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ORIGINAL RESEARCH

Analysis of the Serum Levels of copper and zinc in chronic obstructive pulmonary disease patients

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Abstract
Background: The present study was conducted for analyzing of the Serum Levels of copper and zinc in chronic obstructive pulmonary disease (COPD) patients.
Materials & methods:A total of 50 patients with presence of COPD were enrolled. Another set of 50 healthy subjects were enrolled as controls. Patients had different stages of the disease according to GOLD (GOLD II, III and IV). Blood samples were obtained from al the subjects and was sent to laboratory where copper and zinc levels were evaluated using auto-analyzer.
Results: Mean serum copper levels among COPD patients and controls was 356.8µg/L and 224.7µg/L respectively. While comparing the results statistically, significant results were obtained. Mean serum zinc levels among COPD patients and controls was 2135.1µg/L and 1539.2µg/L respectively. Mean serum zinc levels were significantly higher among COPD patients.
Conclusion:COPD patients are accompanied by significant alteration of serum copper and zinc levels.
Key words: Copper, Chronic obstructive pulmonary disease

Introduction

Chronic obstructive pulmonary disease (COPD) is a common and treatable disease characterized by progressive airflow limitation and tissue destruction. It is associated with structural lung changes due to chronic inflammation from prolonged exposure to noxious particles or gases most commonly cigarette smoke. Chronic inflammation causes airway narrowing and decreased lung recoil. The disease often presents with symptoms of cough, dyspnea, and sputum production. Symptoms can range from being asymptomatic to respiratory failure.[1- 3]

Most patients with COPD are middle-aged or elderly. In 2000, 16 million office visits were attributed to COPD-related conditions, with the caseload expected to increase with the aging of the population. There is no cure for COPD. True breakthroughs in treatment, particularly disease-modifying agents, have been elusive.[4- 6]COPD is characterized by increased numbers of neutrophils, macrophages, and T lymphocytes (CD8 more than CD4) in the lungs. In

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general, the extent of the inflammation is related to the degree of the airflow obstruction. These inflammatory cells release a variety of cytokines and mediators that participate in the disease process.[7]There is evidence that high levels of heavy metals may play a key role in the development of COPD due to the induction of chronic inflammation and oxidative stress. The presence of higher levels of heavy metals in the air, water and food that people consume on a daily basis is largely complemented by the effects of smoking. The region where the settlement subjected to research is located is also significant.[8]Hence; the present study was conducted for analyzing of the Serum Levels of copper and zinc in chronic obstructive pulmonary disease patients.

Materials & methods

The present study was conducted for analyzing of the Serum Levels of copper and zinc in chronic obstructive pulmonary disease patients. A total of 50 patients with presence of COPD were enrolled. Another set of 50 healthy subjects were enrolled as controls. Diagnosis of forced expiratory volume in 1 s (FEV1) of <80%; forced expiratory volume in 1 s (FEV1)/forced vital capacity (FVC) ratio of ≤70%; FEV1 reversibility after inhalation of Salbutamol 400 µg of <12%.Blood samples were obtained from al the subjects and was sent to laboratory where copper and zinc levels were evaluated using auto-analyzer. All the results were recorded in Microsoft excel sheet and was subjected to statistical analysis using SPSS software. Student t test and ANOVA was used for evaluation of level of significance.

Results

Mean age of the COPD patients and healthy controls was 43.8 years and 45.7 years respectively. Majority proportion of patients of both COPD group and healthy controls were males. Mean serum copper levels among COPD patients and controls was 356.8µg/L and 224.7µg/L respectively. While comparing the results statistically, significant results were obtained. Mean serum zinc levels among COPD patients and controls was 2135.1µg/L and 1539.2µg/L respectively. Mean serum zinc levels were significantly higher among COPD patients.

Table 1: Demographic data

Variable	COPD Patients	Controls
Mean age (years)	43.8	45.7
Males (n)	38	35
Females (n)	12	15
Mean BMI (Kg/m^2)	24.6	24.1

Table 2: Comparison of serum copper and zinc levels

Variable	COPD Patients	Controls	p-value
Serum Copper (µg/L)	356.8	224.7	0.001 (Significant)
Serum Zinc (µg/L)	2135.1	1539.2	0.000 (Significant)

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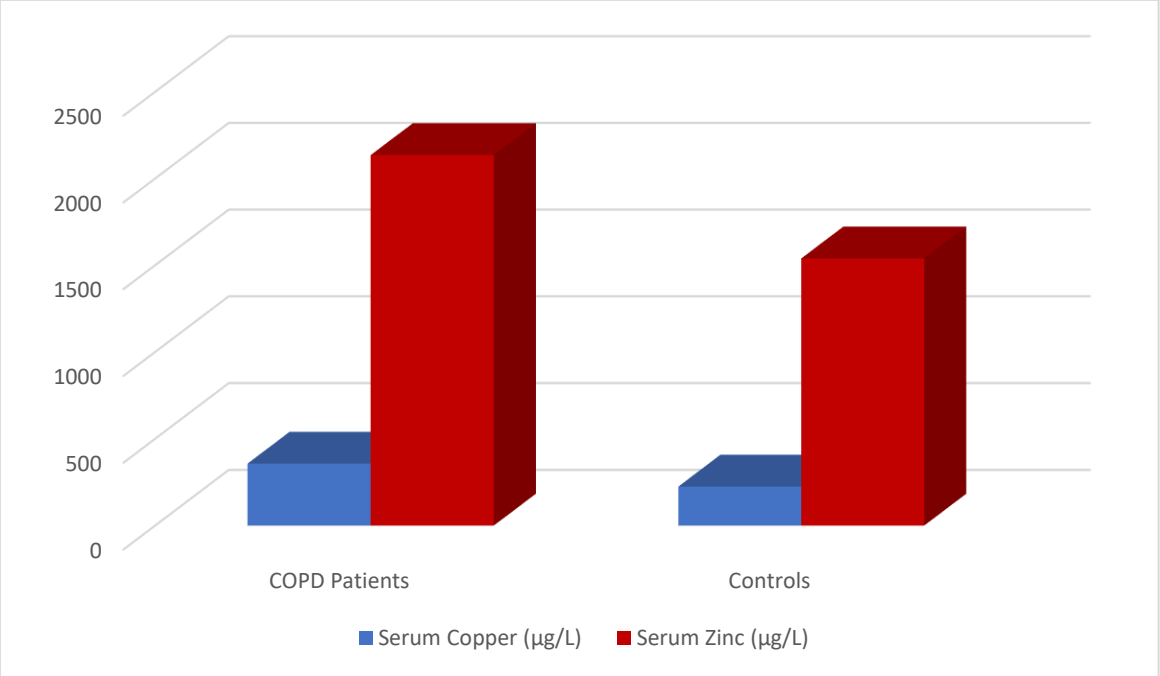
Graph1: Comparison of serum copper and zinc levels



Discussion

Chronic obstructive pulmonary disease (COPD) is a leading cause of morbidity and mortality worldwide, resulting in increasing economic and social burdens. COPD affects 5% to 15% of the world's population, and in 2007, it was diagnosed in 12 million Americans, with a substantial number of unreported cases. Lung inflammation after exposure to inhaled particles and gases is thought to be at the root of COPD pathophysiology. Exposure to these inhaled particles in the lung results in the recruitment to and activation of inflammatory cells in the lung. Mucus hypersecretion, small airway remodeling and narrowing, and destruction of lung parenchyma are key features of the disease, which lead to cough, air trapping, and worsening ventilation and perfusion mismatch.[7- 9]

Zinc (Zn) plays a key role in many processes, such as DNA and RNA synthesis, energy metabolism, many metabolic reactions and in the regulation of the immune system. Increased prevalence of obstructive pulmonary disease has been associated with low daily dietary Zn intake. Copper (Cu) is considered an essential element for living cells. On the other hand, it might be quite toxic, as the toxicity of Cu is directly dependent on the values of the physicochemical parameters of water (pH, alkalinity, solutes, hardness, etc.).[8- 10]Hence; the present study was conducted for analyzing of the Serum Levels of copper and zinc in chronic obstructive pulmonary disease patients.

Mean age of the COPD patients and healthy controls was 43.8 years and 45.7 years respectively. Majority proportion of patients of both COPD group and healthy controls were males. Mean serum copper levels among COPD patients and controls was 356.8µg/L and 224.7µg/L respectively. While comparing the results statistically, significant results were obtained. Arora S et al, in a previous study, investigated whether serum inflammatory markers, C-reactive protein (CRP), leptin, and nutritional status correlated with COPD severity.Patients with increasing severity of COPD had a significantly greater serum inflammatory marker level and poorer nutritional status.[10]

In the present study, mean serum zinc levels among COPD patients and controls was 2135.1µg/L and 1539.2µg/L respectively. Mean serum zinc levels were significantly higher among COPD patients. Kunutsor SK et al assessed the association between Cu/Zn-ratio and chronic obstructive pulmonary disease (COPD) risk.Serum Cu/Zn-ratio and Cu

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concentrations were linearly associated with COPD risk, whereas the relationship was curvilinear for Zn and COPD risk. for the middle and top tertiles of Zn, respectively.Increased serum Cu/Zn-ratio and Cu concentrations were linearly associated with an increased COPD risk in men.[11] Systemic inflammation and disturbance in serum electrolytes and trace elements in patients with COPD was evaluated in a previous study conducted by Rasha M et al.Serum C-reactive protein (CRP), TNF-α, copper (Cu), zinc (Z), Na, K, and Mg levels were measured for all participants.CRP, TNF, Cu, and Z were significantly higher in the stable group than in the control group with significantly higher levels during exacerbation. The Cu/Z ratio was significantly lower in the exacerbation group than in the stable group.with more reduction observed in the exacerbation group.CRP, TNF-α, Cu, and Z levels were significantly higher in stable COPD patients, with higher levels during exacerbation.[12]

Conclusion

COPD patients are accompanied by significant alteration of serum copper and zinc levels. However; further studies are recommended for better exploration of role of these elements in pathogenesis of the disease.

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