The Distribution of The Lumbal Bone Mineral Density Within Turkish Postmenopousal Female Population

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OBJECTIVE: The aim of this study was to evaluate the distribution of the lumbal bone mineral density within Turkish postmenauposal female population. Models proposed so far for pathogenesis of osteoporosis often do not take the factors underlying the different incidences of vertebral fractures in different location in the spinal column and in different populations.
STUDY DESIGN: To adress this issue, we analyzed 580 postmenopausal female patients in a population-based retrospective study. Bone mineral density (BMD) values found at the lumbal spine were almost similar. Intraclass Correlation Coefficient (ICC) was computed for L1, L2, l3, L4, L2-4. Two-way mixed effect model (ConsistencyDefinition) defined as people effect random and measure effect fixed. Single Measure Intraclass correlation was foun to be 0.9068.
RESULTS: The same estimator is used whether the interaction effect is present or not. (95% C.I. Lower=0.8850, Upper=0.9260, F=49.6643, p<0.0001) Cronbach alpha reliability anlaysis showed the mean vertebral t scores-1.33 (min:-1.45 and max:-1.15 and inret-item correlations mean r=0.9 8min :0.82 and max :0.97).
CONCLUSION: Estimated marginal means of measure revealed L3 vertebra is the most reliable amongst the others and can be used single most effective diagnostic marker in postmenouposal female Turkish patients. These results confirm the associaton of BMD in lumbal spines and support the evidence that lumbal bone density measurements play a significant role in the diagnosis of osteoporosis and L3 is the best predictive parameter among those tested.
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Key Words: Vertebral BMD, Turkish population, Osteoporosis

Vertabral fractures are the most common clinical manifestation of osteoporosis. In contrast to hip, wrist and other long-bone fractures, a majority of vertebral fractures, a majority of vertebral fractures in women are either asymptomatic or not diagnosed.[1-3] Radiographic population surveys find that about 5% of 50-to 54-year-old white women have at least 1 prevalent radiographic vertebral fracture, but the proportion with a prevalent fracture rises to more than 35% among women aged 80 to 85 [2,3] The risk of an incident vertebral fracture on x-ray is only about 0.5 % in a 5-year-old white woman but increases to 2% to 3% per year by age 80-85. This is roughly 3 times the incidence of clinically diagnosed vertebral fractures. Vertebral fractures detected by radiograph are a sentinel and clinically important event in postmenopausal osteoporosis. The risk ofa vertebral fracture is strongly associated with low bone mineral density (BMD) , and most women with a vertebral fracture have a BMD that is low for their age .vertebral fracture is also a potent marker for skeletal fragility. A woman with a single existing vertebral fracture has a risk of subsequent vertebral fracture that is 3-4 times higher than does a woman without an existing fracture, independed of BMD.[4,5] Woman with an existing vertebral fracture also have a 2-fold increased risk of subsequent hip fracture and a 50% increased risk of other nonspine fractures.these risks are independent of a woman's BMD, suggesting that a vertebral fracture is amarker for general skeletal fragility . Bone mineral density and fracture rates vary among women of differing ethnicities. Most reports suggest that BMD is highest in African-Americans,lowest in Asians, and intermediate in Caucasians, yet Asians have lower fracture rates thanCaucasians.[6,7]

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Material and Methods

To ases the contributions of anthropometric and lifestyle characteristics to ethnic differents in BMD, we assessed lumbar spine BMD by dual-energy-ray absorptiometry in 580 postmenopausal women (mean age, 46.2 yr) participating in this study.

Bone mineral density (BMD: g/cm2) measurements were performedwith a Lunar DEXA x–ray bone densitometer as reported previoously. The bone mineral contect (BMC) was expressed in grams, after internal calibration, and BMD was then calculated as the BMC divided by the area of the region of interest: the vertebrae from L2 to L4 including the intervertebral discs. The absence of fractures, osteoarthritis and severe scoliosis was confirmed in the regions analysed. Measurements of BMD in the femoral neck were not performed in the present study. The coefficient of variation of measurement in the present study was less than 1.0%.

Table 1. Paired samples statistics for femoral geometry and vertebral BMD measurements.

		Mean	Std. deviation	Std. Error mean
Pair 1	FNECK (BMD T score)	-1.0982	1.1950	9.138E-02
	FLENGTH (cm)	3.711	,588	4.497E-02
Pair 2	FNECK (BMD T score)	-1.0982	1.1950	9.138E-02
	FWİDTH (cm)	3.553	,354	2.706E-02
Pair 3	FNECK (BMD T score)	-1.0982	1.1950	9.138E-02
	RATIO	1.0497	,1695	1.296E-02
Pair 4	WARD (BMD T score)	-1.4665	1.3369	,1022
	FLENGTH (cm)	3.711	,588	4.497E-02
Pair 5	WARD (BMD T score)	-1.4665	1.3369	,1022
	FWİDTH (cm)	3.553	,354	2.706E-02
Pair 6	WARD (BMD T score)	-1.4665	1.3369	,1022
	RATIO	1.0497	,1695	1.296E-02
Pair 7	L1 (BMD T score)	-1.4594	1.5546	,1189
	RATIO	1.0497	,1695	1.296E-02
Pair 8	L2 (BMD T score)	-1.4246	1.7033	,1303
	RATIO	1.0497	,1695	1.296E-02
Pair 9	L3 (BMD T score)	-1.1512	1.7889	,1368
	RATIO	1.0497	,1695	1.296E-02
Pair 10	L4 (BMD T score)	-1.3358	1.8182	,1390
	RATIO	1.0497	,1695	1.296E-02

Intraclass Correlation Coefficient (ICC) was computed for L1, L2, L3, L4, L2-4.

Two-way mixed effect model (Consistency Definition) defined as people effect random and measure effect fixed. Single Measure Intraclass Correlation was estimated. Cronbach alpha reliability analysis and inte-item correlations are also computed.

Estimated marginal means of measure for most reliable amongst the L1, L2, L3, L4, L2-4 vertebral BMD's comouted.

Results

Single Measure Intraclass Correlation was found to be 0.9068. The same estimator is used whether the interaction effect is present or not. (95% C.I. Lower=0.8850, Upper=0.9260, F=49.6643, p<0.0001). These results confirm the assosiation of BMD in lumbal spines and support the evidence that lumbal bone density measurements play a significant role in the diagnosis of osteoporosis and L3 is the best predictive parameter among those tested.

Estimated marginal means of measure for most reliable amongst the L1, L2, L3, L4, L2-4 vertebral BMD's comouted for single most effective diagnostic marker in postmenouposal female Turkish patients. These result confirm the association of BMD in lumbal spines and support the evidence that lumbal bone density measurements play a significant role in the diagnosis of osteoporosis and L3 is the best predictive parameter among those tested. There was strong correlation among lumbal spines Paired t test results is demonstrated in table 2. In this table the mean differences between the L1-L2, L1-L4 and L2-L4 were found to be statistically not significant . On the other hand the mean differences between the L1-L3, L1-L2, L2-L3, L2-L4 and L3-L4. Were found to be statistically significant. (Table 1-2)

Table 2. Paired samples correlations for femoral geometry and vertebral BMD measurements.

		Correlation	Sig
Pair 1	FNECK&FLENGTH	,098	,201
Pair 2	FNECK&FWİDTH	,022	,773
Pair 3	FNECK&RATIO	,109	,156
Pair 4	WARD&FLENGTH	,108	,160
Pair 5	WARD&FWİDTH	,011	,892
Pair 6	WARD&RATIO	,120	,119
Pair 7	L1&RATIO	,039	,616
Pair 8	L2&RATIO	,105	,172
Pair 9	L3&RATIO	,121	,115
Pair 10	L4&RATIO	,054	,486

Discussion

Finkelstein et al, showed that after adjustment, lumbar spine and femoral neck BMD remained highest in African-American women, and there were no significant differences between the remaining groups.[7] When BMD was assessed in a subset of woman weighing less than 70 kg and then adjusted for covariates, lumbar spine BMD became similar in African-American, chinese, and Japanese women and was lo-

west in Caucasion women.[8] Adjutment for bone size increased .values for Chinese women the levels equal to or above those of Caucasion and japanese woman. Among women of comporable weights, there are no differences in lumbar spine BMD among African-American, Chinese and Japanese women, all of whom have higher BMD s than Caucasians. Femoral neck BMD is highest in African-Americans and similar in Chinese, Japanese, and Caucasians. These findings may explay why Caucasian woman have higher fracture rates than African-americans and Asians.

Since the biomechanical competence of a vertebral body may be closely related to the content and distribution of the bone mineral, Yang et al, have evaluated the effects of projected vertebral bone area (BA) and bone mineral parameters [Bone mineral content (BMC) or bone mineral density (BMD)] on their biomechanical competence. They found that the contributory effects of BMC and BA on the biomechanical competence were not equal. The effects of BMC was larger than BA in determining the failor load and stored strain energy, whereas the reverse was found for the compressive stress. Using the log-transformed parameters as the regressors resulted in similar results. These results suggested the differential effects of BA and BMC in determining the biomechanical competence of vertebral bodies. They recommend the use of both parameters instead of BMD alone for evaluation of the vertebral biomechanical competence.[9,10]

Ismail et al,[11] performed a population-based prospective study to determine the insidence of limb fracture by site and gender in different regions of Europe. They concluded that among woman, the incidence of hip, humerus and distal forearm fracture ,though not 'other' limb fracture, increased with age, while in men only the incidence of hip and humerus fracture increased with age. Among woman, there was evidence of significant variationsin the occurence of hip, distal forearm and humerus fractures across Europe , with incidence rates higher in Scandinavia than in other Europian regionas, though for distal forearm fracture the incidence in east Europe was similar to that observed in Scandinavia, Among men, there was no evidence of significant geographic variation in the occurenc eof these fractures. This is the first large population-based study to characterize the incidence of limb fracture in men and women over 50 years of age across Europe. There are substential differences in the descriptive epidemiology of limb fracture by region and gender.[11]

Our data showed that L3 vertebra is the most reliable amongst the others and can be used single most effective diagnostic marker in postmenouposal female Turkish patients. These results confirm the association of BMD in lumbal spines and support the evidence that lumbal bone density measurements play a significant role in the diagnosis of osteoporosis and L3 is the best predictive parameter among those tested.

Limitation in the study design are recognized, in particular with respect to statistival power to show differences between the lumbal spines, but more importantly fracture end-points.

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