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Prevalence Of Osteoporosis In Relation To 10 Years Probability Of Major Osteoporotic Fracture And Hip Fracture Risk Using Country Specific Frax Algorithm In Postmenopausal Women In India

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Abstract: The purpose of the study was to investigate the prevalence of osteoporosis in relation to assess the 10-year probability percentage of Major Osteoporotic Fracture Risk and to assess the10-year probability percentage of Hip Fracture Risk using FRAX country specific algorithm with bone mineral density. Method: 74 older osteoporotic postmenopausal females ranging the age between 40 to 90 years were randomly selected as the subject of the study. Bone mineral density T-score were obtained by using Ultrasound Bone Densitometry (Omnisense) at distal radius by the experts and technicians. WHO Fracture Risk Assessment Tool (FRAX) INDIA was used to assess the fracture risk probability. FRAX probability calculated with distal radius Bone mineral density was obtained by reference method. Results: There were significant relationship between Body mass index and Bone mineral density. The correlation was highly significant between Bone mineral density and Major Osteoporotic Fracture Risk as well as Bone mineral density and Hip Fracture Risk. Conclusion: The results provide a framework which enhances the assessment of fracture risk in women in combination with Bone mineral density. Fracture risk feedback based on Bone mineral density could potentially make an important contribution to osteoporosis prevention and treatment in postmenopausal women irrespective of age and BMI.

Keyword: Osteoporosis, BMD, BMI, MOFR, HFR, FRAX, Bone Densitometry.

INTRODUCTION:

The World Health Organization (WHO) defined osteoporosis as "a systemic skeletal disease characterized by low bone mass and micro architectural deterioration of bone tissue, with a consequent increase in bone fragility and susceptibility to fractures." T-scores were originally designed to predict fracture risk in postmenopausal women. Age is an important predictor of fracture risk. At the same bone mineral density (BMD), an older woman is more likely to have a fracture compared with a younger woman of reproductive age, most likely because of lower bone quality Osteoporosis, literally "porous bone", is a disease characterized by weak bone. It is a major public health problem, affecting hundreds of millions of people worldwide, predominantly postmenopausal women. The main clinical consequence of the disease is bone fractures. It is estimated that one in three women and one in five men over the age of fifty worldwide will sustain an osteoporotic fracture.1

Table. 1. WHO Criteria for assessing severity.

Diagnostic classification	T-score[a]
Normal	> -1.0
Osteopenia (low bone mass)	-1.0 to -2.5
Osteoporosis	= -2.5
Severe (established) osteoporosis	< -2.5 with fracture

abone mass t-score the standard deviation in a patient's bmd, compared with the pick bone mass in a young adult of the same gender.

World Health Organization Criteria -It is widely accepted basis for osteoporosis detection. Osteoporosis is defined as a T-score equal to or less than -2.5. T-score above this cut off but below -1.0 define osteopenia or low bone mass. Normal BMD is 1 SD (standard deviation) above or below the mean (T-score of -1 to +1). An individual who has a T-score of -2.5 or less and has suffered from an osteoporotic fracture is considered to have severe or established osteoporosis. Osteoporotic fractures are an important cause of morbidity2 and are linked with significant risk for subsequent fracture and mortality, in postmenopausal women. In prospective and cross-sectional epidemiologic studies it has been shown that there is an inverse relationship between bone mass and fracture. The risk of osteoporotic

fracture increases continuously as BMD declines, resulting in a 1.5- to threefold increase in risk of fracture for each SD decrease in BMD3. Advanced age and low BMD are strongly associated with higher fracture risk in postmenopausal women4. Age and bone mineral density (BMD) are the strongest known risk factors for hip fracture. These risk factors are in part independent, so that absolute values for BMD have a different significance at different ages. Diagnostic criteria for osteoporosis (and low bone mass) have been proposed by an expert panel of the WHO and are widely used in epidemiology, by regulatory agencies, for practice guidelines and in clinical research. The diagnostic criteria stratify individuals according to the BMD of the young healthy population, so that osteoporosis in women is defined as a BMD value that lies 2.5 SD or more below the average value in young healthy women (T-score = 72.5) or lower. Using T-scores has many benefits, because T-scores are simple and widely used, have a good correlation with fracture risk, and can detect some high-risk patients. However, the majority of fractures occur in the large group of older women without osteoporosis, but with BMD in the osteopenic range5. Furthermore, several other independent risk factors for fractures, over and above that reflected by BMD, have been identified6. Thus, BMD will not reliably predict all individuals who will sustain a fracture from those who will not. The development of the FRAX tool has been supported by organizations including the International Osteoporosis Foundation, National Osteoporosis Foundation (NOF), the American Society for Bone and Mineral Research, and the International Society for Clinical Densitometry. The FRAX tool computes the 10-year probability of hip fracture or a major osteoporotic fracture. A major osteoporotic fracture is defined as a clinical spine, hip, forearm, and humerus fracture. The most common distal forearm fracture is a Colles' fracture. This fracture lies within 2.5 cm of the wrist joint margin and is associated with dorsal angulations and displacement of the distal fragment of the radius. It may be accompanied by a fracture of the ulna styloid process. The health burden of osteoporotic fractures is likely to rise, which is partly due to an increased life expectancy and to changes in lifestyle (e.g., less exercises/ mobility, less calcium intake, less exposure to sunlight). Therefore, understanding the epidemiology of this disease is essential in trying to develop strategies to target individuals at high risk for fracture7.

OBJECTIVES:

The objectives of the present study were to estimate 10 year probabilities of osteoporotic fractures in women according to AGE, BMD, BMI, Major Osteoporotic Fracture Risk (MOFR) and Hip Fracture Risk (HFR), of the older adult women of the age range 40 to 90.

METHODS:

The study was conducted in the Department of Physical Education, Visva Bharati University, Santiniketan, India. The study population comprised 74 fully compliant menopausal (at least one year) women aged 40 to 90 years served as the subject of the study. . Height and weight were measured in all patients using standard techniques. Body mass index (BMI) was calculated as weight in kilograms divided by height squared in meters and was used as a continuous variable. A bone mineral density test was organized using Ultrasound Bone Densitometry (Omnisense) at distal radius by the experts and technicians to get the BMD T- score. 60 women aged 50 years and above were tested and 74 women were detected as osteoporotic patient. The association between each of the risk factors and the risk of hip fracture was examined individually A questionnaire was used to get the data for measuring the fracture risks probability by WHO FRAX tool India software. Fracture risk by FRAX was based on age, BMI, prior fracture, hip fracture in parents, steroid use, rheumatoid arthritis, alcohol use, secondary osteoporosis and T-score for distal radius BMD.

RESULTS:

All statistical analyses were carried out using the Statistical Package for Social Sciences (SPSS) version 17.0 statistical software. Descriptive statistics are presented as mean values and standard deviations (SDs). We tested Bivariet correlation using Pearson correlation. All P values are two-tailed. Results are presented as mean ± SD. In this manuscript, BMD is presented at individual site (Distal Radius). The mean age of the postmenopausal women (n=74) was 59.54±11.38, with average BMI 25.60±4.63. The mean BMD T-score value was -2.76±1.33. Ten-year fracture probability for a major osteoporotic fracture and hip fracture. The mean risk values for hip and for major osteoporotic fracture at distal radius within 10 years. The probability of major osteoporotic fracture risk percentage (MOFR) was 24.51±20.52. And hip fracture risk (HFR) percentage was 15.88±20.23. The correlation between Age and BMI was statistically insignificant. There was a highly significant relationship between Age and BMD ($p< 0.01$) which indicates that bone mineral density decreased with increasing age of the women after menopause. The relation between Age and major osteoporotic fracture (MOFR) was also highly significant ($p< 0.01$). As the correlation between Age and BMD was highly significant that means as women ages the risk of osteoporosis fracture is also will be increase which would be an indicator of susceptibility to osteoporotic fracture. Age and HFR relation ($p< 0.01$) was also high enough to suspect risk of hip fracture with increasing risk. BMI and BMD, p- value is less than 0.01 levels. A significant association was found among BMI with MOFR, HFR ($p< 0.01$) and BMD with MOFR, HFR ($p< 0.01$) as well as MOFR with HFR ($p< 0.01$).

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TABLE. 2. Baseline characteristics of the subjects

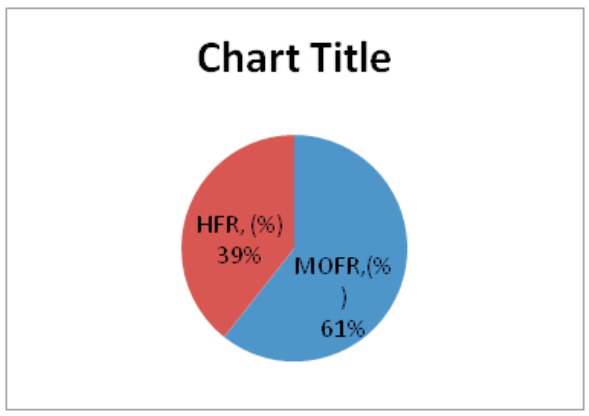
Characteristics	Mean (n=74)	Standard Deviation	Standard error of mean	Range
Age,(years)	59.5405	11.38154	1.32308	50.00
Height (mts.)	1.5163	.05820	.00677	.33
Weight (kg)	58.8459	11.09486	1.28975	51.90
BMI, (Kg m^{-2})	25.6007	4.63209	.53847	22.50
BMD,(T-score)	-2.8061	1.23751	.14386	6.20
MOFR,(%)	24.5176	20.52717	2.38624	83.60
HFR, (%)	15.8851	20.23805	2.35263	86.00

Frax (major osteoporotic fracture) 10-year probability of a major osteoporotic fracture (clinical distal radius) using the country specific who fracture risk assessment algorithm, frax (hip fracture) 10-year probability of a hip fracture using the country specific who fracture risk assessment algorithm.

DISCUSSION:

The risk of different fractures by age, sex and T-score in Fracture probabilities increased with decreasing T-score and increasing age, In this paper we describe 10 year probabilities for the common osteoporotic fractures. The level of fracture probability that provides an intervention threshold is likely to depend in part upon health economic considerations. Several studies have examined the cost-effectiveness of treatments directed at osteoporosis alone. For relatively expensive treatments intervention for 5 years is cost-effective in women with a T-score of 73.0 at the age of 50 years without prior fragility fractures. This would be equivalent to a 2.8% 10 year probability of hip fracture or a 3.5% probability of vertebral fracture. Somewhat higher intervention thresholds arise if health economic estimates are made on hip fracture risk alone.

Figure. 1. Major Osteoporotic Fracture Risk and Hip Fracture Risk



Average Fracture Risk in Postmenopausal Women

Figure. 2. Graphical Representation of Bone Health and Fracture Risk variables of Post Menopausal Women.

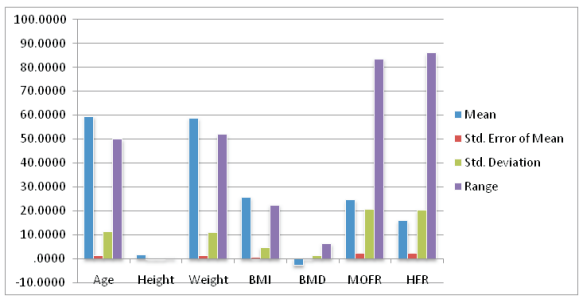
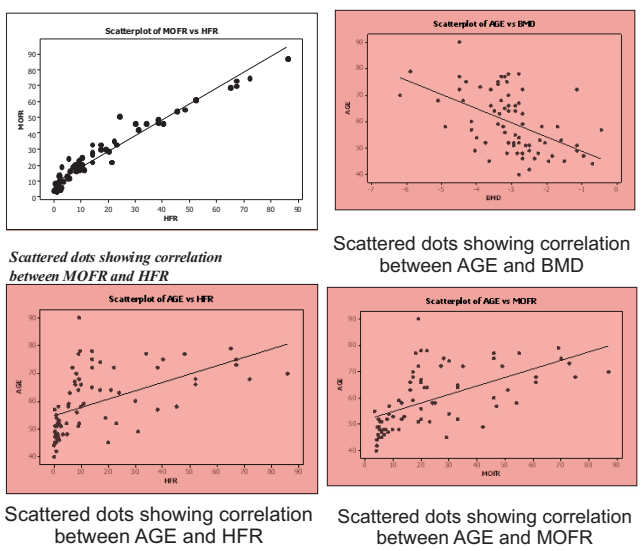


Figure. 3. Statistical analyses of correlation matrix between the variables.



CONCLUSION:

From the results it can be concluded that there were significant positive relationship between Age, BMI and BMD. The correlation was highly significant between BMD and MOFR as well as BMD and HFR also. The results provide a framework which enhances the assessment of fracture risk in women in combination with BMD. From a societal perspective it is appropriate to formulate risks and intervention thresholds in populations. As shown in this paper, a population of osteoporotic patients would have a higher risk than individuals at the thresholds for osteoporosis. To improve the sensitivity of osteoporosis risk prediction, typically it has been proposed that additional tests must be performed. Unfortunately, by adding tests, specificity is often compromised. However Fracture risk feedback based on BMD could potentially make an important contribution to osteoporosis prevention.

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