Trakia Journal of Sciences, Vol. 18, Suppl. 1, pp 143-147, 2020

Available online at:
http://www.uni-sz.bg

ISSN 1313-3551 (online) **doi:10.15547/tjs.2020.s.01.026**

RISK ASSESSMENT FOR OSTEOPOROSIS IN POSTMENOPAUSAL WOMEN

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ABSTRACT

PURPOSE: Risk factors for osteoporotic fractures include parental history of hip fractures, smoking, excessive alcohol consumption, low body weight and menopause.
Postmenopausal women under 65 years with at least one risk factor should be evaluated with a risk assessment tool to decide if they need to undergo osteodensitometry. There is an evidence of a significantly greater sensitivity of the SCORE test for detection of osteoporosis in women with age between 50 to 64 years compared to the FRAX tool.

METHODS: We conducted a survey to evaluate the risk of osteoporosis in 64 postmenopausal women using SCORE tool. The assessed women were with mean age of 50 years. A total score of more than 6 points is considered to determine a possible risk of osteoporosis.

RESULTS: 50% of the women showed moderate risk and 25% of the women had very high risk for osteoporosis. 75% of all evaluated subjects were detected to need bone mineral density (BMD) assessment with a dual-energy X-ray absorptiometry (DXA).

CONCLUSIONS: The results of the current study are evidence of the high sensitivity of the SCORE tool and of the significant prevalence of osteoporosis among Bulgarian postmenopausal women.

Key words: SCORE tool, screening, osteoporosis, postmenopausal women

INTRODUCTION

Osteoporosis is a progressive bone metabolic disease. It is undetectable until a bone fracture occurs. Once osteoporosis has developed, then it is less likely to completely restore the bone strength of the patients. The prevalence of osteoporosis is increasing as the global population ages rapidly. Various clinical risk assessment tools have been developed to evaluate the risk of osteoporosis (1). The Simple Calculated Osteoporosis Risk Estimation (SCORE) considers six risk factors—age, race, weight, estrogen use, rheumatoid arthritis, and personal fracture history—and have a sensitivity of 91 percent and specificity of 40 percent, **Figure 1**. The aim of the current study is to assess postmenopausal women at risk of osteoporosis through SCORE test and to evaluate the predictability of the SCORE tool.

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PURPOSE

SCORE test may be suitable for mass screening among community-dwelling older people. This tool has not been also validated in older men. Risk assessment tools for osteoporosis are helpful for making decision if the patients should undergo bone density scan. There are several osteodensitometry devices. Dual energy X-ray absorptiometry (DXA) is the gold-standard method for the assessment of the axial skeleton. Furthermore computer vision methods are used to assess spinal deformity from DXA scan images and to make more accurate diagnosis of osteoporosis (2).

METHODS

We conducted a survey to evaluate the risk of osteoporosis in 64 postmenopausal women using SCORE tool. The assessed women were with mean age of 50 years. Among the assessed risk factors were race, rheumatoid arthritis (RA), history of fractures, age, estrogen therapy and weight. If the race wasn't black, 5 points were added to the score of the

subject. If RA was concomitant diagnosis it was considered to add 4 points to the score. 4 points were counted for each type of non-traumatic fracture after age 45 (wrist, rib, and hip). If the subject had 3 non-traumatic fractures each of them were counted with 4 points so the sum of the points was 12 for the variable "history of fractures". The risk according to the variable "age" was evaluated as three times first digit of age in years. For example if the subject was 50 years, the overall risk for age was calculated 3x5=15 points. If the women has never received estrogen therapy one point was added to the total score. The risk for the variable "weight" was calculated as -1 times the weight in pounds divided by 10 and truncated to nearest integer. SCORE is calculated by the following formula: SCORE = race + RA + non-traumatic fractures + estrogen + (3 x age / 10) - (weight / 10). Interpretation includes low risk (0 to 6 points), moderate risk (7-15 points) and high risk (16-50 points). For cases with more than 6 points, the use of an osteodensitometer to determine BMD is recommended. SPSS version 19 was used to analyze statistically the data.

Variable	Score	Conditions
Race	+5	Woman is not black
Rheumatoid arthritis	+4	Woman has rheumatoid arthritis
History of fractures	+4	For each type (wrist, rib, hip) of nontraumatic fracture after age 45 (maximum score = 12)
Age	+3	Times first digit of age in years
Estrogen therapy	+1	Woman has never received estrogen therapy
Weight	–1	Times weight in pounds divided by 10 and truncated to nearest integer

(*Adapted from* Lydick et al. [4].)

Figure 1. SCORE

RESULTS

48/64 women (75%) were detected to need an assessment of the BMD with DXA scan. 12/48 subjects (25%) had low risk, 24/48 women (50%) were at moderate risk of osteoporosis and 12/48 women (25%) had high risk of osteoporosis**, Figure 2.** 6/64 women (9.4%) had RA and were counted with 4 points for this condition. The remaining 58 of 64 women (90.6%) didn't have diagnosis of RA and were counted with 0 points for this condition. According to the variable "history of fractures" 41 subjects (64%) haven't experienced any fractures and were counted with 0 points for fractures, 13 subjects (20.3%) had one fracture and were counted with 4 points, 9 subjects experienced two fractures counted with 8 points and one subject had three fractures counted with 12 points. After assessing the age according to the formula the mean evaluated points for the variable "age" were 16 points. 19 women (29.7%) had previous estrogen treatment and they weren't counted with +1 point as estrogen therapy is protective factor for osteoporosis. The remaining 45 women (70.3%) weren't treated with estrogen agents and they were counted with +1 point. The mean evaluated points according to the variable "weight" was calculated as -12 points. All 64 women were non-black so they were assessed with 5 points because white race is risk factor for osteoporosis, **Table 1.** After doing ROC analysis for the assessment of the predictability of SCORE test for osteoporosis we found 73% sensitivity and 41% specificity of this test to screen women for osteoporosis, **Figure 3.**

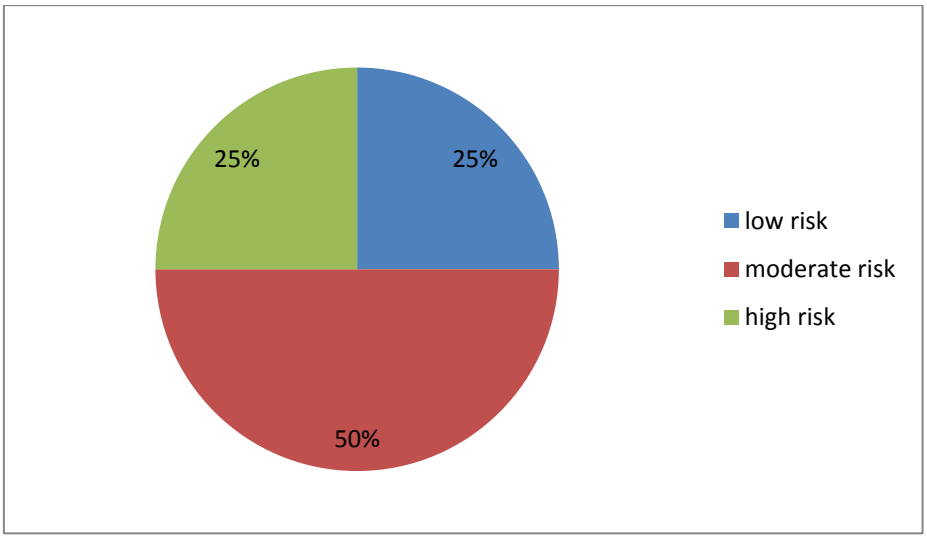

Figure 2. Distribution of the subjects according to the risk of osteoporosis-low, moderate and high risk

Table 1. *Count and percent of the women according to each variable (risk factor)*

Variable		Count	%	Mean
RA	no	58	90.6%	
	yes	6	9.4%	
history of fractures	0	41	64.0%	
	1	13	20.3%	
	2	9	14.1%	
	3	1	1.6%	
age				16
estrogen therapy	no	45	70.3%	
	yes	19	29.7%	
weight				-12
race	Non-black	64	100.0%	

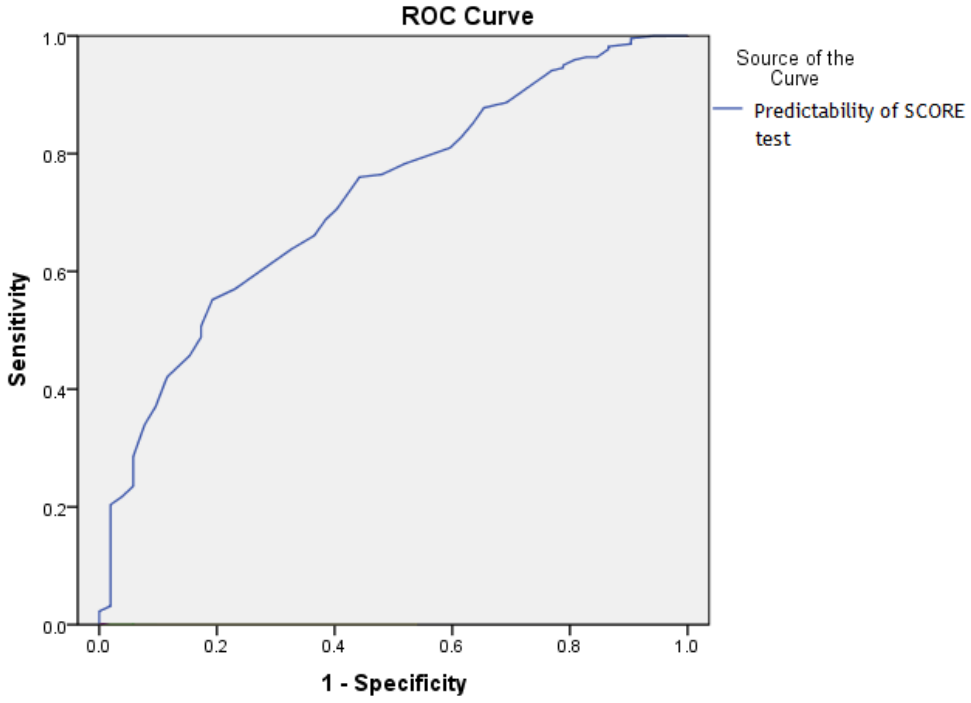

Figure 3. Predictability of SCORE test for osteoporosis

DISCUSSION

Low BMD at the lumbar spine or at the femoral neck is an important criterion to make a decision about the treatment to prevent osteoporosis and possible fragility fractures. SCORE is one of the first attempts which could detect subjects at high risk of osteoporosis who should undergo bone densitometry to decide if they need preventive treatment. Therefore, SCORE's discriminatory function was based on its ability to correctly classify subjects with low BMD at either the femoral neck or the lumbar spine (3, 4).

The threshold of 6 points was recommended by Lydick et al. They showed that SCORE had a sensitivity of 90% and specificity of 32%. This means that 90% of the individuals with low BMD, and 68% of those with normal BMD, would be selected for DXA. Although the high false positive rate resulted in unnecessary DXA scans, Lydick et al. found SCORE's performance to improve with increasing age. SCORE tool was not validated according to ethnic variations (3).

Lydick et al. combined BMD values from different DXA manufacturers, and relied on reference populations to determine low BMD. BMD values derived using equipment from different manufacturer differed if they are not expressed in standardized BMD units (5-8). A number of methodological difficulties may have contributed to SCORE's poor performance. SCORE may not be universalized for all postmenopausal women due to the characteristics of the subjects (they were recruited only from specialty clinics) included in the study of Lydick et al. Furthermore, more women in the Lydick cohorts were taking estrogens and this is recognized as a therapeutic intervention for the prevention of bone mineral loss in the menopausal years. Despite of these limitations the sensitivity of the SCORE tool to detect subjects with low axial skeleton BMD remains high-90% (3).

A couple of studies used SCORE tool to analyze the risk for osteoporosis (9-12), however there isn't any published study in Bulgaria which assessed the predictability of the SCORE test to select women for DXA scan. Our study is the first one which assesses postmenopausal women at risk of osteoporosis through SCORE test and evaluates the predictability of this test. We found lower sensitivity of the SCORE tool-73%, but higher specificity-41% compared to the previous published studies. That means that that 73% of the women with low BMD and 59% of those with normal BMD would be selected for DXA scan.

CONCLUSIONS

The results of the current study show that SCORE tool has a good prediction power for osteoporosis and could be used for the assessment of osteoporosis among Bulgarian postmenopausal women.

REFERENCES

1. Kirilova E, Tcherkezov D, Gonchev V, Zheleva Z. OSIRIS index for assessment of the osteoporosis risk in postmenopausal women. National conference Science and Society, Kardjali, RKR print OOD ISSN 1314-3425: 95-99, 2019.
2. Kirilov N, Kirilova E. Computer vision for assessment of scoliosis from dual energy X-ray (DXA) image, Second Youth Scientific Session *"Biomedicine and Quality of Life"* November 4-5, , BMQL-2019-Book-of-abstracts.pdf :18, 2019.
3. Lydick E, Cook K, Turpin J, Melton M, Stine R, Byrnes C. Development and validation of a simple questionnaire to facilitate identification of women likely to have low bone density. *Am J Manag Care*; 4:37–48, 1998.
4. Cadarette SM, Jaglal SB, Murray TM. Validation of the simple calculated osteoporosis risk estimation (SCORE) for patient selection for bone densitometry. *Osteoporos Int.*10(1):85-90, 1999.
5. Blake GM, Fogelman I. Interpretation of bone densitometry studies. Semin Nucl Med 1997; 27:248–60. 6. Simmons A, Simpson DE, O'Doherty MJ, Barrington S, Coakley AJ. The effects of standardization and reference values on patient classification for spine and femur dual-energy X-ray absorptiometry. *Osteoporos Int* 7:200–6. 1997
6. Formica CA. Standardization of BMD measurements [editorial]. *Osteoporos Int* 1998;8:1–3. 20.
7. Faulkner KG, Roberts LA, McClung MR. Discrepancies in normative data between Lunar and Hologic DXA systems. *Osteoporos Int* 6:432–6. 1996
8. Schwartz, E.N., Steinberg, D.M. Prescreening tools to determine who needs DXA. *Curr Osteoporos Rep* 4; 148–152. 2006.

9. US Preventive Services Task Force. Screening for Osteoporosis to Prevent Fractures: US Preventive Services Task Force Recommendation Statement. *JAMA;* 319(24):2521–2531. 2018.
10. Crandall CJ, Larson J, Gourlay ML, et al. Osteoporosis screening in postmenopausal women 50 to 64 years old: comparison of US Preventive Services Task Force strategy and two traditional strategies in the Women's Health Initiative. *J Bone Miner Res;* 29(7):1661-1666. 2014.
11. JenniferL. Pecina, Lindy Romanovsky, Step hen P. Merry, Kurt A. Kennel, Tom D. Thacher. Comparison of Clinical Risk Tools for Predicting Osteoporosis in Women Ages 50–64. *The Journal of the American Board of Family Medicine*; 29 (2) 233 239, 2016.