The male osteoporosis risk estimation score and the osteoporosis self-assessment screening tool for Indonesian men

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ABSTRACT

Purpose. To evaluate the male osteoporosis risk estimation score (MORES) and the osteoporosis self-assessment screening tool (OST) score as a means of screening for osteoporosis in men.

Methods. Records of 113 Indonesian men aged 50 to 91 (mean, 71) years who underwent evaluation of bone mineral density (T-score) using Dual-energy X-ray absorptiometry were retrospectively reviewed. The MORES was determined by 3 osteoporosis risk factors: age (in years), body weight (in kg), and chronic obstructive pulmonary disorder. A MORES of ≥6 indicated osteoporosis and corresponded to a T-score of ≤-2.5. The OST score was calculated as body weight (in kg) minus age (in years) multiplied by 0.2. An OST score of ≤2 indicated osteoporosis and corresponded to a T-score of ≤-2.5. Sensitivity, specificity, and positive and negative predictive values of the MORES and the OST score were determined.

Results. Respectively for the MORES and the OST score, sensitivity values were 100% and 74%, specificity values were 7% and 41%, positive predictive values were 25% and 28%, and negative predictive values were 100% and 83%. Using receiver operating characteristic curves, the area under curve was 0.535 for the MORES and 0.574 for the OST score.

Conclusion. The MORES and the OST score should be used together to screen for osteoporosis in men.

Key words: absorptiometry, photon; bone density; osteoporosis

INTRODUCTION

Osteoporosis in men is under-recognised and thus undertreated.¹ In the United States, by 2030 the total male population aged >65 years is expected to double in comparison to today’s number.² The prevalence of male osteoporosis will increase by almost 50% in 15 years.³ The number of hip fractures secondary to osteoporosis is expected to increase to 13 million in 2050, with 31% (about 4 million) being in men.⁴,⁵ Osteoporosis is a major predictor of fractures.⁶,⁷
Dual-energy X-ray absorptiometry (DEXA) is the gold standard for measuring the bone mineral density (BMD) of the lumbar vertebrae, proximal femurs, distal forearms, and/or in the whole body. For diagnosing osteoporosis, assessment can be made only in the lumbar vertebrae for women aged <60 years or in the proximal femurs for women aged >60 years and for men. A T-score of ≤-2.5 is defined as osteoporosis, -1 to -2.5 as osteopenia, and >-1 as normal. Men aged ≥50 years have a 13% lifetime risk of fractures. Men aged ≥40 years have a 25% residual lifetime risk of fractures, whereas those with a T-score of ≤-2.5 have a 42% risk of fractures. In persons aged >75 years, the one-year mortality after hip fractures is greater for men than for women (20.7% vs. 7.5%).

In Canada, BMD testing for men aged ≥65 years is advised, as low BMD contributes significantly to the risk of fractures. BMD testing is also advised for younger men with secondary causes of osteoporosis and other risk factors for fracture (Table 1).

BMD peaks at around age 30 years and declines after menopause for women and after age 70 years for men. In men aged >70 years, BMD decreases rapidly owing to decreased testosterone or estradiol levels. Bone trabeculae become thinner because of decreased bone formation. This process is controlled by growth factors such as insulin growth factor-1; the loss of cortical bone mass in males occurs later in life (85% after age 50 years). These changes are associated with changing testosterone levels, the availability of natural oestrogen, and an increase in bone remodelling.

### Table 1
Risk factors of fractures in men independent of bone mineral density

| Risk factors of fractures | Score |
|---------------------------|-------|
| Age (years)               |       |
| ≤55                       | 0     |
| 56–74                     | 3     |
| ≥75                       | 4     |
| Body weight (kg)          |       |
| ≤70                       | 6     |
| 71–80                     | 4     |
| >80                       | 0     |
| Chronic obstructive pulmonary disorder | 3 |
| Yes                       |       |
| No                        | 0     |

### Table 2
Calculation of the male osteoporosis risk estimation score

| Risk factor | Score |
|-------------|-------|
| Age (years) |       |
| ≤55         | 0     |
| 56–74       | 3     |
| ≥75         | 4     |
| Body weight (kg) |       |
| ≤70         | 6     |
| 71–80       | 4     |
| >80         | 0     |
| Chronic obstructive pulmonary disorder | 3 |

### Table 3
Proportion of patients with osteoporosis in terms of the male osteoporosis risk estimation score (MORES) and the osteoporosis self-assessment screening tool (OST) score

| Screening tool | No. of patients (n=113) |
|----------------|-------------------------|
|                | T-score of ≤-2.5 (osteoporosis) | T-score of >-2.5 (no osteoporosis) |
| MORES          | ≥6 | 27 | 80 |
|                | <6 | 0  | 6  |
| OST score      | ≤2 | 20 | 51 |
|                | >2 | 7  | 35 |
The MORES was determined by 3 osteoporosis risk factors: age (in years), body weight (in kg), and chronic obstructive pulmonary disorder (Table 2). Scores ranged from 0 to 13; a MORES of ≥6 indicated osteoporosis and corresponded to a T-score of ≤-2.5 (Table 3). The OST score was calculated as body weight (in kg) minus age (in years) multiplied by 0.215; an OST score of ≤2 indicated osteoporosis and corresponded to a T-score of ≤-2.5 (Table 3).

Sensitivity/specificity referred to the proportion of individuals with/without osteoporosis based on DEXA (gold standard) who were correctly identified as osteoporosis positive/negative by the new screening tests. The positive/negative predictive value was the proportion of individuals with a positive/negative test who actually was osteoporosis positive/negative.

RESULTS

Respectively for the MORES and the OST score, sensitivity values were 100% and 74%, specificity values were 7% and 41%, positive predictive values were 25% and 28%, and negative predictive values were 100% and 83% (Table 3). Using receiver operating characteristic curves, the area under curve was 0.535 (95% confidence interval [CI], 0.414–0.656) for the MORES and 0.574 (95% CI, 0.453–0.695) for the OST score (Fig.).

DISCUSSION

There are many clinical assessment tools for screening osteoporotic patients such as the SCORE (simple calculated osteoporosis risk estimation), ABONE (age, body size, no estrogen), OSIRIS (osteoporosis index of risk), and ORAI (osteoporosis risk assessment instrument). In our study, the MORES and the OST score were selected, because they are simple, validated, and cost-effective for screening osteoporosis in men. Inclusion of more variables did not substantially improve screening performance.

For men aged ≥60 years, the MORES is a simple method to identify men at risk of osteoporosis and refer them for confirmatory DEXA. The OST score appears to be an excellent method to identify men at high and low risk of osteoporosis. The OST score is superior to a broad risk-factor analysis in identifying men at risk of osteoporosis or osteoporotic fractures. Both the MORES and the OST score can be combined for screening suspected osteoporotic male patients before they undergo DEXA examination.

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