Original Article

CORRELATION OF FRACTURE INDEX WITH BMD T-SCORE IN POSTMENOPAUSAL FEMALES

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ABSTRACT:
Objective: To find the correlation between Fracture Index and BMD T-score so that fracture index can be used as a predictive tool for fracture risk estimation in post menopausal females.
Design: A cross-sectional study was conducted on a sample of 396 women age 50 years and above. BMD T-score measurements using ultrasound and Fracture Index calculations based on the risk factor assessment were performed.
Setting: North Medical Ward, Unit 4 & Out Patient Clinics, Mayo Hospital and Akram Medical complex, Lahore.
Main outcome: Use of Fracture Index as a predictive tool for the estimation of fracture risk in post menopausal females.
Results: The study results showed that when Fracture Index increases BMD T-score decreases to osteoporotic range and correlation coefficient is –0.162.
Conclusion: When Fracture Index increases, BMD T-score decreases therefore we can use Fracture Index as an assessment tool for predicting fracture risk in postmenopausal females.

KEY WORDS: BMD:- Bone mineral density, Fracture Index, Post menopausal

Pak J Med Sci July-September 2004 Vol. 20 No. 3 207-210

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* Received for publication: September 20, 2003

Revision received: March 22, 2004

Revision accepted: March 31, 2004

INTRODUCTION

Osteoporosis is the most common metabolic bone disease and it is important because of its contribution to fractures particularly in the elderly . In osteoporosis there is a reduction in the amount of bone per unit volume[1]. Osteoporosis commonly occurs in post menopausal and elderly women due to accelerated bone loss after menopause. Reduced mobility, endocrine diseases, chromosomal disturbances and a number of other conditions may also contribute[2]. Osteoporosis is affected by certain environmental factors including diet, smoking and alcohol intake. As the age of the population increases, osteoporotic fractures will be more common[3,4]. Technologists diagnose osteoporosis by measuring a patient's bone mineral density (BMD). Bone mineral density measures the amount of calcium in various sites of the bones.

BMD measuring methods involve specialized ultrasound scan , dual energy x-rays (DEXA) or CT scans (Osteo CT or QCT) of bones in the spinal column, wrist and hip[5]. BMD measurements can also be used to find out the future risk of hip fracture in osteoporotic patients[6,7]. A simpler tool for the evaluation of risk of fractures in osteoporotic and normal women is Fracture Index[8]. This study was carried out to find out the correlation between Fracture Index and BMD T-score as the later is an important predictor of future fractures in post menopausal females.

SUBJECTS AND METHODS

To conduct a cross-sectional study a sample of 396 females was taken. Verbal and written consent were obtained from the subjects in local language after approval of the experimental protocol by the hospital's human ethics committee.

Selection criteria included the following points:

* Females of post menopausal age group (above 50 years)
* Females from both urban and rural areas.
* Smokers and non smokers both were included.

Females with any concomitant bone disease e.g Tuberculous osteomyelitis, cancers of bones, or systemic diseases like diabetes mellitus were excluded from the study.

BMD T-score measurements were calculated using a specialized ultrasound (set on normal Asian BMD values as reference data) that gave us both BMD and T-score measurements but for convenience we used only the T-score values. Fracture Index was evaluated using a modified form of scored questionnaire designed by D.M.Black, Msteinbuch and co workers in their study "An assessment tool for predicting fracture risk in post Menopausal females". This questionnaire was based on the following factors as shown in table-I.

* Age
* Any fracture after 50 years of age
* Any fracture to the patient's mother after 50 years of age

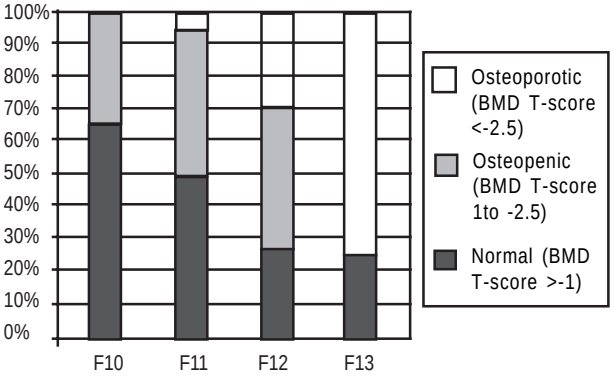

Figure 1: Correlation of Fracture Index with BMD T-score in Postmenopausal females

Table-I: Fracture Index questions and scoring

	Points
What is your current age?	
Less than 65 years	0
65-69 years	1
70-74 years	2
75-79 years	3
80-84 years	4
85 or older	5
Have you broken any bones after the age of 50?	
Yes	1
No	0
Has your mother had hip fracture after the age of 50?	
Yes	1
No	0
Do you weigh 125 pounds (57Kg) or less?	
Yes	1
No	0
Are you currently a smoker?	
Yes	1
No	0
Do you usually need assistance of your arms while standing from chair?	
Yes	1
No	0
Total score	

Table-II: WHO criteria for the diagnosis of Osteoporosis[5]

Normal	BMD > -1.0 below the young adult reference range
Osteopenic	BMD is -1.0 to -2.5 SD below the young adult reference range
Osteoporotic	BMD < -2.5 SD below the young adult reference range
Severe osteoporotic	BMD < -2.5 SD below the young adult reference range and the patient has one or more fractures

Table-III: Sample Distribution

Age(Years)	*Sex*	*Fracture Index*	*No.of subjects*
50 and above	Females	0	124
		1	204
		2	56
		3	12
Total subjects			396

* Weight of the patient (either above or below 125 pounds)
* Smoking status
* Whether the patient requires any assistance while standing up from a seated position[8].

For the diagnosis of osteoporosis we followed the WHO criteria[9] as shown in table-II. The data thus collected was analysed by applying the correlation coefficient.

RESULTS

Out of 396 females 124 females had 0 fracture index and 204 had 1 fracture index, 56 had 2 fracture index and only 12 had 3 fracture index. (Table-III)

Table-IV shows that out of 124 females who had 0 fracture index 64.5% had normal BMD T-scores where as 35.5% had BMD T-scores in osteopenic range. Out of 204 females with one fracture index 51% had normal BMD T-scores, 45% had osteopenic BMD T-scores and 4% had osteoporotic BMD T-scores. Out of 56 females who had two fracture index, 29% had normal BMD T-scores, 42% had osteopenic BMD T-scores and 29% had osteoporotic BMD T-scores. Out of 12 females with three fracture index, 75 % had BMD T-scores in osteoporotic range and 25% had BMD T-scores in osteopenic range. Table-IV also shows that correlation coefficient of Fracture Index with BMD T-score is –0.162.

Table-IV: Division of subjects in groups according to BMD T-scores

	Fracture Index	*No.of Subjects*	*%*	*Correlation coefficient*
Normal (T-score >-1)	0	80	64.5	
Osteopenic (T-score –1to-2.5)	0	44	35.5	
Osteoporotic (T-score <-2.5)	0	0	0	
Normal (T-score >-1)	1	104	51	
Osteopenic (T-score –1to-2.5)	1	92	45	
Osteoporotic (T-score <-2.5)	1	8	4	-0.162
Normal (T-score >-1)	2	16	29	
Osteopenic (T-score –1to-2.5)	2	23	42	
Osteoporotic (T-score <-2.5)	2	16	29	
Normal (T-score >-1)	3	0	0	
Osteopenic (T-score –1to-2.5)	3	3	25	
Osteoporotic (T-score <-2.5)	3	9	75	

DISCUSSION

On the basis of BMD measurements we can divide patients of osteoporosis in different groups and can name them according to their BMD values as normal, osteopenic and osteoporotic. This criteria has been used by WHO for epidemiological studies[9]. BMD measurements are predictors of postmenopausal fracture risk[10] and have added value in hip fracture risk estimation[11]. It is considered that low hip bone density is a stronger predictor of hip fracture than bone density at other sites[12,13] and it is also said that combination of ultrasonographic heel measurements of BMD makes possible the identification of women at very high or very low risk of fracture[14]. For all these reasons we used ultrasonographic heel measurements of BMD to find osteoporotic patients and then compared them with Fracture Index . We found that when Fracture Index increases, BMD T-score decreases to osteoporotic range and correlation coefficient of Fracture Index with BMD T-score is –0.162 which is moderately negative (indicating that with an increase in Fracture Index, BMD T-score decreases) as shown in Table-IV. We also found that when Fracture Index increases , percentage of females in osteoporotic BMD T-score range also increases (Fig1) shows that with an increase in Fracture Index future risk of fractures also increases . So we can say that Fracture Index can be used for predicting risk of fractures in postmenopausal females.

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