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Original Research Article

Profile of CRP(C - reactive protein), Serum Calcium, BMD (Bone Mineral Density), BMI (Body Mass Index) in COPD Patients

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Abstract: COPD is a syndrome characterized by progressive airflow limitation caused by abnormal inflammatory reaction of airways and lung parenchyma along with systemic involvement and widespread extra-pulmonary manifestations. Among the various extra pulmonary manifestations of COPD the involvement of musculoskeletal system is very common. The aim of this study was to study profile of CRP, serum calcium, bone mineral density (BMD), and body mass index (BMI) in COPD patients and to establish multi-system involvement in COPD. This was a cross-sectional study comprising of 20 patients each as study and control group. Stable male patients with age more than 45 years with established COPD without any comorbidities and steroid use were included in this study. Among 20 study patients, BMD was normal in 8 patients (40%) while osteopenia was found in 3 patients (30%). 9 people were osteoporotic (45%). in the control group BMD was normal in 15 patients (75%). Osteopenia was found in 2 patients (10%) and osteoporosis in 3 patients (15%). In the present study 12 people had abnormal BMD and also 12 people had low BMI. Out of the 12 COPD patients who had low BMI, 9 (75%) also had abnormal BMD. Though this is statistically significant the numbers are small. In the present study out of 20 patients CRP was normal in 9 patients (45%) and elevated (more than 0.6 mg/dl) in 11 patients (55%). Serum calcium was normal in all 20 patients. To conclude elevated CRP in the current study points towards the inflammatory nature of the disease. The observation of decreased BMI which is due to TNF- alpha also indicates that COPD is a systemic inflammatory disease. Poor nutrition is also contributory towards decreased BMI, which is to be considered in the management of COPD in –toto. Systemic inflammation also accounts for osteopenia and osteoporosis (decreased BMD), hence prophylactic and therapeutic considerations are to be made in this point of view. Since osteoporosis is the disease of the organic matrix of the bone, plasma concentrations are not markedly elevated.

Keywords: COPD, Osteoporosis, Bone mineral density, serum calcium, C- reactive protein, Body mass index

INTRODUCTION

COPD is no longer considered as a disease confined to respiratory system, but viewed as a systemic disease. It is characterized by systemic inflammation with involvement of multiple organ systems most common being the cardiovascular system and musculoskeletal system. Osteoporosis is one of the systemic effects associated with COPD. The occurrence of fractures as a consequence of osteoporosis can contribute to morbidity and mortality of COPD patients due to immobility. The treatment with corticosteroids for the pulmonary disease is also associated with increased risk of fractures. This suggests need for an alternative therapeutic strategy for COPD and also prophylactic interventions for osteoporosis in this disease entity.

COPD Systemic manifestations:

There is growing evidence of systemic inflammation in COPD. Increased circulatory cytokines and acute phase proteins occur in stable COPD and COPD exacerbations are also associated with pulmonary and systemic inflammation.

Origin of systemic inflammation:

1. Smoking along with its many extra pulmonary effects may cause systemic inflammation.
2. VERNOOY *et al.;* Michael *et al.;* consider pulmonary and systemic inflammation as independent processes.

3. HYPOXIA – Enhance production of TNF ALPHA by macrophages, there is inverse correlation between PaO2 and TNF ALPHA.

Systemic Inflammation:

Increase levels of TNF ALPHA, IL-1, and IL-6 are noted in COPD [1].

IL-1 ALPHA and TNF ALPHA stimulate bone resorption [2].

IL-6 stimulates formation of osteoclasts [3].

Osteoporosis:

Osteoporosis is sometimes referred to as "Silent epidemic" of the century. Silent in the sense those changes in bone structure remain undetected and epidemic in the sense that it is the most prevalent generalized disease of skeleton.

Definitions:

Z – Score: measures by how many standard deviations the BMD (Bone mineral density) deviates from the population average for the patient's age.

T- score: Measures by how many standard deviations the BMD differs from the population average for young healthy adults who have attained peak bone density.

Diagnostic techniques: Photon Absorptiometry Quantitative CT, Dual energy Absorptiometry, Ultrasonography

Definitions by Kanis and colleagues:

Diagnostic Categories

Category	Definition by Bone mineral density
Normal	BMD >/= Young adult – 1 SD
Osteopenia	BMD >/= Young adult – 2.5 SD
Osteoporosis	BMD < Young adult – 2.5 SD

BODY MASS INDEX:

Weight loss and low BMI are predictors of mortality in COPD [4, 5]. A preferential loss of fat free mass (FFM) is noted in COPD [6-8]. Mid arm circumference is considered as an index of FFM. BMI is related to FFM in males [9] while in females it is related to either fatty mass (FM) or both FM and FFM [10].

Aims and Objectives

- To study profile of CRP, serum calcium, bone mineral density(BMD), and body mass index (BMI)in COPD patients
- To establish multi-system involvement in COPD.

MATERIALS AND METHODS

Study conducted among known patients of COPD who visited Govt General and Chest Hospital.in the present study control group is considered for BMD only, in the same age group. BMD is measured by Ultrasonography.

Inclusion Criteria

1. Stable COPD (cases were selected from known COPD patients with cough and mucoid expectoration, breathlessness, wheezing, and spo2 more than 92% at room air.
2. Male patients aged above 45 years.

Exclusion criteria

1. Female patients
2. Cor pulmonale
3. Any other co-existing disease
4. Radiological abnormality other than COPD
5. History of steroid usage.

RESULTS

Table-1: Age Distribution

AGE	NO. OF PATIENTS	PERCENTAGE
45-55	7	35%
56-65	9	45%
66-75	4	20%

Table-2:BMD

BMD	COPD	CONTROL GROUP
Normal	8	15
Osteopenia	3	2
Osteoporosis	9	3

By t- test p value < 0.05 (statistically significant)

Table-3:BMI IN COPD

Normal	8
Underweight*	12

*BMI < 18.5 Kg/m^2

Table-4:CRP IN COPD

Normal	9
Elevated*	11

*CRP > 0.6 mg/dl

Table-5:BMI VS BMD

	Normal	Abnormal
Normal	5(62%)	3(25%)
Abnormal	3(38%)	9(75%)

Table-6: BMI WISE DISTRIBUTION OF BMD

BMI	BMD	BMD
	Normal	Abnormal
16	1	3
17	2	2
18	0	4
19	0	3
20	3	0
21	0	0
22	0	0
23	2	0
Total	8	12

Among those with abnormal BMD 75% have low BMI.

DISCUSSION AND SUMMARY

The present study includes 20 patients. The study group consists of stable COPD patients in whom 4 parameters i.e., CRP, serum calcium, BMD (Bone Mineral Density), BMI (Body Mass Index) are measured. In the study group of 20 patients BMD is normal in 8 patients 40%).osteopenia is found in 3 patients(30%).9 people are osteoporotic (45%).in the control group BMD is normal in 15 patients (75%).osteopenia is found in 2 patients(10%).osteoporosis in 3 patients(15%).by applying t-test p-value is found to be <0.05 (statistically significant). In the present study 12 people have abnormal BMD and also 12 people have low BMI. Out of the 12 COPD patients who had low BMI, 9 (75%) had abnormal BMD. Though this is statistically significant the numbers are small .in the current study out of 20 patients BMI is normal in 8 patients (40%). In the present study out of 20 patients CRP is normal in 9 patients (45%). CRP is elevated (more than 0.6 mg/dl) in 11 patients (55%). In the present study serum calcium is normal in all 20 patients.

CONCLUSIONS

Elevated CRP in the current study points towards the inflammatory nature of COPD. The observation of decreased BMI which is due to TNF_alpha also indicates that COPD is a systemic inflammatory disease. Poor nutrition is also contributory towards decreased BMI, which is to be considered in the management of COPD in –toto. Systemic inflammation in COPD also accounts for osteopenia and osteoporosis (decreased BMD). Hence prophylactic and therapeutic considerations are to be made in this point of view. Since osteoporosis is the disease of the organic matrix of the bone, plasma concentrations are not markedly elevated.

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