

Original article:

Association between serum Testosterone and Malondialdehyde levels in chronic obstructive pulmonary disease

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Abstract:

Chronic obstructive pulmonary disease (COPD) is a type of progressive, irreversible, obstructive lung disease characterized by poor air flow in response to noxious stimuli. Based on spirometry and Global Initiative for Chronic Obstructive Lung Disease (GOLD) criteria, COPD patients were classified as mild, moderate, severe and very severe groups (25 in each group). Average levels of serum total Testosterone and Malondialdehyde level in each group were analyzed and compared. Serum total testosterone levels were low and MDA levels high in very severe COPD patients. Serum total testosterone levels had an inverse correlation with the severity of the disease. Serum MDA levels had a negative correlation with serum total testosterone levels which implies the fact that the increase in oxidative stress as the disease progresses have an impact on testosterone levels.

Key words: Chronic obstructive pulmonary disease, Testosterone, Malondialdehyde.

Introduction:

Chronic obstructive pulmonary disease (COPD) is a type of progressive, irreversible, obstructive lung disease characterized by poor air flow in response to noxious stimuli¹. The common symptoms of COPD are cough with sputum and shortness of breath². Nearly 174.5 million people suffer from COPD globally by 2015 and in developing countries it accounts for about 3.2 million deaths^{3,4}. Though COPD, primarily a lung disease, it also has wide extrapulmonary manifestations which makes it an alarming disease⁵. Various studies have demonstrated hypogonadism in middle aged men with COPD^{6,7}. The imbalance in oxidative status contributes to the pathogenesis of COPD. Malondialdehyde (MDA), a product of polyunsaturated fatty acid peroxidation is

a marker for detecting oxidative stress⁸. This study is done to find the possible association between Malondialdehyde and testosterone levels in COPD patients.

Objectives of the study:

1. To evaluate the change in serum total testosterone and Malondialdehyde levels in COPD patients.
2. To find out the association between serum total testosterone and Malondialdehyde levels in COPD patients.

Materials and methods:

After obtaining institutional ethics committee approval study was done

Cross sectional study

Sample size: 100

Period of study: 2 years

Inclusion criteria: Clinically and spirometrically confirmed male COPD cases who are smokers at present or had history of smoking (40-60 years)

Exclusion criteria: Patients with acute exacerbation of COPD, patients with morbid diseases like Diabetes mellitus, Hypertension, Cardiovascular diseases, Epilepsy, patients with Renal and Hepatic diseases, Alcoholic.

Body mass index (BMI) was measured from height and weight of the study subjects.

Based on spirometry and Global Initiative for Chronic Obstructive Lung Disease (GOLD) criteria,

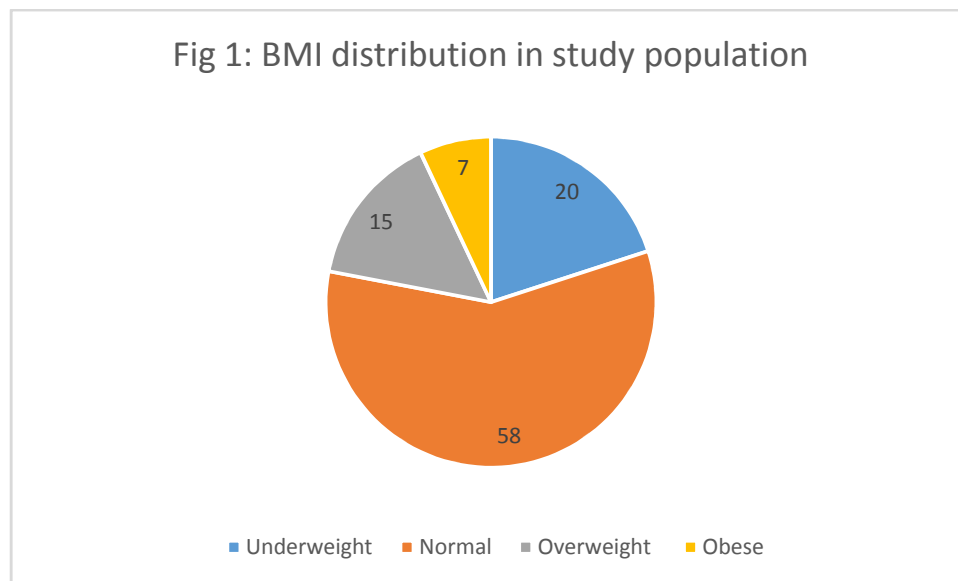
COPD patients were classified as mild, moderate, severe and very severe groups (25 in each group). Average levels of serum total Testosterone and Malondialdehyde level in each group were analyzed and compared. Serum total testosterone is measured by electrochemiluminescence kit method. Malondialdehyde levels are measured by thiobarbituric acid reactivity assay method.

All the parameters were analyzed using fully automated analyser.

Statistical analysis was done using Microsoft excel 2009 and SPSS version 17.

Results:

The mean age of our study group is 46 ± 3 years. BMI distribution of the study population is as shown in Fig 1. The mean BMI of the study population is around 20 ± 2 .



Pack years of smoking was calculated from number of cigarettes smoked per day and the number of years smoked. The mean pack years of smoking was around 18 ± 4 years. There was no significant difference in age, BMI, pack years of smoking among study population.

Based on Forced expiratory volume in one second (FEV_1) and Forced vital capacity (FVC), COPD patients were grouped as mild, moderate, severe and very severe.

Table 1: Serum total Testosterone and Malondialdehyde levels in COPD patients

COPD patients	Mild	Moderate	Severe	Very severe	P value
Total testosterone(ng/ml)	3.3±1.03	2.8± 1.8	2.4±1.5	2.3±1.2	< 0.05
MDA (µmoles/L)	5.5±0.4	6.8±0.5	8.6±0.4	10.2±0.6	< 0.05

Serum total testosterone and MDA levels in various stages of COPD are as shown in Table 1 with the $p < 0.05$ and is considered statistically significant.

Pearson correlation was done and total testosterone showed a negative correlation to MDA with r value - 0.275 and p value < 0.05 considered statistically significant

Discussion:

COPD patients with $FEV_1/FVC < 0.70$ were categorized into four groups (25 patients each) based on GOLD criteria: $FEV_1 \geq 80\%$ of predicted (mild stage), $50\% \leq FEV_1 < 80\%$ of predicted (moderate stage), $30\% \leq FEV_1 < 50\%$ of predicted (severe stage), $FEV_1 < 30\%$ of predicted

(Very severe stage)⁹. Testosterone levels are related to muscle strength and cardiorespiratory fitness accounting for physical activity and muscle mass .Various studies have documented lower levels of endogenous testosterone in severe COPD patients and it is believed to be due to the changes in the levels of the sex hormone associated with hypoxia, hypercapnia, and reduced FEV_1 ¹⁰. The imbalance between oxidants /antioxidants contributes to the pathogenesis of COPD¹¹.MDA is a marker of

oxidative stress and studies have shown high levels of MDA levels in COPD patients compared to controls¹².Similar to other studies, testosterone was low and MDA levels high in very severe COPD patients. Serum total testosterone levels had an inverse correlation with the severity of the disease. Serum MDA levels had a negative correlation with serum total testosterone levels, which implies the fact that the increase in oxidative stress as the disease progresses have an impact on testosterone levels.

Conclusion:

Oxidative stress remains the main cause in the pathogenesis of Chronic obstructive pulmonary disease , a progressive lung disease causing airway limitation. The incidence of hypogonadism in male COPD patients continues to increase as the disease progresses. Serum total testosterone levels were low and MDA levels high in very severe COPD patients and testosterone also has a negative correlation with MDA levels. Therefore, antioxidants can be used as therapeutic targets to control the progress of disease and reduce the incidence of hupogonadiam. In addition,MDA levels may be used as potential prognostic¹¹ markers in COPD patients.

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