PREDICTIVE ABILITY OF THE OSTEOPOROSIS SELF-ASSESSMENT TOOL FOR ASSESSING THE RISK OF OSTEOPOROSIS

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Abstract. Osteoporosis (OP) is a progressive metabolic bone disease caused by disturbed balance between bone formation and bone resorption. Osteoporotic fractures lead to a deterioration in the quality of patients’ life due to high morbidity and mortality, and the economic burden of osteoporotic fractures is expected to increase. Various tools have been developed to assess the risk of osteoporosis in the clinical practice. The Osteoporosis Self-Assessment Tool (OST) is used to predict osteoporosis and is suitable for self-assessment. The purpose

Резюме. Остеопорозата (ОП) е прогресивно метаболитно костно заболяване, което възниква в резултат на нарушен баланс между костно изразяване и костна резорция. Остеопорозните фрактури водят до влошаване на качеството на живот на болния поради високата заболяемост и съмртност, а икономическата тежест на остеопорозните фрактури се очаква да нарасне. В тази връзка в клиничната практика са разработени различни инструменти за оценка на риска от остеопороза и от фрактурите. Osteoporosis Self-Assessment Tool (OST) се използва за предиция на остеопороза и е подходящ за самооценка. Целта на това проучване е да се оцени предиктивната способност на OST срещу риска от ОП. В проучването е включени 180 постменопаузални жени на средна възраст 61 ± 13 години (диапазон 38-86 години). OST сроч е оценен по следната формула: (телесна тежест - възраст) × 0.2. Пациентките са разпределени в три рискови групи според риска от развитие на остеопороза, както следва: нисък риск (> -1), умерен риск (от –1 до –4) и висок риск (≤ -4). На базата общия T-сроч на лумбален гръбнак, измерен чрез двойноенергийна рентгенова абсорбциометрия (DEXA-dual-energy X-ray absorptiometry), беше установен реалният брой на жените с ОП. Според OST сроч 22 жени попадат в категорията с висок риск от остеопороза, 41 жена – в категорията със среден риск от остеопороза и 117 жени – в категорията с нисък риск от остеопороза. Съществува корелация между риска от ОП, изчислен с OST, и броя пациентки с ОП, установен чрез DEXA измерване – с нарастване на риска от ОП, нараства и броят на жените с остеопороза (p = 0.000). Процентът на жените с остеопороза в най-голямата групата с висок риск от ОП и най-малък в групата на жените с нисък риск от ОП. 95,5% от групата жени с висок риск от ОП имат поставена диагноза остеопороза. Тези резултати доказват добрата предиктивна способност на OST за оценка на риска от ОП в българската популация.

Ключови думи: остеопороза, риск, Osteoporosis Self-Assessment Tool

Abstract. Osteoporosis (OP) is a progressive metabolic bone disease caused by disturbed balance between bone formation and bone resorption. Osteoporotic fractures lead to a deterioration in the quality of patients’ life due to high morbidity and mortality, and the economic burden of osteoporotic fractures is expected to increase. Various tools have been developed to assess the risk of osteoporosis in the clinical practice. The Osteoporosis Self-Assessment Tool (OST) is used to predict osteoporosis and is suitable for self-assessment. The purpose
of this study is to assess the ability of the OST score to predict the risk of OP. 180 postmenopausal women with a mean age of 61 ± 13 years (38-86 years) were included in the study. The OST score was evaluated using the formula: \((\text{body weight} - \text{age}) \times 0.2\). Patients were divided into three groups according to the risk of OP: low risk (> -1), moderate risk (-1 to -4) and high risk (< -4). Based on the total lumbar spine T-score, measured by dual-energy X-ray absorptiometry (DEXA), the actual number of the women with OP was established. According to the OST score, 22 women were in the high risk group, 41 women in the moderate risk group, and 117 women in the low risk group. There was a correlation between the risk of OP calculated with OST and the number of patients with OP, established by DEXA measurement – with increased risk of OP, the number of the women with OP also increased \((p = 0.000)\). The percentage of the women with osteoporosis is highest in the high risk group and lowest in the low risk group. In the high risk group, 95.5% of the women had a diagnosis of osteoporosis. These results demonstrate the good ability of OST score to predict the risk of OP in the Bulgarian population.

Key words: osteoporosis, risk, Osteoporosis Self-Assessment Tool
Predictive ability of the Osteoporosis Self-Assessment Tool (OST) to predict the risk of osteoporosis.

Patients and Methods

180 postmenopausal women with an average age of 61 ± 13 years (range 38-86 years) were included in the study. The OST score was evaluated using the following formula: (body weight – age) × 0.2. Patients were divided into three risk groups according to the risk of developing OP as follows: low risk (>-1), moderate risk (-1 to -4), and high risk (<-4). Based on the total T-score of the lumbar spine, measured by dual energy X-ray absorptiometry (DEXA), three groups were created: 1st group: normal bone density, 2nd group: with osteopenia and 3rd group: with osteoporosis. According to the definition of the World Health Organization (WHO) for the thresholds of bone mineral density (BMD), osteoporosis has been defined as a T-score ≤ -2.5 standard deviations below the mean for normal young white women, osteopenia as a T-score ≤ -1.0 SD (standard deviations) > -2.5 SD and normal bone density as T-score > -1.0 SD.

Statistical analysis

The statistical analysis was performed with SPSS version 21. Descriptive statistical analysis was used to divide the women by age and weight in the three risk groups according to the OST score. Using a chi-square test, the relationship between the risk of OP, calculated with OST score, and the number of women, diagnosed with OP according to DEXA scan, was evaluated.

Results

According to the OST score, 22 women were in the high-risk category of osteoporosis, 41 women in the moderate risk category of osteoporosis, and 117 women in the low risk category of osteoporosis. Women at high risk of osteoporosis were with mean age of 76 years (range 67-86 years (y)) and with average weight of 54 kg (range 42-64 kilograms (kg)). Women with a moderate risk of osteoporosis...
were on average 69 years old (range 50-83 years) with an average body weight of 63 kg (range 43-81 kg). Women at low risk of osteoporosis were with mean age of 56 years (range 38-76 years) and with mean weight of 76 kg (range 46-127 kg). (Table 1).

There was a correlation between the risk of OP, calculated with OST score and the number of patients with OP, established by DEXA measurement – with increasing risk of OP, the number of the women with osteoporosis also increased (p = 0.000). The percentage of the women with osteoporosis is the highest in the high risk group of OP and the lowest in the group of women with low risk of OP. In the group of high risk of OP, 21 out of 22 women (95.5%) had osteoporosis. In the group of moderate risk of OP, 29 out of 41 women (70.7%) had osteoporosis, and in the group of low risk of OP, 3 out of 117 women (2.6%) had osteoporosis. Conversely, the percentage of the women with osteopenia and normal bone density was the highest in the group of the women at low risk of OP and the lowest in the group of women at high risk of OP. 70/117 (59.8%) of the low-risk of OP, 44/117 (37.6%) of the moderate risk of OP and 1/22 (4.5%) of the high risk of OP had osteopenia. 44/117 (37.6%) of the low-risk of OP, 11/41 (26.8%) of the moderate risk of OP and 1/22 (4.5%) of the high risk of OP had normal BMD (figure1).

**Discussion**

According to some studies, the risk assessment tools for prediction of OP with a small number of risk factors, such as OST score, predict OP just as well as or better than those tools with more

**Table 1. Distribution of the women by age and weight in three risk groups according to the OST score**

| OST score / OST score | С висок риск от OP / With high risk of OP (N = 22) | Със среден риск от OP / With moderate risk of OP (N = 41) | С нисък риск от OP / With low risk of OP (N = 117) |
|----------------------|---------------------------------|---------------------------------|---------------------------------|
| Средна стойност Mean value | Мин. Min. | Макс. Max. | Средна стойност Mean value | Мин. Min. | Макс. Max. | Средна стойност Mean value | Мин. Min. | Макс. Max. |
| Възраст (г) Age (y) | 76 | 67 | 86 | 69 | 50 | 83 | 56 | 38 | 76 |
| Тегло (кг) Weight (kg) | 54 | 42 | 64 | 63 | 43 | 81 | 76 | 46 | 127 |
skora za прогнозиране на ОП е проучена в различни азиатски и неазиатски популации [6, 8, 11]. Проучванията показват добри прогностични стойности по отношение на чувствителността, специфичността и площта под кривата (AUC площта), когато КМП се използва като референтна. Някои промени в граничните прагови стойности (cut off values) на OST скора трябва да бъдат направени и тествани, за да се оптимизира неговото приложение според възрастта, пола, етническата принадлежност и мястото на измерване на КМП. Необходимостта от национални валидиращи проучвания преди включването на OST скора в програмата за скрининг на ОП ни мотивира да проведем това проучване [7, 9, 12, 18].

В тази връзка целта на проучването беше да се изследва способността на OST скора за предсказване на риска от ОП в българската популация. Установихме, че съществува корелация между риска от ОП, определен на базата на OST скора, и реалния брой жени с поставена диагноза ОП въз основа на DEXA изследване. В групата на жените с висок риск от ОП 95,5% от тях имат поставена диагноза остеопороза. Тези резултати доказват добрата предиктивна способност на скора за самооценка на риска от ОП и risk factors [13, 14, 16, 17, 19]. The ability of the OST score to predict OP has been studied in various Asian and non-Asian populations [6, 8, 11]. The conducted studies showed good prognostic capability in relation to the sensitivity, specificity and area under the curve (AUC area) when BMD is used as a reference. Some changes to the cut off values of the OST score must be made and tested to optimize its use according to age, gender, ethnicity, and place of measurement of BMD. The need for national validation studies prior to inclusion of the OST score in the general practitioner’s screening program motivated us to conduct this study [7, 9, 12, 18].

In this regard, the aim of the study was to investigate the ability of the OST score to predict the risk of OP in the Bulgarian population. We found that there was a correlation between the risk of OP, determined on the basis of the OST score, and the actual number of the women, diagnosed with OP on the basis of the DEXA scan. In the group of women at high risk of OP, 95.5% of them had a diagnosis of osteoporosis. These results prove the good predictive ability of the OST score in the Bulgarian
da se насочат към DEXA изследвания. Така ще се увеличи броят на жените с потенциален риск от OP, които ще проведат DEXA изследване, ще получават адекватно лечение и същевременно ще се намалят броят на фрактурите, морбидността и смъртността, асоциирана с тях, както и разходите за хоспитализации [10].

ЗАКЛЮЧЕНИЕ

OST скорът е подходящ инструмент за самооценка на риска от OP. Той може да се използа в практиката на общопрактикуващите лекари поради лесната му оценка с цел насочване на пациентите към DEXA изследване. Рутинното му приложение би могло да намали броя на фрактурите при пациенти с остеопороза, които са насочени навреме за DEXA изследване и впоследствие са включени навреме в терапия.

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