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Original Article

Utility of Osteoporosis Self-Assessment Tool as a Screening Tool for Predicting Osteoporosis in Indian Men

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Abstract

The osteoporosis self-assessment tool (OSTA) predicts the risk of osteoporosis in an individual. It is a simple calculation-based tool [wt (kg) – age (yr)/5] and can be used for measuring bone mineral density (BMD). However, OSTA is influenced by ethnicity. We studied the performance of OSTA index as a screening tool for osteoporosis in 257 community-dwelling North Indian men above 50 yr age. Each subject underwent a detailed clinical, dietary, anthropometric, and biochemical assessment and bone density measurement using dual-energy X-ray absorptiometry. As per World Health Organization criteria, osteoporosis, osteopenia, and normal BMD were observed in 17.9%, 58.8%, and 23.3%, respectively. OSTA index ranged between –6.4 and 8.8. OST index ≤2 predicted osteoporosis with a sensitivity of 95.7% and a specificity of 33.6% and an area under the curve for a receiver operating characteristic curve of 0.702. The OSTA index is an effective screening tool for measuring BMD in elderly Indian men and can be used by primary care physicians.

Key Words: 25OHD; BMD; DXA; elderly; iPTH.

Introduction

Osteoporosis is a common clinical problem in men. About 30% of fractures due to osteoporosis occur in men *(1)*. Osteoporosis usually presents with a fragility fracture in an otherwise asymptomatic individual. The mortality associated with osteoporotic hip fracture is 2–3 times higher in men than in women *(1–3)*. Treatment of men with osteoporosis is associated with a significant decrease in osteoporotic fractures *(4)*. Therefore, men should be screened for osteoporosis by simple clinical tools and those at higher risk should undergo a formal dual-energy X-ray absorptiometry (DXA) testing to detect the dreaded disease at the asymptomatic stage. The osteoporosis self-assessment tool (OSTA) is a simple tool based on a patient's weight and age and predicts the risk of osteoporosis in an individual. A cutoff value of ≤3 predicted osteoporosis with a sensitivity of 93% and a specificity of 66% in Caucasian men *(5)*. We studied the performance of OSTA as a screening tool for osteoporosis in Indian men above 50 yr of age.

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Material and Methods

Two hundred fifty-seven free-living, community-dwelling men above the age of 50 yr were enrolled from December 2013 to May 2014. All these subjects were enrolled after a health education program and were invited for bone health evaluation. Subjects with a prior diagnosis of osteoporosis, chronic kidney disease, chronic liver disease, stroke or any paralytic illness, prolonged immobilization, organ transplant, or malignancy were excluded. Subjects with a history of use of bisphosphonates or bone anabolic agents, for example, teriparatide or fluoride, were also excluded. Informed consent was obtained from all the sub-

jects and the study protocol was approved by the Institute Ethics Committee. All subjects filled a predefined performa, which included demographics, detailed medical history with emphasis on occurrence of fragility fractures, and risk factors for osteoporosis by interview method by a trained medical social worker. Each subject underwent a detailed physical examination including anthropometry.

All subjects underwent measurement of bone mineral density (BMD) by DXA (QDR 4500A; Hologic, Inc., Bedford, MA) at the lumbar spine (anteroposterior, L1–L4) and hip (total hip and femoral neck) as per standard protocol stated by the manufacturer. The BMDs at various sites were analyzed as per World Health Organization (WHO) criteria for the diagnosis of osteoporosis, osteopenia, and normal BMD (i.e., the lowest *T*-score, ≤–2.5, as osteoporosis; between <–1 and >–2.5 as osteopenia; and >–1.0 as normal BMD). BMD at the hip was analyzed using reference data from the National Health and Nutrition Examination Survey III *(6)*. The OSTA index was calculated for each subject by using the formula [wt (kg) – age (yr)]/5.

Statistical Analysis

All statistical analyses were performed using the statistical software SPSS version 21.0 (SPSS Inc., Chicago, IL). We calculated the area under the receiver operating characteristic (ROC) curve for the OSTA diagnosis of osteoporosis using the BMD *T*-score of ≤–2.5 as standard (test variable). We estimated the sensitivity, specificity, positive predictive value, and negative predictive value for various cutoffs of the OST index. We also used WHO Fracture Risk Assessment Tool (FRAX) without BMD and calculated the 10-yr probability of a hip fracture or other major fracture for our subjects and compared its performance with the OSTA cutoff in predicting osteoporosis in our study population.

Results

Two hundred fifty-seven men were enrolled in the study. The mean age, weight, and body mass index of our subjects were 67.0 ± 7.0 yr, 69.4 ± 11.9 kg and 25.3 ± 3.8, respectively. The demographic characteristics, biochemical investigations, and risk factors for osteoporosis are given in Tables 1–3, respectively. Out of 257 subjects, 46 (17.9%) had osteoporosis, 151 (58.8%) had osteopenia, and 60 (23.3%) had normal BMD according to WHO criteria.

The OSTA index ranged from –6.4 to 8.8. The predictive value of the OSTA index at different cutoffs are given in Table 4. An OST cutoff of ≤2 predicted osteoporosis with a sensitivity of 95.7% and a specificity of 34% in our cohort (men >50 yr of age). The area under the curve for the ROC curve was 0.702 (Fig. 1).

We calculated the 10-yr probability of a major osteoporotic fracture or a hip fracture for all 257 subjects using FRAX without BMD. A 10-yr probability of a major osteoporotic fracture of ≥20% or a 10-yr probability of a hip fracture of ≥3% was seen in 22 (8.6%) subjects. The sensitivity and specificity of FRAX to predict osteoporosis (BMD ≤–2.5 at any of the 3 sites) were 17.4% and 93.4%, respectively. We compared the sensitivity and specificity of FRAX to OSTA (cutoff ≤ 2) in predicting osteoporosis: sensitivity 95.7% vs 17.4 ($p < 0.0005$) and specificity 34% vs 93.4 ($p < 0.0001$; Table 5).

Table 1
Demographic Characteristics of the Study Subjects (n = 257)

Variable	Mean ± SD
Age (yr)	67.0 ± 7.0
Weight (kg)	69.4 ± 11.9
Height (cm)	165.4 ± 6.6
BMI (kg/m^2)	25.3 ± 3.8
Diabetes mellitus, n (%)	87 (34)
Hypertension, n (%)	127 (49)
Hyperlipidemia, n (%)	66 (25.7)
Coronary artery disease (documented), n (%)	42 (16.3)

Abbreviations: BMI, body mass index; SD, standard deviation.

Table 2
Biochemical Parameters in the Study Subjects (n = 257)

Serum parameter	Mean ± SD	Range
Creatinine (mg/dL)	0.94 ± 0.26	0.35–2.10
Calcium (mg/dL)	8.6 ± 0.98	6.6–10.6
Phosphorus (mg/dL)	3.2 ± 0.69	2–5.6
Albumin (g/dL)	4.1 ± 0.48	3.1–5.2
Alkaline phosphatase (IU/dL)	78.8 ± 28.5	20.7–242
25OHD (ng/mL)	17.5 ± 10.7	2.5–61
iPTH (pg/mL)	69.46 ± 46.75	3–321
Testosterone (nmol/L)	12.68 ± 6.75	0.72–53.68

Abbreviations: 25OHD, 25-hydroxyvitamin D; iPTH, intact parathyroid hormone; SD, standard deviation.

Table 3
Risk Factors for Osteoporosis in Study Subjects (n = 257)

Variable	n (%)
Current smoking	40 (15.6)
Alcohol (≥3 units/d)	23 (8.9)
Glucocorticoid exposure (prednisolone ≥ 5 mg/d for 3 mo)	20 (7.8)
Weight loss (>10% of body weight)	8 (3.1)
History of previous fragility fracture	11 (4.3)
Family history of fragility fracture	27 (10.5)
Rheumatoid arthritis	2 (0.8)