

Determine the Association between Chronic obstructive pulmonary disease and Osteoporosis in Patients Visiting to a Tertiary Care Hospital

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ABSTRACT

Aim: To determine the association between COPD and osteoporosis in patients visiting to a tertiary care hospital.

Study design: Observational Case Control Study.

Place and duration: Chest Ward, Jinnah Postgraduate Medical Centre, Karachi from 1st Jan 2018 to 31st Jan 2019.

Methods: Thirty five male patients of chronic obstructive pulmonary disease was collected through registered out patients who visit for the routine check-up of COPD and fulfill the inclusion criteria were included in the study as cases and their relatives or attendant with no history of COPD and FEV1/FVC \geq 0.7 were included as control. Mineral Density will be measured in cases and control by dual energy X-ray absorptiometry commonly known as DEXA Scan. Two x-ray beams with differing energy levels are aimed at the patient's bones.

Results: Mean age in cases and control were 61.57 \pm 6.69 and 53.97 \pm 7.08 years respectively. Mean FEV1 in cases and control were 1.37 \pm 0.49 and 2.17 \pm 0.45 respectively. In comparison of cases and control significant association were found between COPD and osteoporosis i.e. (P=.004) and odd ratio (7.11) with C.I (1.82-27.79).

Conclusion: There is a significant association between COPD and osteoporosis. Prevalence and severity of osteoporosis increased with the increase of COPD degree.

Keywords: Chronic obstructive pulmonary disease, Osteoporosis, Association

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a disorder of dynamic wind current restriction brought about by the irregular provocative response of the aviation route and lung parenchyma. It is presently viewed as a foundational illness with far reaching extra pneumonic indications. The comorbid conditions, in relationship with aspiratory signs, represent extra issues in the administration of the disease.¹ It stays a significant general medical issue and is anticipated to be rank fifth, in 2020 in weight of malady worldwide.² An investigation directed on 3,696 patients in Karachi indicated that 5.7% of the examination populace had wind current hindrance when spirometry was performed at routine wellbeing visits in an essential consideration setting³. Another investigation in Lahore detailed that 37.9% of the smokers having ischemic coronary illness had undiscovered COPD⁴. Those analyzed gotten insufficient treatment on account of absence of assets.

Osteoporosis in men is currently perceived as a significant thought little of general wellbeing problem⁵. With the slow increment in future, propelling age related ailments are increasing⁶. After the age of fifty, one out of three osteoporotic breaks are found in men. Moreover, an inside and out comprehension of this subject has uncovered that around 50% of these causes are conceivably treatable. Studies have demonstrated that men with osteoporotic breaks have an a lot higher

mortality and dismalness when contrasted with women⁷. This may add on to the financial weight in a creating nation like Pakistan, where men might be the main procuring individuals in numerous families⁸. An Indian examination revealed (20%) pervasiveness pace of Osteoporosis in solid men⁹.

The predominance of osteoporosis in COPD patients is 36-60% and that of osteopenia is 35-72%¹⁰. COPD patients have a higher danger of osteoporosis when contrasted with sound subjects, and the loss of bone happens over an all-inclusive time of years¹¹. In 2013 an Egyptian investigation revealed the pervasiveness of osteoporosis in male patients with COPD versus solid men (26% vs 0%)¹².

A cross sectional examination included 102 COPD patients among them, 68 patients (66.6%) had osteoporosis and 20 patients (19.6%) had osteopenia. Greater part (64.7%) of the patients who had osteoporosis had stage III and stage IV COPD disease¹³.

Notwithstanding hereditary determinants, a few way of life related variables like physical action, calcium admission, smoking, liquor utilization, and nutrient D status may impact the bone mass in men¹⁴. However, the prevalence and influence of these factors may vary according to ethnicity. There are no clear guidelines available for screening men with osteoporosis among ethnic groups other than the Caucasian population.

MATERIALS AND METHODS

This case control observational study was conducted at Chest ward, Jinnah Postgraduate Medical Centre,

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Karachi during from the period 1st Jan 2018 to 31st Jan 2019. In this study 35 male patients of chronic obstructive pulmonary disease (COPD) with ages 40 to 70 years and disease duration >5 years were analyzed as cases and 35 relatives/attendants of cases with ratio of FEV1/FVC ≥ 0.7 assess on post bronchodilator spirometry were taken as control. Female patients, Known case of asthma, Patients with history of chronic liver diseases, chronic renal failure patients and patients with chest wall deformities were excluded from study. A written consent was also being taken from each patient by the primary investigator of this study. Bone Mineral Density was measured in cases and control by dual energy X-ray absorptiometry commonly known as DEXA Scan. Two x-ray beams with differing energy levels are aimed at the patient's bones. When soft tissue absorption is subtracted out, the BMD can be determined from the absorption of each beam by bone. Height and weight were noted to calculate BMI in kg/m². All the procedure was done under the supervision of consultant having more than 5 years of experiences. Inclusion criteria were strictly followed to control potential confounders and effect modifiers. All the data will be entered into the SPSS version 20. Chi-square test using P≤0.05 as significant. Odd ratio > 2 was considered as significant association.

RESULTS

In this case control study the total of 70 patients 35 in each group as cases and control to determine the association between COPD and osteoporosis and results

Table 1: Descriptive statistics

Variable	No.	Mean±SD	95% CI
Age (years)	70(40-70)	57.77±7.83	55.90-59.60
Duration of COPD (Years)	35 (only in cases)(5-20)	9.09±4.52	7.53-10.64
Duration of Treatment (years)	35 (Only in cases)(2-15)	5.37±2.81	4.40-6.33
FEV1	70 (1-3)	1.77±0.61	1.62-1.91
BMI (kg/m ²)	70 (18.5-25)	21.49±2.62	20.86-22.11

Table 2: Descriptive statistics age, BMI and FEV1 among cases and controls

Variable	Mean±SD	95% CI
Age (years)		
Cases (45-70)	61.57±6.69	59.97-63.16
Control (40-70)	53.97±7.08	52.314-55.62
BMI (kg/m ²)		
Cases (18.5-25)	21.14±2.78	20.47-21.80
Control (18.5-25)	21.83±2.46	21.24-22.41
FEV1		
Cases (1-2)	1.37±0.49	1.25-1.48
Control (1-3)	2.17±0.45	2.06-2.27

Table 3: Frequency of smoking status (N=70)

Group	Smoker	Non-smoker	Ex-smoker
Cases	6(17.14%)	6(17.14%)	23(65.71%)
Control	26(74.28%)	4(11.42%)	5(14.28%)

were analyzed as Mean±SD of age, FEV1, BMI, duration of COPD and treatment was 57.77±7.837 with C.I (55.90-59.60) years, 1.77±.618 with C.I (1.62-1.91), 21.49±2.625

with (20.86-22.11) kg/m², 9.09±4.527 with C.I (7.53-10.64) and 5.37±2.819 with C.I (4.40-6.33) years respectively (Table 1). Mean ±SD of age in cases and control was 61.57±6.69 and 53.97± 7.08 years.

Table 4: Comparison of osteoporosis among cases and controls

Group	Osteoporosis		P value	Odd ratio	95% CI
	Yes	No			
Cases	14(40%)	21(60%)	.004	7.11	1.822
Controls	3(8.57%)	32(91.42%)			

Table 5: Comparison of age according to osteoporosis

Age (years)	Osteoporosis		P value	Odd ratio	95% CI
	Yes	No			
40-57					
Cases	3	7	0.317	3.286	0.538-20.081
Control	3	23			
>57					
Cases	11	14	0.017	0.560	0.396-0.793
Control	-	9			

Table 6: Comparison of FEV1 according to osteoporosis

FEV1	Osteoporosis		P value	Odd ratio	95% CI
	Yes	No			
1-2					
Cases	14	21	0.009	5.55	1.40-21.96
Control	3	25			
>2					
Cases	-	-	NA	NA	NA
Control	-	7			

Table 7: Comparison of BMI according to osteoporosis

BMI	Osteoporosis		P value	Odd ratio	95% CI
	Yes	No			
18.5-21					
Cases	8	10	0.021	11.20	1.20-104.39
Control	1	14			
>21					
Cases	6	11	0.109	4.90	0.83-28.74
Control	2	18			

Table 8: Comparison of smoking status according to osteoporosis

Smoking status	Osteoporosis		P value	Odd ratio	95% CI
	Yes	No			
Non-smoker					
Cases	2	4	0.288	3.83	0.47-30.70
Control	3	23			
Current smoker					
Cases	1	5	1.00	0.833	0.58-1.19
Control	-	4			
Ex-smoker					
Cases	11	12	0.125	0.522	0.35-0.77
Control	-	5			

Mean ±SD of BMI in cases and control was 21.14±2.78 and 21.83±2.46 kg/m². Mean ±SD of FEV1 in cases and control was 1.37±.49 and 2.17±0.45 (Table 2). In cases 23 (65.71%) were ex-smoker followed by 6 (17.14%) smoker and non-smoker each and in control 26 (74.28%) were smoker followed by 5 (14.28%) and 4 (11.42%) were ex-smoker and non-smoker respectively (Table 3). In comparison of cases and control significant association were found between COPD and osteoporosis i.e. (P=.004) and odd ratio (7.11) with C.I (1.82-27.79) [Table 4].

In stratification of cases and control with respect to age group (40-57) and > 57 years, FEV1 (1-2) and > 2, BMI (17-21) and > 21 kg/m² and smoking status were done to assess the association between COPD and osteoporosis from (Table 5-8).

DISCUSSION

Chronic obstructive pulmonary disease globally is the fourth leading cause of death with an expected rise of mortality in the future despite advances in management⁴. In Pakistan, the estimated COPD mortality rate is 71 deaths per 100,000. This is the fourth highest rate among the 25 most populous nations in the world⁵. COPD have several systemic features, particularly in patients with severe disease, and that these have a major impact on survival and co morbid diseases.⁸ Patients with COPD also have increased likeliness of having depression, chronic anemia and cardiovascular diseases.^{9,10} Other complications of Chronic Obstructive Pulmonary Disease are Cor pulmonale, acute exacerbations of COPD, end-stage lung disease, pneumonia, polycythemia, pneumothorax and osteoporosis¹¹. Multiple studies have focused on osteoporosis in COPD Graat-Verboom et al studied COPD patients (n=554) consecutively entering pulmonary rehabilitation and found Twenty-one percent of patients had osteoporosis¹⁵.

Forli et al studied COPD patients awaiting lung transplant and found osteoporosis in 59% of patients.¹⁶ Jorgenson et al evaluated COPD for osteoporosis and found 44.8% patients had osteoporosis.¹⁷ Silva et al studied osteoporosis in COPD and found 42% patients of COPD with osteoporosis¹⁸.

In our study the mean age was 56.54±8.04 years. In the study conducted by Jorgenson et al the mean age was 63.2±5.4 years which is comparable to our study.¹⁷ Study conducted by Graat-Verboom et al the mean age was 65.6 years which is higher than the mean in our study because life expectancy is higher in the western civilization.¹⁵ In the study conducted by El-Gazzar mean age was 56.04±7.14 years which is comparable to our study¹⁹.

In our study the mean FEV1 in cases and control was 1.37±.49 and 2.17±.45. In the study conducted by Jorgenson et al mean FEV1 of the COPD was 0.90±0.43 L which is comparable to our result.¹⁷ Bhattacharyya et al in their study calculated mean FEV1 of COPD patients separately in two groups, one with Bone mineral density abnormalities had mean FEV1 of 0.81±0.37 L whereas the group of COPD patients with normal bone mineral density had mean FEV1 of 0.79±0.49 L also correlate our result²⁰.

In the present study, the COPD patient's age ranged from 40 to 70 years (61.57±6.69) and the age of the control group (53.97±7.08) with no significant difference between the two groups.

In current study osteoporosis was found in (40% v/s 8.57%) in cases and control respectively and it shows statistically significant association between COPD and osteoporosis i.e., (P=.004) and odd ratio (7.11) with C.I (1.82-27.79).

These results were in agreement with the results of the cross sectional study carried by Silva et al¹⁸ 42% and Gallego et al²¹; 41.6% patients were found to be osteoporotic which is comparable to our results.

The results of this study confirm highly significant association between COPD and osteoporosis. We have studied patients only in age group of 40---70 years while in other studies patients > 70 years have been included so we cannot comment on the association of that age group.

CONCLUSION

There is a significant association between chronic obstructive pulmonary disease and osteoporosis. Prevalence and severity of osteoporosis increased with the increase of COPD degree. Osteoporosis is a frequent complication of COPD and its early detection and treatment in patients of COPD will help in decreasing morbidity and mortality in COPD.

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