ORIGINAL ARTICLE

# Osteoporosis in COPD: A reality.

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**ABSTRACT… Objective:** To determine the frequency of Osteoporosis in Chronic Obstructive Pulmonary Disease, (COPD). **Study Design:** Cross Sectional study. **Setting:** Husan Ara Unit, Gulab Devi Hospital Lahore. **Period:** July 2017 to January 2018. **Material & Methods:** One hundred fifty patients with COPD meeting the inclusion criteria were included in the study. Bone mineral density (BMD) was calculated in each patient. Bone mineral density (BMD) was calculated via Dual Energy X-ray Absorptiometry (DEXA) scan. Osteoporosis was labeled when value for BMD was found $< -2.5$ SD below the mean for young adults (T-score). **Results:** The mean age was $56.54 + 8.04$ year. The majority (90.7%) of the patients were male and fourteen (9.3%) patients were female. The mean T-score was $-2.07 + 0.76$ SD. Twenty-two (14.7%) patients had BMD score within normal range, out of which nineteen were males and three were females. Fifty-seven (38.0%) patients were found to have osteopenia of which fifty-four were males and three were females. Seventy-one (47.3%) patients had osteoporosis with sixty-three males and eight females. **Conclusion:** Majority of the patients with COPD who had osteopenia and osteoporosis correlated with COPD severity stages and were males above 50 year age. The male preponderance highlights towards the increased incidence of smoking amongst them and perhaps the male oriented society in Pakistani culture.

**Key words:**     Chronic Obstructive Pulmonary Disease, Frequency, Osteoporosis.

## INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is a common respiratory disease causing progressive airflow obstruction and an exaggerated chronic inflammatory response to noxious stimuli.[1] Almost one-third of smokers develop COPD; other causes of COPD are genetic (alpha1-antitrypsin deficiency), biomass smoke either occupational or environmental.[2] Regardless of the new drugs we have now for its treatment, the death toll is on incremental trend now becoming the third leading cause of mortality in the world.[3]

COPD is classified according to FEV1 to mild (FEV1 more than 80%), moderate (FEV 1 between 50% and 80%), severe (FEV1 between 30 and 50%) very severe (FEV1 less than 30%).[4] COPD has systemic involvements, especially in patients with severe disease, which has a major impact on mortality and morbidity.[5] Systemic features of COPD include polycythemia, depression, chronic anemia, osteoporosis and cardiovascular diseases.[6] Other complications are cor pulmonale, acute infective and non-infective exacerbations of COPD, end-stage lung disease, pneumonia and pneumothorax.[7] Osteoporosis is considered a systemic skeletal disease causing micro-architectural reduction of bone tissue which leads to reduction in bone mass and more bone fragility leading to increased fracture risk.[8] The WHO defines osteoporosis on the basis of measurement of BMD, (BMD of - 2.5 SD below the mean for young adults (T-score) and osteopenia when BMD between -1.0 to -2.4 SD more than -0.1 deemed normal.[9] Hip, wrist, thoracic and lumbar spine are the primary sites for osteoporotic fracture. Vertebral compression fractures may lead to kyphoscoliosis and impaired rib cage mobility which causes a further decline of pulmonary functions.[10]

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Hence this study was planned to determine the frequency of osteoporosis in COPD patients as it will not only help in early detection of associated bone insult but also may pave the way for preventive management.

## MATERIAL & METHODS

This was a retrospective cross sectional study conducted at Gulab Devi Teaching hospital, Lahore, Pakistan. Medical records were collected for one hundred and fifty patients who had COPD between 1st July 2017 until 30th January 2018. Information recorded included demographics, medical comorbidities, age and gender. Bone Mineral Density (BMD) was calculated by Dual Energy X-ray Absorptiometry commonly known as DEXA scan. It is most widely used bone density measurement tool. Bone mineral density calculated via Dexa scan. Spirometric classification of severity of COPD was used for staging COPD and BMD based on T score for normal, osteopenia and osteoporosis was used. Non probability purposive sampling technique was used. Patients who had associated bronchial asthma, malignancy, left ventricular failure, chronic liver disease, chronic renal failure and any previous bone disease such as paget's disease, pott's disease were excluded from this study. All data was processed and analyzed with the help of Statistical Package for Social Sciences (SPSS) software version 23.Ethical approval was taken from Gulab Devi institutional Review Board (AAMC/DME/IRB/EA/1218).

## RESULTS

The mean age of the patient was 56.54+ 8.04 year. In the distribution of patients by gender, 136 (90.7%) patients were male and 14 (9.3%) patients were female. The mean T-score was -2.07+0.76. In males, the mean T-score was -2.07+0.76 SD. In females, the mean T-score was -2.05+0.87 SD. The mean FEV1 was 1.19+0.14 L. The mean FEV1 of the male patients was 1.19+0.14 L, while the mean FEV1 of the female patients was 1.19+0.16 L. Mean FVC was 1.77+0.20 L. The mean FVC of the male patients was 1.77+0.20 L while the mean FVC of the female patients was 1.76+0.20 L. Among all, 47% of patients had osteoporosis (Table-I).

| Age (mean) year | 56.5+-8 |
|---|---|
| Gender n/N (%)<br>Male<br>Female | <br>136/150(91%)<br>14/150(9%) |
| Mean FEV1(L) | 1.19+- 0.8 |
| Mean FVC (L) | 1.77 +- 0.2 |
| Mean T score (SD) | -2.07 +- 0.8 |
| Mean T score (SD) in males | -2.07 +-0.8 |
| Mean T score (SD) in females | -2.05+-0.9 |
| Frequency of osteoporosis n(%) | 71/150(47%) |

**Table-I. Characteristic of study population.**

According to severity of COPD, of the Stage II disease patients, 5 had osteopenia and 13 were normal wheras none were found to have osteoporosis in this disease stage. Patients with COPD Stage III disease, 21 patients had osteoporosis, 17 had osteopenia and 11 were normal. Patients with COPD Stage IV disease, 50 patients were found to have osteoporosis and 33 had osteopenia. (Table-II).

| Gold Stage | Osteoporosis | Osteopenia | Normal |
|---|---|---|---|
| II n/N(%) | 0/18(0%) | 5/18(28%) | 13/18(72%) |
| III n/N(%) | 21/49(43%) | 17/49(35%) | 11/49(22%) |
| IV n/N(%) | 50/83(60%) | 33/83(40%) | 0/83(0%) |

**Table-II. Distribution of osteoporosis according to severity of airway obstruction.**

## DISCUSSION

Multiple studies have shown the relation of osteoporosis with COPD but to date this study is one of the pioneers from a tertiary care center in Lahore, Pakistan. In our study, the mean age was 56.54+8.04 year with male predominance (90.7%) comparable to other studies.[11] In our study, 71 (47.3%) patients were found to have osteoporosis i.e. had a T-score of less than -2.5 comparable to studies conducted by Forli et al and Jorgenson NR et al.[12,13] We found that 57 (36.7%) patients were osteopenia i.e had a T-score in between -1.0 to -2.4SD which was broadly comparable to the results from the studies conducted by Jorgenson et al, Silva DR et al and Rittayamai N et al.[13,15,16] The mean FEV1 of patients with COPD in our study was 1.19+0.14 L which is relatively better than previous studies which are mostly conducted in

patients with lower FEV1.[13,14] In our study, mean FVC of patients with COPD was 1.77+0.2 L comparable to the results in a study conducted by Jorgenson NR et al who found mean FVC of 1.67+0.43 L.[13]

Furthermore, in our study, patients who had early stages of COPD were more likely to have osteopenia and as the pulmonary disease advances into higher stage, they develop osteoporosis.

Our study has few limitations. First, it is a single center study so it might not represent the whole country population despite the fact that Gulab Devi Teaching hospital is the largest pulmonary referral tertiary care center of Punjab province for pulmonary disease. Secondly, sample size is relatively small, reasons being single institutional study and perhaps relatively limited time frame in which study was conducted.

## CONCLUSION
Osteoporosis is a frequent complication of COPD. The study demonstrated that most patients who had COPD and associated osteopenia and osteoporosis were males above 50 year age. The severity of COPD correlates to some extent with bone mineral loss. More advance the stage of COPD in a particular patient, there is more likelihood of the patient to have underlying osteoporosis. Its early detection and treatment in COPD patients will help in decreasing morbidity and mortality in COPD patients.
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## AUTHORSHIP AND CONTRIBUTION DECLARATION

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| 3 | Huma Batool | Write up. | |
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