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PREVALENCE OF LOW BONE MINERAL DENSITY AND IT'S ASSOCIATED RISK FACTORS IN AL-AHSSA

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Abstract:
Background: *Osteoporosis is a global health problem that is increasing in significance with time. Osteoporosis is characterized by low bone mass and structural deterioration of bone leading to increased risk of fractures. Low bone mass has been reported to range from 10-60 % in different studies. The objective of this study is to determine the prevalence of low bone mass in Saudi-Arabia and to characterize the associated risk factors in our population.*
Methods: *We retrospectively studied with 114 Saudi patients aged between 29 to 56 years old who had BMD measured at the polyclinic center in King Faisal University. Our study collected patients in whom BMD whose determined by DEXA scan. Then we used mean, standard deviation, Chi-squared test, pearson correlation and step wise regression to analysis our result.*
Result: *114 patients was performing DEXA and 54 (47.4%) were normal, 48 (42.1%) were having osteopenia and 12 (10.5%) were suffer from osteoporosis. The result shows that the decreasing of BMD in patients of age between 20-60 but it occurs more in the age of 40-60. Also, from data we found that decreasing of BMD is more in females than males and it was highly correlated with menopause and smoking.*
Conclusion: *BMD is decrease by many factors like menopause status. The prevalence of osteopenia in pre-menopausal females indicates the ultimate importance of early intervention to prevent development of osteoporosis in later life; so, routine measurement of BMD every 1 year for all pre-menopausal females for early detection and treatment of osteopenia seemed to be essential.*
Keywords: *Low bone mineral density, Risk factors, osteopenia, osteoporosis*

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INTRODUCTION:

Osteoporosis is a systemic skeletal disorder characterized by low bone mass and disruption of bone microarchitectural that enhanced *bone* fragility and thus consequently increase fragility fracture risk [1]. Due to its worldwide predominance, osteoporosis is recognized as major medical health concerned among the population. The worldwide prevalence of osteoporosis is estimated to be over 200 million people [2]. It is associated with several risk factors, including nutritional factors such as consumption of calcium, vitamin D, protein, fruits, vegetables, and behavioral factors such as physical activity, smoking, and alcohol consumption [3].

Bone mineralization is remarkably affected by calcium and phosphorus metabolism, which is controlled by vitamin D, calcitonin, and parathormone [4]. Previous research suggested that extended breastfeeding may have a long-term negative effect on bone mineral density (BMD) that *can* increase the likelihood of *developing* osteoporosis later in life [5]. Numerous studies recommended that sunlight exposure is essential to enhance the production of vitamin D3 in the skin [6 7].

Medications can contribute to induce osteoporosis; for example, steroid-induced osteoporosis is understood to induces a major reduction of bone mineral density that significantly prompt risk of bone fragility fracture [8].

There are studies that have been reported that proton pump inhibitor (PPI) therapy is associated with osteoporotic fractures [9]. However, previous randomized study showed that PPI use has no apparent influences on bone structure [10].

The aim of this study is to determine the frequency of who have low bone mineral density in Alahssa, Saudi Arabia and its associated risk factors.

METHODOLOGY:

Study design and patients.

We retrospectively studied 114 Saudi patients aged between 29 to 56 years old who had BMD measured at the polyclinic center in King Faisal University from December 2014 to April 2015. Our study collected patients in whom BMD whose determined by DEXA scan. Their demographic and clinical data were obtained by careful review of their hospital charts and electronic records. Each patient's age, gender, menopausal status, smoking history, disease duration, prior surgery, past history and duration of corticosteroid use, use of other medications like calcium, vitamin D supplementation and PPI, past history of bone fractures, and simple investigations including CBC (Hb, WBC, and platelets) liver function (AST and ALT), renal function (urea) and ESR erythrocyte sedimentation.

Bone mineral density measurement.

Dual Energy X-ray Absortiometry, or DEXA scanning, is currently the most widely used method to measure bone mineral density. For the test, a patient lies down on an examining table, and the scanner rapidly directs x-ray energy from two different sources towards the bone being examined in an alternating fashion at a set frequency. The mineral density of the patient's bone weakens, or prolongs the transmission of these two sources of x-ray energy through a filter onto a counter in a degree related to the amount of bone mass present. The greater the bone mineral density, the greater the signal picked up by the photon counter. The use of the two different x-ray energy sources rather than more traditional radioisotope studies greatly improves the precision and accuracy of the measurements.

Although single-photon absorptiometry (SPA) has been the predominant tool used to assess BMD in the forearm, the development of dual-energy x-ray absorptiometry (DEXA) provides the benefits of greater source stability, reduced scanning time, and improved image resolution compared to SPA. It has a lot of advantages, such as it is a precise, accurate, and reliable method, it is based on a three compartmental model (total body mineral (from bones), fat-free soft (lean) mass, and fat tissue mass) rather than two compartment as in most other methods, it can also distinguish regional as well as whole body parameters of body composition. As such, it is considered a reference standard, and the latest body composition research uses this method, it is a simple, quick and noninvasive procedure, the anesthesia is not required and X-rays usually have no side effects in the typical diagnostic range for this exam [11].

According to the World Health Organization (WHO) has published a guideline for the diagnosis of osteopenia and osteoporosis (1994), which related to an individual's BMD, a T-score between +1 and −1 is considered normal or healthy. Osteoporosis is defined as a BMD of more than 2.5 SD below that of young adults (T-score -2.5 or more) whereas a BMD between one and 2.5 SD below that of young adults (T-score -1 to -2.5) is considered osteopenia [12].

The study was approved by the ethical committee in King Faisal University in Alahsaa.

Statistical analysis

The results are presented as the mean±SD. Student's unpaired t tests were used when

appropriate. Frequencies were compared using the Chi-squared test or Fisher's exact test when appropriate. Pearson's correlation coefficients were calculated for continuous variables. Stepwise regression analysis was performed to determine the independent risk factors for low BMD. Two-tailed values for significance were used in all statistical tests, and significance was defined as $P<0.05$. Statistical analyses were performed using SPSS statistical package, versions 16 (SPSS Inc., Chicago, IL).

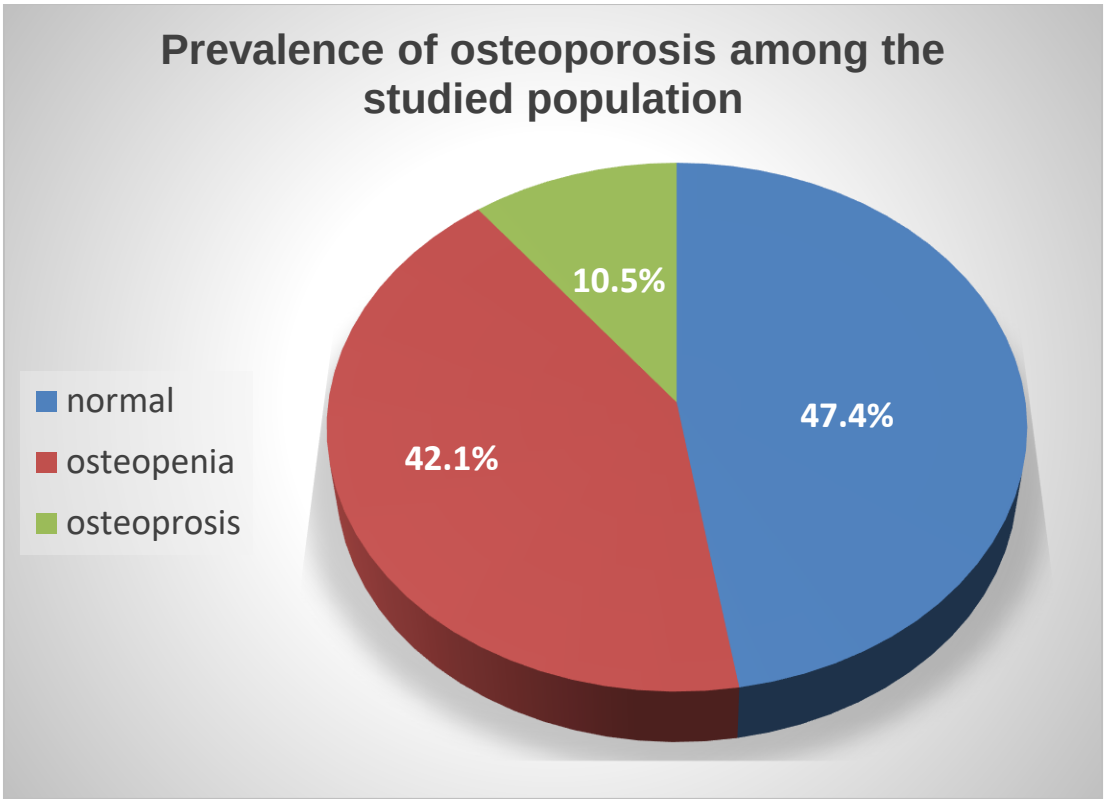
RESULT:

Demographic date of the studied patients (n=114):

	Range	mean±SD
Age	29-56	44.56±6.55
BMI	19.5-31.2	25.99±3.08
	Frequency	Precent
Gender Male female	36 78	31.6 68.4
BMI Normal Over weight Obese	42 60 12	36.8 52.6 10.5
Marital status Single Married Widow	2 110 2	1.8 96.4 1.8
smoking yes no	24 90	21.1 78.9
Meno-pause yes no	20 58	25.6 74.4
Exercise Yes no	42 72	36.8 63.2

Our study applied on 114 patients. 31.6% of them were male and 68.4 were female with a ratio of 1:2. Among female patient, 25.6% were post-menopausal. the mean age of the participants was 44.65_+6.55, range from 29-56 years. 36.8% of them were have normal BMI. 52.6% were overweight. 10.5% were obese. For their marital status, the majority of them were married (96.4%) while single and widow patients occupied only 1.8% for each of them. Most of them were not smoker (78.9%) and 21.1% were smoker. 36.8% of our population were exercising and the rest of them were not, and demographic date of the studied patient are shown in **Table1**.

Prevalence of osteoporosis among the studied patients (n=114):



Among the studied population and according to WHO classification criteria, 47.4% have normal BMD, 42.1% have osteopenia while osteoporosis was detected only 10.5% as shown in **figure1**. These measures were taken either at the lumbar spine or femoral neck or wrist using DEXA.

Laboratory investigation among the studied patients (n=114):

	Range	Mean±SD
Hb (g%)	9.5 -14.2	12.5754±.88092
WBC (mm^3)	10800-11000	9565.1018±13661.60134
Platelets (mm^3)	16000-182100	232736.8421±216048.05482
ESR (mm/h)	10-55	31.5439±10.58479
SGOT	9-43	33.4035±9.26858
SGPT	9-61	27.9474±10.54685
Urea	19-54	35.8070±10.54685
Creatinine	0.5-1.2	.8000±6.61839

Hb= hemoglobin WBC= white blood cells
ESR= Erythrocyte sedimentation rate
SGOt= Serum glutamic oxaloacetic transaminase
SGPT= Serum glutamic pyruvic transaminase

Laboratory investigation among the studied population is illustrated in table 2. The HB range was between 9.5-14.2 % with a mean of 12.57±0.88. The WBC range was between 10800-11000 mm^3 with a mean of 9565.10±13661.60 mm^3. Platelets range was between 16000-182100 mm^3 with a mean 232736.84±216048.05. ESR range was between 10-55 mm/3 with a mean of 31.54±10.58. SGOT range was between 9-43 with a mean of 33.40±9.26. SGPT range was between 9-61 with a mean of 27.94±10.55. Urea range was between 19-54 with a mean of 35.80±10.54. Creatinine was range between 0.5-1.2 with a mean of .80±6.61, and the Laboratory investigation are shown in **Table2**.

Correlation between BMD with disease variable among the studied patients (n=114):

	P value	R
age	0.0001	0.373
gender	0.042	-0.191
Marital status	0.046	0.188
Smoking	0.001	-0.318
Meno-pause	0.0001	-0.388
Exercise	0.017	0.222
Pain	0.026	-0.209
Corticosteroid	0.0001	-0.325
Proton pump inhibitor	0.002	-0.282
Associated disease	0.006	0.254
BMI	0.0001	-0.503

Table 3 shows a significant correlation between low BMD and different disease factors including age, gender, marital status, smoking, post-menopause, exercise, pain, corticosteroid, PPI, associated disease, and BMI, as P-value less than 0.05.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.502	.814		1.846	.068
	age1	.154	.092	.145	1.664	.099
	gender	.710	.278	.661	2.548	.012
	menupause	-.376-	.134	-.668-	-2.800-	.006
	smoking	-.311-	.148	-.254-	-2.094-	.039
	maritalstatus	.280	.220	.105	1.272	.206
	exercise	.138	.085	.133	1.621	.108
	pain	-.072-	.109	-.055-	-.656-	.513
	protonpumpinhibitor	-.109-	.111	-.076-	-.977-	.331
	corticosteroid	-.168-	.129	-.103-	-1.303-	.195
	associateddisease	.026	.035	.063	.734	.464
	BMI	-.030-	.015	-.184-	-1.943-	.055

By using regression and using BMD as the independent factor, we found only that besides pain (0.513), using medication (0.263), marital-status (0.206), exercise (0.108) and body mass index (BMI) (0.055) status have negative correlation with BMD while positive correlation with menopausal status (0.006), female-gender (0.012) and smoking (0.039) as it shown in **Table4**.

DISCUSSION:

Our study confirmed an overall high frequency of reduced BMD among Saudi patients in Al-Ahssa. About more than the half (52.3%) of our patients had reduced BMD. According to a study that has done among a group of 226 Saudi men, aged 50 years old and above, it has estimated that 58.5% have low BMD [13]. Another study was done among Saudi women, 66.5% have low BMD [14]. In comparison with the recent prevalence of osteoporosis and low bone mass in the United States based on BMD at the femoral neck or lumbar spine, it estimated 43.9% older adults had low bone mass [15].

The frequency of low bone mass and osteoporosis in our study seemed to be higher (52.3%) if we compare it with other study which based on the association of low BMD with IBD patients and the percentage was (39.4%) [16]. Additionally, their frequency of osteopenia was 44.2%, and the frequency of osteoporosis was 30.5% at both lumbar spine and proximal femur [16]. And there is also a study among Korean adult which has estimated the overall population with osteopenia and osteoporosis 47.9% and 22.4% [17]. In comparison with our study which showed that the of frequency of osteopenia and was osteoporosis were 42.1% and 10.5% at level of the lumbar spine, femoral neck and wrist.

As one of our main objectives in this study was to determine the risk factors that have a significant

effect on low BMD specifically osteoporosis among Saudi patients. Including age, gender, marital status, smoking, menu-pause , exercise, pain, corticosteroid , PPI and BMI. In our study, only menu-pause, gender and smoking showed a signification correlation with BMD 0.006, 0.012 and 0.39. In compare with other study among Dutch perimenopausal women, it showed that an increased risk for low BMD was associated with age, menopausal status and smoking [18]. Other study has confirmed that women tended to comprise the more vulnerable population with regard to Menu-pause, while men were over-represented in groups showing unhealthy smoking as seen in some study [19]. Our study estimated 25.6% out of 78 female patients were menopausal and having low BMD. In compare with other study, which was similar, in Saudi women it has estimated 28.6% menopausal women with low BMD out of 212 [20].

This study acknowledges some limitations. This was a retrospective study which was suitable for evaluating the prevalence of osteoporosis. However, the small sample-size, comparing with other studies was a limitation facing reservation for generalization of its findings for the population. In addition to, there were some factors that limit our research, such as exposure to sunlight , dietary intake, pregnancy, vitamin D and the duration of breastfeeding were missed in the files.

The present study documented that the menopausal and non-menopausal females and males had high prevalence of osteopenia (42.1%), which indicates the importance of early intervention to prevent development of osteoporosis at old age. There was a significant correlation between having osteoporosis and menopause status, gender and smoking which increase the prevalence of decreasing BMD and having osteoporosis. Also, the prevalence of osteopenia in pre-menopausal females indicates the ultimate importance of early intervention to prevent development of osteoporosis in later life; so, routine measurement of BMD every 1 year for all pre-menopausal females for early detection and treatment of osteopenia seemed to be essential

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