive pulmonary disease are increasing. These markers that have high levels are faster leading to decline in lung function. At the same time, deterioration of systemic oxidant-antioxidant balance is reported in patients with chronic obstructive pulmonary disease [10].

Generally, biomarkers of antioxidant are examined separately in chronic obstructive pulmonary disease in most studies. The superoxide dismutase (SOD) and glutathione peroxidase (GSH-Px) in between the most commonly used markers of antioxidant is located [11]. In our study, total antioxidant status values were determinate in patient with chronic obstructive pulmonary disease compared with health control group.

The effects on severity of disease and disease progression, imbalance between antioxidant capacity and oxidative stress have been researches [10-13]. In a study by Rahman et al, the total antioxidant status values were determined to be lower than healthy control in chronic obstructive pulmonary disease [9]. In another study was examined conducted to determine the antioxidant activity total antioxidant status levels in serum of patients with lung cancer. In this study, serum total antioxidant status values in patients group were lower than the control group [13]. Another study made by Altuntas et al has shown an oxidant-antioxidant imbalance systemically in chronic obstructive pulmonary disease. But, this study has been concluded the increase in oxidative stress by leading to disturbances in the antioxidant activity of decrease in the antioxidant capacity and/or increasing in the oxidant capacity [14]. Patients with chronic obstructive pulmonary disease had low levels of antioxidants compared with healthy controls in a study made by Arja et al. [15]. Antioxidant defense system protects organisms from oxidative stress. In studies related to chronic obstructive pulmonary disease were obtained different results such as a decrease or increased in the levels of antioxidants. These reason of different results, increase as response of antioxidant levels and/or decrease due to neutralized by oxidants or may be present as unchanged if sufficient reserves [10,12]. But, a decrease in antioxidant levels stress has been shown response to increased oxidative stress in chronic obstructive pulmonary disease.

In conclusion, the changes in total antioxidant status those are indicative of defense systems in chronic obstructive pulmonary disease patients compared to healthy controls better understand the pathogenesis of chronic obstructive pulmonary disease and may lead the way to new treatment alternatives.

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