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Analysis of Osteoporosis prevalence and risk factors in Chronic Obstructive Pulmonary Disease (COPD) patients in Ghaziabad, UP

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ABSTRACT

Chronic obstructive pulmonary disease (COPD) is a lung illness in which airflow is restricted and risk rises sharply with age of 60. Chronic inflammation in COPD is systemic in nature, although it starts in the lungs, where inflammatory cytokines "spill over" and inflammation spreads to other body organs. The prevalence of osteoporosis in COPD patients is considerable, and treatment is likely necessary. The current study is a prospective cross-sectional study that involved 80 stable COPD patients who were treated at a Santosh Medical College and Hospital Ghaziabad NCR. Spirometry was used to stage the severity of COPD after acquiring written consent and a full clinical history that included a questionnaire regarding risk factors. To assess osteoporosis, a DEXA scan of the entire body was performed using a fan beam X-ray bone densitometer. The connection between COPD and osteoporosis was determined using the Chi-square test. The risk variables for developing osteoporosis were studied using univariate logistic regression. The overall prevalence of low BMD was reported to be 92.5 percent in COPD patients, with osteoporosis and osteopenia being equally prevalent (46.25%).In univariate analysis, the duration and severity of disease, as well as steroid use, were identified as risk factors for osteoporosis, with risk ratios of 1.32 (95 %CI 1.06-1.64), 1.75 (1.11-2.75), and 1.40 (1.00-1.97), respectively (p value <0.05). In COPD patients at a Santosh Medical College and Hospital Ghaziabad NCR, the frequency of low BMD was very high. In univariate analysis, duration and severity of disease, as well as steroid consumption, were determined to be risk factors for osteoporosis.

***Key words**: COPD; osteoporosis; DEXA; severity; steroid; BMD.*

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INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a lung illness in which airflow is restricted over time. It is triggered by an aberrant inflammatory response in the airway and lung parenchyma, which leads to a high rate of morbidity. Low bone mass causes osteopenia, osteoporosis, and fragility fractures, and is thought to be a systemic disease with widespread extrapulmonary symptoms [1]. The most common etiological agent for COPD is cigarette smoking, which is caused by a complex combination of hereditary factors and many diverse environmental exposures. When a patient has co-morbidity in addition to pulmonary symptoms, controlling the patient becomes more difficult. COPD affects between 4% and 10% of the adult population at this time. However, the World Health Organization predicts that COPD-related impairments and mortality will continue to rise over the next two decades.

The risk rises sharply with age, reaching a nadir when individuals reach the age of 60 [2]. Chronic inflammation in COPD is systemic in nature, although it starts in the lungs, where inflammatory cytokines "spill over" and inflammation spreads to other body organs [3-4]. The greatest risk factor for systemic inflammation is cigarette smoking, and it persists even after quitting.

It is anticipated to be the sixth most serious public health issue in the globe by 2020 [5-6]. In India, there are an estimated 1.49 crore chronic COPD cases in people aged 30 and over, with the number expected to rise by 50% by 2016.

Environmental factors and behaviours such as smoking play a role in the development of osteoporosis. Corticosteroid medication (both inhaled and systemic) used throughout the disease is also an important risk factor in the development of osteoporosis. COPD patients' quality of life is typically limited, which is exacerbated when fractures develop due to osteoporosis. As a result, healthcare practitioners should be aware of the potential for osteoporosis in COPD patients. Early detection of osteoporosis will aid in the implementation of effective preventive and treatment strategies. It would help COPD patients cope with the repercussions of osteoporosis [7].

However, evidence on the frequency of low BMD in COPD in central India is insufficient. As a result, the current study was conducted with the goal of determining the prevalence of osteoporosis in COPD patients as well as analysing the many risk factors that contribute to osteoporosis in these COPD patients.

MATERIAL AND METHODS

The study was conducted in the department of Biochemistry and Pulmonary Medicine, Santosh Medical College and hospital. Patients who were diagnosed with COPD on spirometry based on the GOLD guidelines and who were seen in the chest OPD or admitted to the chest ward were randomly chosen and enrolled in the trial after giving written informed consent [8]. The sample size was estimated using a 65 percent prevalence of osteoporosis and osteopenia in COPD patients as the overall prevalence.

Inclusion criteria

The trial included all stable COPD patients of both sexes, aged 40 to 80 years, who were diagnosed using GOLD criteria and had been treated with inhaled corticosteroids for less than a year.

Exclusion criteria

Patients above the age of 80, respiratory failure, neoplastic disease, or any other systemic disease that causes immobility or affects BMD The study excluded patients with endocrine disorders such as hypo or hyperparathyroidism, diabetes, thyroid dysfunction, unstable patients with concomitant hypertension, ischemic heart disease, and congestive cardiac failure.

RESULT AND DISCUSSION

The current study is an observational study that involved 80 COPD patients and was conducted at a tertiary care hospital. The prevalence of low BMD was determined to be 74/80 (92.5%) utilizing a whole body DEXA scan, with 37 (46.25%) having osteopenia and 37 (46.25%) having osteoporosis. The majority of the patients (n=70) were elderly, meaning they were over 60 years old.The average age of the study participants was 68.89 ± 7.33 years. Males had a mean age of 69.4 ± 7.0 years, while females had a mean age of 67.1 ± 8.34 years. With a sex ratio of 31:9, there were 18 (22.5%) female and 62 (77.5%) male patients. Five female patients had osteopenia and thirteen had osteoporosis, while 62 male patients had osteopenia, osteoporosis, and normal BMD.

Age, sex, smoking history, disease duration, steroid use in the previous year, disease severity (GOLD stage), Body mass index (BMI), and Fat free mass index (FFMI) were all examined in this study. Duration of illness and severity of disease were identified to be risk factors for osteoporosis in COPD patients in univariate analysis. In COPD patients, however, steroid use in the previous year has been linked to osteopenia, osteoporosis, and low BMD.

The duration of sickness for more than 10 years was found to be 48.6% in the osteoporosis group compared to 0% in the normal BMD group in the current study (p value 0.04). 1.32 was found to be the risk ratio (95 % CI 1.06-1.64). The highest steroid intake was reported in the osteoporosis group, followed by 62.2 % in the low BMD group, and 45.9% in the osteopenia group, compared to 16.7% in the normal BMD group (p value 0.0004, 0.004, 0.04 respectively). The 95 % confidence intervals for the risk ratios were 1.75 (1.11-2.75), 1.21 (1.04-1.42), and 1.3 (1.05-1.61). COPD severity was revealed to be a risk factor for osteoporosis, with GOLD stage >II in 70.3 percent of those with osteoporosis compared to 16.7% in those with normal BMD (p value 0.02). The risk ratio (95 % confidence interval) was determined to be 1.40 (1.00-1.97). (Table I).

Table 1: Univariate analysis for risk factors of osteopenia, osteoporosis & low BMD in COPD patients

Parameters	Normal BMD N=6	Osteopenia N=37	Osteoporosis N=37	Low BMD N=74	p-value		
Age (years)	**1**	**2**	**3**	**4**	**1vs2**	**1vs31**	**vs4**
<60 ≥60	0 (0%) 6 (100%)	4 (10.8%) 33 (89.2%)	6 (16.2%) 31 (83.8%)	10 (13.5%) 64 (86.5%)	0.54	0.38	0.44
Sex							
Male Female	6 (100%) 0 (0%)	32 (86.5%) 5 (13.5%)	24 (64.9%) 13 (35.1%)	56 (75.7%) 18 (24.3%)	0.45	0.09	0.20
Smoking habit							
Non smokers Ex-smokers	1 (16.7%) 5 (83.3%)	16 (43.2%) 21 (56.8%)	15 (40.5%) 22 (59.5%)	31 (41.9%) 43	0.26	0.31	0.26

				(58.1%)			
Duration of disease (years)							
≤10 >10	6 (100%) 0 (0%)	27 (73%) 10 (27%)	19 (51.4%) 18 (48.6%)	46 (62.2%) 28 (37.8%)	0.18	0.03* RR= 1.32 95%CI 1.06-1.64	0.07
Steroid intake							
No Yes	6 (100%) 0 (0%)	20 (54.1%) 17 (45.9%)	8 (21.6%) 29 (78.4%)	28 (37.8%) 46 (62.2%)	0.04* RR= 1.3 95%CI 1.05-1.61	0.0004* RR= 1.75 95%CI 1.11-2.75	0.004* RR= 1.21 95%CI 1.04-1.42
Gold stage							
≤II >II	5 (83.3%) 1 (16.7%)	26 (70.3%) 11 (29.7%)	11 (29.7%) 26 (70.3%)	37 (50%) 37 (50%)	0.58	0.02* RR= 1.40 95%CI 1.00-1.97	0.14
Body mass index							
Normal Abnormal	5 (83.3%) 1 (16.7%)	23 (62.2%) 14 (37.8%)	17 (45.9%) 20 (54.1%)	40 (54.1%) 34 (45.9%)	0.37	0.12	0.20
FFMI							
Normal Low	1 (16.7%) 5 (83.3%)	6 (16.2%) 31 (83.8%)	6 (16.2%) 31 (83.8%)	12 (16.2%) 62 (83.8%)	0.93	0.93	0.92

*p value significant; RR: Risk Ratio; CI: Confidence Interval

Because COPD is a multicomponent disease, people should be aware of the high prevalence of osteoporosis. Because there are few studies from India and data from Central India on the incidence of osteoporosis and osteopenia in COPD patients, an observational study in a tertiary care hospital was conducted to investigate the prevalence of osteoporosis and osteopenia in COPD patients.

Low BMD was shown to be highly common in the current investigation (92.5 %). With T-scores of -2.35,≤ -2.35, the prevalence of osteoporosis was 46.25 %. This finding was found to be consistent with findings from prior studies involving 95, 62, and 255 COPD patients. However, only the current investigation used whole body DEXA to assess BMD. Three studies on the prevalence of osteoporosis in India have been published: two from South India showed a higher percentage of osteoporosis than the current study, and one from East India showed a lower prevalence of osteoporosis [9-11]. The low prevalence in West Bengal could be due to the small number of patients, male population dominance, and the method used to diagnose osteoporosis.

The prevalence of osteopenia was 46.25 % in this study, which was similar to other studies that indicated frequency of 41 percent to 52 percent. Studies from Denmark7, Thailand, and South India, on the other hand, found a lower percentage prevalence of osteopenia [12-14]. In the current study, osteoporosis and osteopenia were found to be equally prevalent, but a South Indian study reported a greater prevalence of osteoporosis than osteopenia, and an East Indian investigation revealed a higher frequency of osteopenia than [15-16].

Various risk variables affecting BMD in COPD patients were investigated in this study, including age, sex, smoking history, duration of disease, and steroid use in the previous year, severity of disease (GOLD stage), BMI, and FFMI. Age and sex were not shown to be risk factors for osteoporosis in COPD patients in this investigation. However, a study found that age, rather than sex, is a significant, independent risk factor for osteoporosis in COPD patients. Smoking was found to be an insignificant risk factor for osteoporosis in this study, which was similar to earlier studies that found smoking to be a risk factor for osteoporosis.

The duration of disease, steroid usage in the previous year, and severity of COPD were determined to be significant risk factors for osteoporosis in the current investigation. Few researchers have looked into the

risk factors for osteoporosis in COPD patients. A study from Karnataka, India, found the severity of COPD to be a risk factor on univariate analysis and an independent risk factor in multivariate analysis, similar to the current study. Other research looked at 13 studies with a total of 775 COPD patients and discovered that a higher GOLD stage and/or a lower FEV1 were linked to osteoporosis and/or poor BMD [17-19].
The current study discovered that having an illness for more than 10 years is a substantial risk factor for osteoporosis. As the cumulative dose of steroid increases, the prevalence of osteoporosis increases among patients who have received corticosteroids. Steroid use in the previous year was found to be a significant risk factor for osteopenia, osteoporosis, and overall low BMD (p value < 0.05). Several studies, in contrast to the current study, reported no significant effect of corticosteroids on osteoporosis and osteopenia. Although BMD loss, particularly osteoporosis, has been considered a late symptom of continuous oral corticosteroid treatment, considerable BMD loss has also been documented in patients with less severe airway obstruction. Male COPD patients who did not receive corticosteroid treatment had a higher rate of vertebral fractures [20]. This suggests that factors other than the use of corticosteroids may play a role in the development of low BMD in COPD patients.
In this investigation, aberrant BMI was found to be a minor risk factor for osteoporosis, osteopenia, and poor BMD (p > 0.05). BMI was similarly found not to be a risk factor for poor BMD in COPD patients. Studies observed that obesity and overweight in COPD patients lessens the chance of getting osteoporosis when compared to average weight upper class people (21- 23). Obesity and being overweight had a significant protective impact. In this investigation, FFMI was not found to be a significant risk factor for poor BMD (p value > 0.05). However, one study found that as COPD severity grows, FFMI decreases, and that having a low FFMI increases the chance of having a low BMD in COPD patients.

CONCLUSION

In COPD patients, osteoporosis and osteopenia were both common. The length of the disease, the severity of the disease (GOLD stage), and steroid use were all found to be major risk factors for osteoporosis. As a result, increased clinical vigilance, as well as early detection and treatment of osteoporosis in COPD patients, will aid in enhancing their quality of life.

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