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OSTEOPOROSIS AND ASSOCIATED FACTORS AMONG PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE IN JIMMA UNIVERSITY SPECIALIZED HOSPITAL, JIMMA, ETHIOPIA

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ABSTRACT

Osteoporosis is one of the systemic features of chronic obstructive pulmonary disease and its prevalence is assumed to be two-to five-folds greater than in sex and age matched healthy subjects. This study was designed to assess the prevalence of osteoporosis and associated factors among patients with chronic obstructive pulmonary disease attending chest clinic of the Jimma University Specialized Hospital. In this cross-sectional study, data were collected using dual-energy X-ray absorptiometry, bone mineral density scan of 2^{nd} to 4^{th} lumbar spine for three repetitive measurements and from the patient's medical chart (doses and frequency of corticosteroid therapy) and other potential factors via structured questionnaires. The collected data were analyzed using SPSS version 21. Binary logistic regression was used to control the potential confounders and the strength of the association was expressed in an adjusted odds ratio with 95% confidence interval. Finally, an association with p-value < 0.05 was considered as statistically significant. Among 80-patients with chronic obstructive pulmonary disease evaluated; the prevalence of osteoporosis was found to be 33(41.3%). Cigarette smoking [AOR= 4.949; 95% CI: 1.323, 18.508] and corticosteroid therapy [AOR= 4.768; 95% CI: 1.258, 18.065] were the two variables which were found to be significantly associated with osteoporosis (p- value < 0.05). This study comes with high prevalence of osteoporosis among patients with chronic obstructive pulmonary disease in Jimma University Specialized

Hospital. Factors such as smoking cigarette and doses of corticosteroid therapy were found to be significantly associated with osteoporosis.

KEYWORDS: Prevalence, DEXA, BMD, T- score, osteoporosis, COPD.

INTRODUCTION

According to World Health Organization (WHO) osteoporosis is defined as "a state of disease characterized by low bone mass and micro-architectural deterioration of bone tissue, leading to enhanced bone fragility and a consequent increase in fracture risk".[1] The standard tool used to diagnose osteoporosis is Bone mineral density (BMD). Different methods of imaging have been developed to measure BMD. Dual energy X-ray absorptiometry (DEXA) scan is considered as the gold standard methods used to diagnose osteoporosis.[2] A global initiative for chronic Obstructive Lung Disease (GOLD) has defined Chronic obstructive pulmonary disease (COPD) as "a preventable and treatable disease with some significant extra-pulmonary effects that may contribute to the severity in individual patients''.[3] Though cigarette smoking is the primary cause of COPD, indoor and outdoor air pollutants, occupational dusts and chemicals, genetic factors and respiratory infections are considered as possible risk factors.[4] It was found that COPD patients benefit from exercise training programs, improving with respect to both exercise tolerance and symptoms of dyspnea and fatigue. Bronchodilator medications (β_2-agonists, anti-cholinergic, theophylline and a combination of these drugs) are central to the symptomatic management of COPD. They are given as and when needed or on a regular basis to prevent or reduce symptoms. Instead of just increasing the dose of a single bronchodilator, combining bronchodilators may improve efficacy and decrease the risk of adverse effects. Inhaled corticosteroids combined with a long-acting β_2-agonist are more effective than the individual components. Prolonged treatment with systemic glucocorticosteroids should be avoided because of an adverse benefit-to-risk ratio of osteoporosis.[5-13]

In COPD patients, the prevalence of osteoporosis is assumed to be two -to five-folds higher than in age and sex matched healthy subjects.[14,15] Also in a recently developed screening tool for factors of osteoporosis, COPD is found to be one of the parameters, increasing the risk almost four times.[16] There are factors for osteoporosis in COPD patients, some of them are; life style, sex, advanced age, low body weight, smoking cigarette, nutritional deficiencies, prolonged corticosteroid therapy and endocrinological disorders.[17,18]

Osteoporosis is one of the most common public health problems affecting both women and men over the age of 50 years worldwide.[19] Only after the occurrence of hip, vertebral, or wrist fractures a number of clinical symptoms associated with osteoporosis become evident. These fractures lead to many problems such as mortality, morbidity, and economic problems to individuals and the society.[20,21] According to WHO estimation in 2005, 5% of all deaths worldwide were caused by COPD.[22] COPD is the fourth leading cause of death in the world and expected to be third by 2030[23] and its global prevalence is about 9 ─10% in adults of 40 years and older.[24]

Chronic obstructive pulmonary disease is a progressive disease of adulthood and older age. Initially the focus of treatment is on relieving the symptoms due to the impairment of the lung function, many systemic effects become obvious as the disease progresses.[25] One of the systemic effects of COPD is osteoporosis, but debates continue on the precise mechanisms involved and on the options for treatment.[26] The cause of osteoporosis in COPD appears to be complex and various factors contribute to its pathogenesis. Some of these are the consequences of the chronic inflammatory lung disease and lung damage, the treatment used during the disease (corticosteroid) and changes due to ageing (hypogonadism, reduced muscle mass, inactivity), environmental factors and habits from earlier in life. The quality of life is further reduced, when fractures occur as a complication of osteoporosis in patients who are already restricted because of the lung disease.[27]

So far there are no published studies in Ethiopia on the burden of osteoporosis, although factors predisposing to the condition are prevalent (nutritional deficiency, coffee consumption.) As studies conducted throughout different countries suggest that, prolonged daily overdose of corticosteroid therapy and COPD itself in these patients also contribute for osteoporosis. Therefore, the main objective of this cross-sectional study was to assess the prevalence of osteoporosis and related factors among patients with COPD attending in chest clinic of JUSH, South West Ethiopia.

MATERIALS AND METHODS

Study design and technique

A cross-sectional study was designed to evaluate the prevalence of osteoporosis and related factors among patients with COPD attending in chest clinic of JUSH, South West Ethiopia from March 15─ May 15, 2015. The sample size was determined based on the total number of target population attending chest clinic, in JUSH in the year 2013/14 G.C. According to

the existing data available, the hospital had a total of 100 -COPD patients in one -year. By considering this number as a target population, the total sample size of the study was determined by using *Yamane Taro*, 1967 equation.

$$n = \frac{N}{1 + Ne^2}$$

Therefore, the required sample size at 95% confidence interval with 5% degree of precision was; $n = \frac{100}{1+100\ (0.05)^2} = 80$ + 5% non-response rate => 84

Where: -N = target population

n = sample size

e = level of precision (sampling error).

Five percent of the calculated sample size was considered for non-response rate and the total sample size adjusted to 84 -COPD patients.

The simple random sampling technique was used to select 84 COPD patients as study participants through computer generated random number methods. The study participants were patients with COPD who were attending in the chest clinic during the data collection period and fulfill the inclusion criteria.

Inclusion criteria

Patients were included in the study if they.

- have a ratio of [FEV1] to [FVC] < 0.7 and adequate medical records.
- were attending in the previous one-year.

Exclusion criteria

Patients were excluded from the study if they.

- have no adequate medical records
- are menopausal women
- are people with endocrine disorders, ovarian and testicular problems
- are taking anti-allergy medications and/or immunosuppressant drugs.

Methods of data collection

Data from structured questionnaires were collected by trained nurses, who was working at chest follow-up clinic and BMD results were collected by senior radiologist selected from

radiology clinic of JUSH. After identifying the study participants and obtaining verbal consents, face to face interview was started by using pre-tested structured questionnaires to assess related factors like; socio-demographic, lifestyle, nutritional intake and anthropometric variables. Moreover, patient's drug related factors; dosages and frequencies were collected from their medical card.

Clinical assessment

The gold standard dual energy X-ray absorptiometry scanner (DEXA) was used to measure the amount of BMCs (expressed in gram) and divided by the area of the bone being scanned (expressed in centimeter square). After three- repetitive measurements, the average BMD values of each lumbar spine were calculated to acquire a definite BMD. First patients lie on DEXA-scan and the scanner passes over lumbar spine. The mean BMD value of the patient's 2^{nd}, 3^{rd} and 4^{th} lumbar spine was collected. For categorization, the WHO standard was applied. T-score > −1 was considered as normal BMD, T-score between −1 and −2.5 was considered as osteopenia and T- score ≤ −2.5 was osteoporosis[4].

Data quality assurance

The quality of the data was assured by using validated pre-tested questionnaires and calibrated DEXA -scan machine. Training was given for data collectors on the data collection instruments and procedures. They were also acquainted about the relevance and objectives of the study and confidentiality of the information. To ensure adherence, to correct data collection procedures and completeness of data, the investigators reviewed the collected data every week.

Methods of data analysis

Data were entered into Epi info version 3.5.3, then checked and exported to SPSS version 21 for analysis. Descriptive statistics like frequencies, percentages, mean and standard deviations were used to depict the findings. In bivariate analysis; simple-crosstab and chi–square test was conducted to see the existence of association between the dependent and independent variables. Those variables with p-value < 0.25 were taken as a candidate for the final model. In multivariate analysis; binary logistic regression analysis was used to control confounders and the strength of the association was expressed in adjusted odds ratio (AOR) with 95% confidence interval (CI). Lastly, association with p-value < 0.05 was considered as statistically significant.

Ethical consideration

Ethical clearance was got from Jimma University ethical review board. Letter of permission to conduct the study was obtained from radiography and chest clinic of JUSH. The aim of the study was clearly explained to the study participants including the benefits and risks of the study. Any information concerning the participants was kept confidential and the result of DEXA collected from the participants was only analyzed for the intended purposes. The willingness and written informed consent were obtained from all study participants before inclusion into the study. Study participants with DEXA result of T- score ≤ −2.5 were communicated with senior health professionals of JUSH for possible interventions.

RESULTS

Basic socio demographic details

Out of the total 84-sampled COPD patients attending in chest clinic of JUSH, four -patients had no complete medical records. Hence 80 - COPD patients were included in the analysis and making a response rate of 95%. The (mean, ±SD) of patient's age, monthly income, height and weight were 52.56 ±11.058, 98.25 ±46.32, 1.6266 ±0.03965 and 52.99 ±4.632, respectively. The (mean, ±SD) of patient's BMD results of lumbar spine-2, lumbar spine-3, and lumbar spine-4 were 1.8748±0.75563, 1.8754±0.75504 and 1.8774±0.75457, respectively. Further, their (mean, ±SD) of average BMD results of lumbar spine and T-scores of lumbar spine (L2—L4) were 1.8756±0.75532 and −1.82±1.90, respectively. [**Table- 1**].

Table1: Socio-demographic, anthropometric and bone mineral density results of COPD patients attending in chest clinic of JUSH, South West Ethiopia from March 15─ May 15, 2015, n= 80.

Variables	**Mean ±SD**
Age (years)	52.56 ±11.058
Monthly income (ETB)	98.25 ±46.32
Height (m)	1.6266 ± 0.04
Weight (kg)	52.99 ± 4.6
Patient's bone mineral density result	
Lumbar spine −2 (g/cm^2)	1.8748 ±0.75563
Lumbar spine −3 (g/cm^2)	1.8754 ±0.75504
Lumbar spine −4 (g/cm^2)	1.8774 ±0.75457
Average Lumbar spine (L-2, L-3, L-4) (g/cm^2)	1.8756 ±0.75532
T-scores of lumbar spine	−1.82 ±1.90

SD=Standard Deviation; *ETB*= Ethiopian Birr; *1 USD = 20 ETB.*

As of lifestyle, anthropometric, nutritional and doses of drug related variables**;** majority of the patients 49(61.3%) smoked greater than 20-packs of cigarette per year**,** 54(67.5%) consumed greater than 2-cups of coffee per day**,** 47(58.8%) took greater than 2 -drinks of alcohol per day, 53(66.3%) took greater than 7.5mg of corticosteroid per day**,** 50(62.5%) consumed less than or equal to 4–times of fruits per week**,** 57(71.3%) eaten less than or equal to 4 –times of vegetables per week**,** 51(63.8%) took less than or equal to 4 –glasses of milk per week**,** 34(42.5%) were underweight in BMI, 62(77.5%) engaged in any physical exercise for less than 3-hours per week and, 23(28.8%) had mild and moderate COPD. [**Table- 2**].

Table 2: **Lifestyle, anthropometric, nutrition and drug related variables of COPD patients attending in chest clinic of JUSH, South West Ethiopia from March 15 ─ May 15, 2015, n=80.**

Variables	Categories	n (%)
Body mass index	Under weight	34(42.5)
	Normal weight	33(41.3)
	Over weight	9(11.3)
	Obese	4(5)
Severity of COPD	Mild	23(28.8)
	Moderate	23(28.8)
	Severe	22(27.5)
	Very severe	12(15)
Physically inactive	< 3 hrs/wk	62 (77.5)
	≥ 3 hrs/wk	18 (22.5)
Smoking cigarette	> 20 pks/yr	49 (61.3)
	≤ 20 pks/yr	31 (38.8)
Alcohol intake	> 2 drinks/day	47 (58.8)
	≤ 2 drinks/day	33 (41.3)
Coffee intake	> 2 cups/day	54 (67.5)
	≤ 2 cups/day	26 (32.5)
Milk intake	≤ 4 glasses/wk	51 (63.8)
	> 4 glasses/wk	29 (36.3)
Fruit intake	≤ 4 times/wk	50 (62.5)
	> 4 times/wk	30 (37.5)
Vegetable intake	≤ 4 times/wk	57 (71.3)
	> 4 times/wk	23 (28.8)
Doses of corticosteroid therapy	> 7.5 mg/day	53 (66.3)
	≤ 7.5 mg/day	27 (33.8)

Prevalence of osteoporosis among patients with COPD

Among 80-patients with COPD evaluated; the prevalence of osteoporosis, osteopenia and normal bone mineral density were found to be 33(41.3%), 21(26.3%) and 26(32.5%), respectively. Concerning patient's osteoporotic status; 21(38.9%) male, 12(46.2%) female, with in the age group of (< 40 years) 3(33.3%), (40-49 years) 5(25%), (≥ 50 years) 25(49%),

married 26(37.1%), primary level of education 18(45%), underweight 18(52.9%) and monthly income within range of (< 1000 Eth. birr) 17(37.8%) had osteoporosis. Similarly; 27 (55.1%) had osteoporosis from patients who smoked greater than 20 -packs of cigarette per year, 17(36.2%) had osteoporosis from patients who took greater than 2 -drinks of alcohol per day, 25(46.3%) had osteoporosis from patients who consumed greater than 2 -cups of coffee per day, 27(43.5%) had osteoporosis from patients who engaged in any physical exercise for less than 3 -hours per week, 23(45.1%) had osteoporosis from patients who took less than or equal to 4 –glasses of milk per week, 22(44%) had osteoporosis from patients who consumed less than or equal to 4 –times of fruits per week, 20(35.1%) had osteoporosis from patients who eaten less than or equal to 4 –times of vegetables per week, 29(54.7%) had osteoporosis from patients who took greater than 7.5 mg of corticosteroid per day. Further 5(21.7%), 9(39.1%), 12(54.5%) and 7(58.3%) patients had osteoporosis from patients with mild, moderate, severe and very severe COPD, respectively**.** [**Table- 3**].

Table 3: Socio-demographic and anthropometric related variables of patients with COPD by their osteoporosis status.

Variables	**Categories**	**Osteoporosis**	
		Yes (%)	**No (%)**
Sex	Female	12(46.2)	14(53.8)
	Male	21(38.9)	33(61.1)
Age (year**)**	< 40	3(33.3)	6(66.7)
	40–49	5(25)	15(75)
	≥ 50	25(49)	26(51)
Marital status	Married	26(37.1)	44(62.9)
	Divorced	4(66.7)	2(33.3)
	Widowed	3(75)	1(25)
Levels of education	Illiterate	11(33.3)	22(66.7)
	Primary [1-8]	18(45)	22(55)
	Secondary [9-12]	4(57.1)	3(42.9)
Monthly income (ETB**)**	< 1000	17(37.8)	28(62.2)
	1001—2000	14(50)	14(50)
	> 2000	2(28.6)	5(71.4)
Alcohol intake	> 2 drinks/day	17 (36.2)	30(63.8)
	≤ 2 drinks/day	16 (48.5)	17 (51.5)
Coffee intake	> 2 cups/day	25(46.3)	29 (53.7)
	≤ 2 cups/day	8(30.8)	18 (69.2)
Milk intake	≤ 4 glases/wk	23 (45.1)	28 (54.9)
	> 4 glases/wk	10 (34.5)	19 (65.5)
Fruit intake	≤ 4 times/wk	22 (44.0)	28 (56.0)
	> 4 times/wk	11 (36.7)	19 (63.3)
Vegetable intake	≤ 4 times/wk	20 (35.1)	37 (64.9)

	> 4 times/wk	13 (56.5)	10 (43.5)
Doses of corticosteroid therapy	> 7.5 mg/day	29(54.7)	24 (45.3)
	≤ 7.5 mg/day	4(14.8)	23 (85.2)
Severity of COPD	Mild	5(21.7)	18(78.3)
	Moderate	9(39.1)	14(60.9)
	Severe	12(54.5)	10(45.5)
	Very severe	7(58.3)	5(41.7)

ETB= *Ethiopian Birr; 1 USD = 20 ETB.*

Factors associated with osteoporosis among patients with COPD

In the bivariate analysis candidate variables such as; advanced age, marital status, level of education, low body mass index, smoking cigarette, coffee intake, vegetable intake and doses of corticosteroid therapy were selected for the final model with p-value < 0.25 **[Table- 4].** Further, multivariate analysis (binary logistic regression methods) were used to identify the main predictor variables by controlling the confounders, and showed two variables such as; smoking cigarette [AOR= 4.949; 95% CI: 1.323, 18.508] and doses of corticosteroid therapy [AOR= 4.768; 95% CI: 1.258, 18.065]were found to be significantly associated with osteopo rosis at p- value < 0.05 **[Table- 5].**

Table 4: Bivariate analysis to select candidate variables for the final model in relation to osteoporosis among patients with COPD attending in JUSH, South West Ethiopia from March 15 — May 15, 2015, n= 80.

Variable	Category	Osteoporosis		X^2-test	COR(95%CI)	p-value
		Yes (%)	No (%)			
Sex	Female	12(46.2)	14(53.8)	0.382	0.742 (0.288 ─ 1.911)	0.536
	Male	21(38.9)	33(61.1)		1	
Age (year)	≥ 50	25(49)	26(51)	3.505	0.396 (0.148 ─ 1.058)	0.061*
	Others (< 40, 40–49)	8(27.6)	21(72.4)		1	
Marital status	Married	26(37.1)	44(62.9)	3.898	1	0.048*
	Others (Divorced, Widowed)	7(70)	3(30)		3.949(0.939—16.613)	
Educational status	Illiterate	11(33.3)	22(66.7)	1.453	0.568(0.226—1.430)	0.228*
	Others (1^0 [1-8], 2^0 [9-12])	22(46.8)	25(53.2)		1	
Monthly income (ETB)	< 1000	17(37.8)	28(62.2)	0.512	0.721(0.294—1.769)	0.474
	Others (1001–2000, > 2000)	16(45.7)	19(54.3)		1	
Body mass index	Under weight	18(52.9)	16(47.1)	3.335	0.430 (0.173 ─ 1.072)	0.068*
	Others (Normal,over–wt., obese)	15(32.6)	31(67.4)		1	
Physically inactive	< 3 hrs/wk	27(43.5)	35(56.5)	0.601	0.648 (0.216 ─ 1.949)	0.438
	≥ 3 hrs/wk	6(33.3)	12 (66.7)		1	
Smoking cigarette	> 20 pks/yr	27 (55.1)	22 (44.9)	10.012	0.196 (0.068 ─ 0.561)	0.002*

	≤ 20 pks/yr	6 (19.4)	25 (80.6)		1	
Alcohol intake	>2 drinks/day	17 (36.2)	30 (63.8)	1.213	1.661 (0.672 ─ 4.108)	0.271
	≤2 drinks/day	16 (48.5)	17 (51.5)		1	
Coffee intake	> 2 cups/day	25(46.3)	29 (53.7)	1.746	0.516(0.192—1.387)	0.186*
	≤ 2 cups/day	8(30.8)	18 (69.2)		1	

ETB= *Ethiopian Birr; 1 USD = 20 ETB.*

Table 5: Multivariate analysis of selected variables in relation to osteoporosis among patients with COPD attending in JUSH, South West Ethiopia from March 15 ─ May 15, 2015, *n=80*.

Variables	Categories	Osteoporosis		AOR(95%CI)	p-value
		Yes (%)	No (%)		
Age (year**)**	≥ 50	25(49)	26(51)	1.197 (0.354 ─ 4.056)	0.772
	Others **(**< 40, 40–49**)**	8(27.6)	21(72.4)	1	
Marital status	Married	26(37.1)	44(62.9)	1	0.482
	Others (Divorced, Widowed)	7(70)	3(30)	0.531(0.91—3.108)	
Level of education	Illiterate	11(33.3)	22(66.7)	1.592(0.507—4.998)	0.425
	Others **(**1^0 [1-8], 2^0 [9-12]**)**	22(46.8)	25(53.2)	1	
Body mass index	Under weight	18(52.9)	16(47.1)	2.699 (0.848 ─ 8.594)	0.093
	Others (Normal, over– wt., obese)	15(32.6)	31(67.4)	1	
Smoking cigarette	> 20 pks/yr	27 (55.1)	22 (44.9)	4.949 (1.323 ─ 18.508)	0.017▲
	≤ 20 pks/yr	6 (19.4)	25 (80.6)	1	
Coffee intake	> 2 cups/day	25(46.3)	29 (53.7)	1.433(0.429— 4.782)	0.559
	≤ 2 cups/day	8(30.8)	18 (69.2)	1	
Vegetable intake	≤ 4 times/wk	20 (35.1)	37 (64.9)	0.300(0.077— 1.167)	0.082
	> 4 times/wk	13 (56.5)	10 (43.5)	1	
Doses of corticosteroid therapy	> 7.5 mg/day	29(54.7)	24 (45.3)	4.768(1.258— 18.065)	0.022▲
	≤ 7.5 mg/day	4(14.8)	23 (85.2)	1	

Keys: ▲ = p < 0.05.

DISCUSSION

This cross sectional study is one of the first to assess the prevalence of osteoporosis and related factors among patients with chronic obstructive pulmonary disease in Ethiopia. According to the current study, the prevalence of osteoporosis was 41.3% among patients with COPD, which might be related with the majority of the patients, were using daily high doses of corticosteroid for COPD exacerbations, and smoking cigarette. This finding is in line with the previous two cross-sectional studies done in Brazil 42%[28] and Denmark 44.8%[29]

on the prevalence of osteoporosis. However, this prevalence is higher from other two studies done in Netherland 23.6%[30] and 21%.[31] But, lower than a study conducted in Iran 52%.[32] The main explanation for such discrepancy might be different in lifestyle and economic status.

Literatures from Iran, Brazil and UK indicated that smoking greater than 20-packs of cigarette per year have a risk for the development of osteoporosis; the reason is that cigarette smoke generates huge amounts of free radical molecules that attack and overwhelm the body's natural defenses. The result is a chain-reaction of damage throughout the body, including cells, organs and hormones involved in keeping bones healthy.[32-34] This study also found that smoking greater than 20-packs of cigarette per year have 5-times risk to develop osteoporosis with the [AOR= 4.949; 95% CI: 1.323, 18.508]. Moreover, in the current study majority of the patients 49(61.3%) were smoking > 20-packs of cigarette per year.

Systemic corticosteroid treatment is recommended in international guidelines for the treatment of COPD exacerbations; however prolonged treatment with systemic corticosteroids is associated with a reduction in BMD, osteoporosis and a risk of fractures. But, the effect of corticosteroid therapy appears to be dose-dependent. Among several adverse effects of corticosteroid on BMD, some of them are direct inhibition of osteoblasts function, direct enhancement of bone resorption, inhibition of gastrointestinal Ca^{2+} absorption, increase in urinary Ca^{2+} loss and inhibition of gonadal hormones. A study from UK reported that, patients using daily dose of oral corticosteroid were strongly associated with reduction in BMD. The risk of fractures (hip and vertebral) was doubled in COPD patients using doses of $\geq$ 7.5 mg of corticosteroids per day.[35] Similarly, this study revealed that using greater than 7.5 mg of corticosteroids per day have more than four -times risk to develop osteoporosis with the [AOR= 4.768; 95% CI: 1.258, 18.065]. As the present study indicates, almost more than a half of patients 53(66.3%) are using greater than 7.5mg of corticosteroid per day.

This study identified factors of osteoporosis, such as smoking cigarette and doses of corticosteroid therapy were found to be significantly associated. However, other variables such as sex, advanced age, marital status, educational status, income, physically inactive, low BMI, alcohol intake, coffee intake and nutritional variables were not significantly associated with osteoporosis. But other studies showed that a significant association between, physically

inactive, heavy alcohol use, low BMI (Less than 19 kg/m^2), low intakes of fruits, vegetables and Milk with osteoporosis.[33,36-47]

CONCLUSION

This study comes with high prevalence of osteoporosis among patients with COPD in JUSH. Indeed, factors such as smoking cigarette and doses of corticosteroid therapy were found to be significantly associated with osteoporosis. In contrast, it didn't find any association between osteoporosis and sex, advanced age, marital status, educational status, income, low BMI, physically inactive, alcohol intake, coffee intake or nutritional variables.

RECOMMENDATIONS

Most countries have guidelines concerning prolonged corticosteroid treatment and prevention of secondary osteoporosis. As of this study is the first of its kind in the Ethiopian context, there is no guideline concerning osteoporosis among COPD patients with prolonged corticosteroid treatment (oral and inhaled). On the basis of the findings in this study it is recommended that Health Policy Makers and Programmers should give attention to improve, especially on the area of prescription of long-term corticosteroid and its dose. The Hospital Medical Director and Health Providers should create awareness on factors associated with osteoporosis among COPD patients, particularly on cessation of smoking cigarette. Further studies are needed to determine the severity of osteoporosis in relation with degree of COPD.

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