

ORIGINAL RESEARCH

## Evaluation of Effectiveness of Mores to Identify Men at Risk of Osteoporosis

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### ABSTRACT

**Background:** Primary care doctors are in a good position to help men at risk for osteoporosis-related fractures get treated early. However, effective screening methods are needed. The goal of this study was to prove that the Male Osteoporosis Risk Estimation Score (MORES) is a good way to find men who are more likely to have osteoporosis.

**Materials and Methods:** This was a blinded analysis of the MORES, which was given to men over 60 years old in a cross-sectional sample. During an outpatient visit, the participants filled out a research questionnaire and had a dual-energy X-ray absorptiometry (DXA) scan to measure their bone density. The MORES was tested to find out its sensitivity, specificity, and area under the curve (AUC). The number needed to screen (NNS) to prevent one more major osteoporotic fracture was used to measure effectiveness.

**Results:** A total of 70 men completed the study. The mean age was  $70.2 \pm 6.9$  years; 76% were non-Hispanic white. Fifteen men (4.3%) had osteoporosis of the hip. The operating characteristics were sensitivity 0.80 (95% confidence interval [CI], 0.52–0.96); specificity 0.70 (95% CI, 0.64–0.74), and AUC of 0.82 (95% CI, 0.71–0.92). Screening with the MORES yielded a NNS to prevent one additional major osteoporotic fracture over 10 years with 259 (95% CI, 192–449) compared to 636 for universal screening with a DXA.

**Conclusion:** This study proved that the MORES is a good and quick way to find men who are more likely to get osteoporosis and could benefit from a diagnostic DXA scan.

**Keywords:** MORES, osteoporosis, DXA.

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### INTRODUCTION

Osteoporosis is a disease in which the density and quality of bones get weaker, making the skeleton weaker and making it more likely that bones will break, especially in the spine, wrist, and hip.<sup>[1,2]</sup> Osteoporosis and the fractures that come with it are a major cause of death and illness. It is now called "silent epidemic disorder" because bone loss happens without any

signs or symptoms. A broken bone is often the first "sign" that something is wrong.<sup>[3,4]</sup> It is a worldwide problem that is getting worse as the world's population both grows and ages. Women have a 30–50% lifetime risk of breaking a bone due to osteoporosis.<sup>[5]</sup> In men risk is 15-30%. It was mostly thought to affect women, but new studies show that men are also getting osteoporosis at a higher rate.<sup>[6]</sup> In the United States, osteoporosis affects 1.5 million men over 65, and 3.5 million men are at risk. In 2002, about 2 million men were diagnosed with osteoporosis, compared to 8 million women. Men are about one-third as likely as women to break their hips over the course of their lives (6% vs. 17.5%), but men are twice as likely to die in the hospital after a hip fracture.<sup>[7]</sup> Also, the death rate one year after a fracture is 31% for men and 17% for women. In India, there are no epidemiological data on how common or rare male osteoporosis is. But some studies show that 61 million people (1 in 3 women and 1 in 8 men) have had osteoporosis, which is a 200% increase over the last 10 years.<sup>[8]</sup> Population-based studies show that 3% of men and 8% of women have osteoporosis. When osteoporosis is found early and treated with bisphosphonates in women, hip fractures are less likely to happen by at least 40% to 50%.<sup>[9]</sup> Recently, Orwoll et al. found that men with osteoporosis had fewer vertebral fractures and that the benefits of bisphosphonate therapy for men were very similar to those for postmenopausal women.<sup>[10]</sup> This study backs up the idea that early diagnosis and treatment of osteoporosis can reduce the risk of fractures in men by a large amount. Even though hip fractures in men are linked to a higher death rate and treatment seems to help, there are no guidelines for the first screening for osteoporosis in men. In the United States, a simple clinical scoring system called MORES is being thought about. But in India, there is no tool like this for screening. So, the goal of this study is to find out how well MORES works to find men who would benefit from dual-energy x-ray absorptiometry (DXA) testing because they are more likely to get osteoporosis and break bones as a result.<sup>[11,12]</sup>

### Objectives

- To evaluate the effectiveness of the MORES to identify men at risk of osteoporosis.

### MATERIALS & METHODS

The study to be done in patients visiting Amrita Institute of Medical Science & Research Centre, AIMS Campus, Kochi, Kerala.

### Study Design

This is a cross sectional study performed at Amrita institute of medical sciences, Kochi, Kerala during the time period of September 2011 to May 2013. With the above criteria for who could join and who couldn't, 70 male patients who had a Dexa scan were added to the study group. All of the people who took part in the study gave their written consent, and the Institute Ethics Committee at the Amrita Institute of Medical Sciences approved the study protocol.<sup>[13, 14]</sup>

We asked about the person's history of comorbid illnesses, alcohol use, smoking habits, and basic demographic information. We also did a thorough physical exam. Weight (kg), height (cm), body mass index (kg/m<sup>2</sup>), and waist circumference were all part of anthropometry (cm). To keep things uniform, all measurements were taken on the right side of the body.<sup>[15, 16]</sup>

Anthropometrical measurements:

**Height:** Measured in standing without shoes by a measuring tape to nearest centimetres.

**Weight:** Measured with same weighing machine to the nearest of 0.5 kg.

**BMI:** It was calculated as weight divided by square of height in meters.

### Investigations

Routine blood investigations like CBC, FBS, PPBS, HBA1C, Ca, Po 4-, vitamin D levels, DEXA Scan were performed.<sup>[17]</sup>

According to DEXA scan report, patients are divided into two groups. Group 1 consists of patients who are diagnosed as having osteoporosis and group 2 consists of controls.<sup>[18]</sup>

Sample Size:

Based on what has been written about the sensitivity and specificity of a scoring system with a cut-off point of 6 (reference no. 65) and a 95% confidence interval and a 20% error margin, the minimum number of samples needed is 70.<sup>[19]</sup>

### Statistical Analysis

To find out if a scoring system with a cut-off point of 6 and a DEXA scan as the gold standard is valid, the accuracy, sensitivity, specificity, productive values of the positives, productive values of the negatives, and productive values of the positives will be calculated. Using the Sqi square test, the statistical significance of the relationship between different screening factors and the scoring system will be checked. ROC curve technique<sup>[20, 21]</sup> will be used to try to find the right cut-off point based on the data.

Sensitivity and specificity refer to the number of people with or without osteoporosis who were correctly identified as having or not having osteoporosis by the new screening test based on DEXA (the gold standard) (MORES). The positive/negative predictive value was the number of people who actually had osteoporosis based on whether or not they had a positive/negative test.<sup>[22, 23]</sup>

### Inclusion Criteria

- All male patients sent from various departments for dexa scan.

### Exclusion Criteria

- Patients on vitamin-D/ calcium supplementation.
- Patients who have previous history of fractures.
- Patients are previously diagnosed case of osteoporosis and are on treatment for the same

### RESULTS

Based on the quantitative data, the majority of students (84.1%) stated that the ECE program could familiarize them with the role of basic sciences knowledge in medicine and the way to apply it in clinical settings. Further, 67.5% of them believed that the early clinical experience increased their interest in medicine and motivated them to read more. Also, 64.3% of students mentioned that group discussion during the grand round could help them to reflect on their experiences and share them with others.

Furthermore, 64.1% of students agreed (completely agree/agree) with the usefulness of the grand round. The descriptive analysis of the questionnaire is presented in Table 1. A

**Table 1: Demographic Chart**

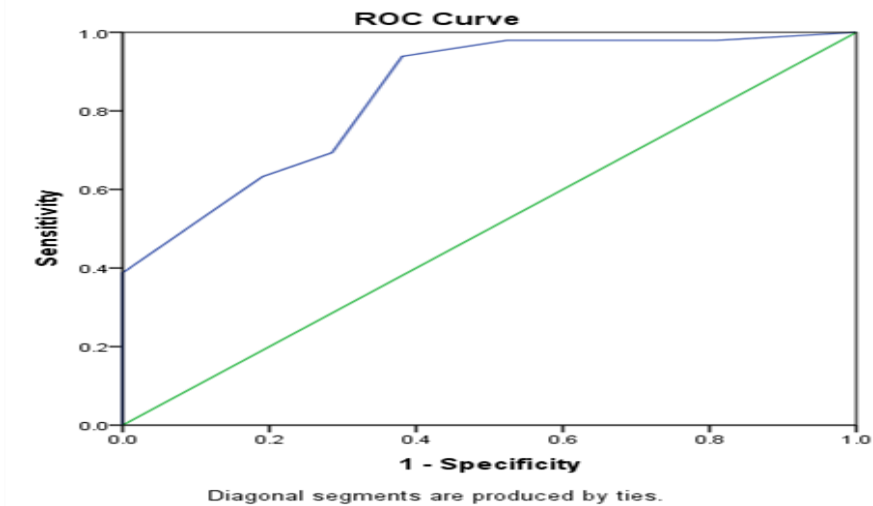
Characters	GROUP 1 (21)				GROUP 2 (49)				P-Value.
	Mean	SD	Min	Max	Mean	SD	Min	Max	
Age	55.74	13.24	32	73	61.78	13.5	28	85	0.09
Weight	75.38	10.87	56	93	63.45	10.25	34	90	0
Height	168.86	7.34	155	188	165.67	7.66	147	180	0.11

Body mass index (BMI)	26.41	3.17	22	33	23.11	3.63	13	32	0
T-score	-0.01	1.03	-0.9	3.2	-3.16	0.62	-4.9	-2.4	0
Calcium (Ca)	8.98	0.4	7.9	9.6	9.16	0.76	8.1	13	0.31
Phosphorous (PO <sup>4</sup> )	3.27	0.61	2.32	4.69	3.28	0.68	1.6	5	0.92
Vitamin D	25.63	12.86	3.3	49	16.92	6.81	3	34	0.01
Mores score	4.38	3.11			8.45	2.57			0

**Table 2: MORES Score Sensitivity and Specificity**

			MORES SCORE		TOTAL
			<6	>=6	
Osteoporosis	Control	Count(n)	13	8	21
		%	61.90%	38.10%	100.00%
	Osteoporosis	Count(n)	3	46	49
		%	6.10%	93.90%	100.00%
TOTAL		Count(n)	16	54	70
		%	22.90%	77.10%	100.00%

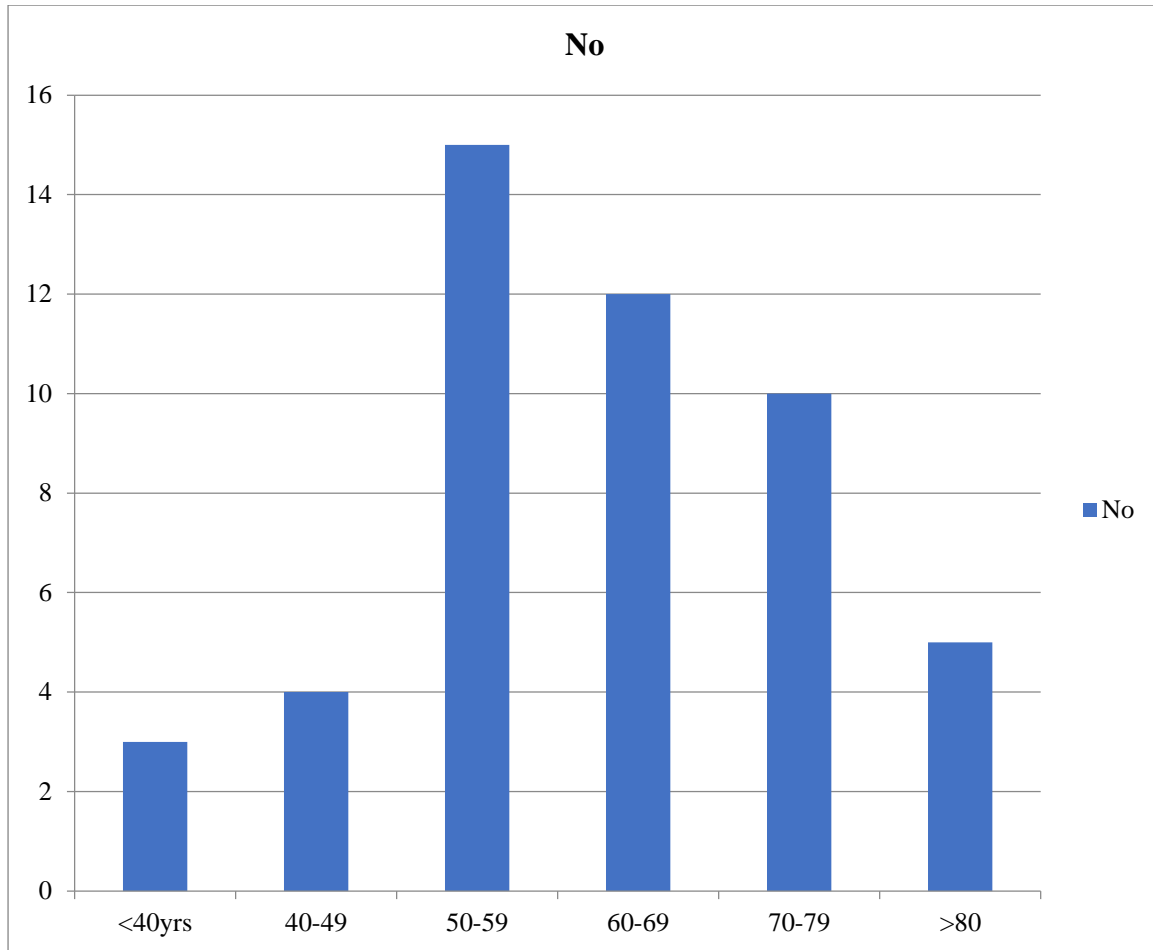
**Sensitivity: 93.9%, Specificity: 61.9 %.**



**Figure 1: ROC curve**

AREA UNDER THE CURVE= 0.844 (P=0.000, 95% CI).

Appropriate cut of point (MORES) based on ROC curve- <=5.



**Figure 2: Age distribution in osteoporotic group**

In my study, MORES has a sensitivity of 93.9% and a specificity of 61.9%. The positive predictive value is 85.19%, and the negative predictive value is 81.25%. Shepherd AJ et al. did a study on the effectiveness of MORES in the US population in 2007. They found that it was 93% sensitive and 59% specific (95% CI: 0.85–0.97). In a study of the US population done in 2010 by the same person, the sensitivity was 65.5% (95%CI: 0.582–0.721) and the specificity was 67.5% (95%CI: 0.649–0.701). Alvah R. Cass et al. did a study on the same group of people and found that the sensitivity and specificity were both 80% (95% confidence interval [CI], 0.52–0.96) and 70% (95% CI, 0.64–0.74). Yuliana Fransiska et al. looked at how well MORES worked in the Indonesian population. They found that it was 100% sensitive and only 7% specific. Its positive predictive value was 25%, and its negative predictive value was 100%.

Using the receiver operating characteristics curve (ROC) (chart.1), I found that a MORES score of 5 or higher was the best way to predict osteoporosis in my study group. With a cut value of 5 or more, the sensitivity is 93.10% and the specificity is 38.10%. Using this cutoff point in my study won't make much of a difference, though, because there are no people with a MORES value between 6 and 5.

## DISCUSSION

Osteoporosis is now seen as a major indicator that a man will break a bone in the future. In the next 15 years, the number of men with osteoporosis is likely to rise by almost 50%.<sup>[24]</sup> In addition to the expected rise in osteoporotic fractures, there are reports that osteoporosis in men is still not diagnosed, treated, or researched enough.<sup>[25]</sup> In 2007, the International Society for Clinical Densitometry tried to solve the problem of underdiagnosis by suggesting that all men over the age of 70 should get a bone mineral density (BMD) test.<sup>[26]</sup> In 2008, the National Osteoporosis Foundation made screening recommendations for men. They said that men 50 to 70 years old who have one or more risk factors for osteoporosis should get a BMD test, and men 70 years old who don't have any risk factors should also get a BMD test.<sup>[27]</sup> These recommendations stress how important screening is, but they aren't very specific, so they might not be used consistently or well in clinical practise. Many foreign studies have found out what makes men more likely to get osteoporosis.<sup>[28]</sup> But using the frequency of these risk factors, a clinical tool called MORES was made that was able to find men who were at a higher risk of osteoporosis.<sup>[29]</sup> No one knows how well MORES works in the Indian population. So, it is important to study how well MORES works as a simple tool that can be easily used in clinical settings to choose men for screening for osteoporosis of the lumbar vertebrae in India. So, this study is being done to find out how well MORES works as a screening tool to find out which Indian men are at risk for osteoporosis.<sup>[30, 31]</sup>

## CONCLUSION

In this study, called "Clinical profile of male osteoporosis," the researchers wanted to find out how well MORES works as a clinical screening tool to find patients with male osteoporosis. The study came to the following conclusions. With a sensitivity of 93.9% and a specificity of 61.9%, MORES can be used as a good screening tool to find men who have osteoporosis. So, it can be used to check for osteoporosis in men who might need a diagnostic DEXA scan. Several foreign studies all agreed with this result. But bigger studies are needed to apply the results to the whole Indian population. From this study group's analysis, the best cutoff point for MORES was found to be  $\geq 5$ . The body weight of people with osteoporosis was found to be lower than that of normal people. There is a strong link between low levels of vitamin D and osteoporosis in men. Male osteoporosis is also strongly linked to the use of steroids. In my research, I found that osteoporosis in men was not linked to other diseases like diabetes, CKD, CLD, and COPD. For men with osteoporosis, joint pain was the most common first sign, followed by vertebral fractures.

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