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Research Article

## A study on prevalence of risk factors for osteoporosis in Postmenopausal women and the importance of Osteoporosis self-assessment tool (OST) in identifying osteoporotic risk

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### Abstract

Osteoporosis is a highly prevalent health issue among postmenopausal women, which can be prevented if identified in the early stages. The use of Osteoporosis Self - assessment Tool (OST) will help in identifying the risk of osteoporosis and hence will allow the patients to seek the best treatment if required. In this study we assessed the prevalence of risk factors for osteoporosis in 400 Postmenopausal women and have measured the osteoporotic risk using OST. The risk factors and risk scores were correlated using spearman's rho correlation analysis. As per the postmenopausal classification, 52% of the population belonged to the late stage. Average BMI of the population was found to be 19.5 that is borderline of the normal which indicates the risk for Osteoporosis. Attaining early menopause 243(60.75%) and history of fall 223(55.75%) was the most common risk factors found in the population. Using OST, 78 patients were identified with high risk. The correlation between OST and risk factors revealed that OST is positively significant with the progression of menopausal stage. Patient education regarding the use and interpretation of OST will help to identify risk of osteoporosis; this should be implemented within the primary gynecological care units for the better outcome.

**Keywords:** Osteoporosis, postmenopausal women, risk factors, Osteoporosis Self - assessment Tool.

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## INTRODUCTION

Osteoporosis is a major health problem in Indian women accounting about 20% of the total global annual incidence.<sup>1</sup> Patient education on early identification and prevention of risk factors can help in decreasing this incidence rate to a greater extent.

The risk factors of osteoporosis can be classified into two, modifiable and non-modifiable. Commonly observed modifiable factors include caffeine intake, smoking, alcohol consumption, calcium-vitamin D deficiency and non-modifiable factors include genetics, being elderly, menopause, family history of osteoporosis, history of fractures etc. increases the risk of developing osteoporosis.<sup>2, 3</sup>

Owing to the unavailability and cost, DXA (Dual-energy X-ray Absorptiometry) scans are not suggested for the purpose of screening to identify risk of osteoporosis in patients especially in a developing country like India.<sup>4</sup> Tools for clinical risk assessment like the Osteoporosis Self - assessment Tool (OST) are designed to find patients at risk of osteoporosis, who would be benefited from a bone mineral density measurement.<sup>5</sup> In this study, we are educating the patients to use the Self-Assessment Tool,

which is a risk prediction tool used in postmenopausal women that helps in evaluating osteoporotic risk on the basis of age(years) and body weight(kg).

It is calculated as:

$$\text{OST score} = (\text{Body Weight} - \text{Age}) * 0.2^6$$

The OST score can be categorized as High(-20 to -4), Moderate(-3 to 1) and Low(1 to 20).<sup>7</sup> This will help in early detection and prevention of osteoporosis as it is difficult to reverse the bone loss if once occurred. In this study, we identified the risk factors and educated each patient on OST utilization and interpretation. The aim of the study is to analyze the osteoporotic risk in the population by estimating the OST risk scores in association with identification of risk factors and by assessing their correlation.

## MATERIALS AND METHODS

### Study design and site

A prospective observational study was conducted over a period of 6 months in the department of General Medicine, General Surgery, OBG and Orthopedics of K. C. General Hospital, Bengaluru, Karnataka.

### Sample size and study criteria

This was a 6 month, time-framed, hospital-based study with an estimated sample size with considerations of previous patient records of the hospital. As per the time line and sample size calculation [Sample size formula used was:  $n = (1.96)^2 p (1-p)/d^2$ ], 384 was the sample size. But, a round-off 400 was taken for the study due to the ease of availability. The patients were chosen using simple random sampling method.

### Inclusion and Exclusion criteria

All 400 patients gave the consent for their participation. Postmenopausal women, who are inpatients and outpatients of the selected departments, with or without family history of osteoporosis were included in the study. Patients who are blind, deaf and dumb were excluded.

### Study procedure and data collection

In the study, 400 individuals were enrolled based on inclusion and exclusion criteria. The informed consent form was provided and approval of the patient was obtained. The patient's risk was estimated using OST and other associated risk factors of osteoporosis. The obtained data of risks were statistically analyzed. The data collection was done using a well-structured patient profile form. The patients were asked for demographics, behavioral factors, past medical history, medication history, family history, menstrual/obstetrical history, risk factors associated with menopause, signs and symptoms associated with osteoporosis, BMD level, lifestyle practices of the patient, present complaints, diagnosis and treatment. With the help of patient information leaflets, the patients were educated on the disease, risk factors, and its prevention. They were taught to identify the risk of developing osteoporosis using OST.

### Osteoporosis Self-Assessment Tool (OST)

It analyzes osteoporotic risk using parameters like weight (in kg) and age (in years), in adult population, which are inversely and directly related to the risk of developing osteoporosis. It is calculated by the formula: **OST Score = (Weight-age)\*0.2**.<sup>6</sup> The OST score categorizes the osteoporotic risk into: *High risk* scored as  $[(-20)-(-4)]$  indicates high risk of osteoporosis: These patients are recommended for an adequate diet of vitamin D and calcium, regular weight-bearing exercises, they may require even supplemental sources of vitamin D and calcium or other medications, then advised for a medical checkup for DXA scan. *Moderate risk* scored  $[(-3)-(-1)]$  indicates moderate risk of osteoporosis: These patients are recommended for an adequate diet of vitamin D and calcium, regular weight-bearing exercises, change in lifestyles (smoking, alcoholism), and advised for medical assistance for analyzing the risk factors. *Low risk* scored as  $[1-20]$  indicates low risk of osteoporosis: The patients are advised for a maintained diet rich with vitamin D and calcium, regular weight-bearing exercises to sustain bone mass, and advised for a regular check on risk factors.

OST acts as prediction tool for osteoporosis using age and weight. It doesn't help in evaluating the actual osteoporotic risk, due to absence of other risk inducing factors, like fractures, other diseases and lifestyle induced risks. It is still considered as a reliable simplest tool for the initial identification of osteoporotic risk.<sup>7</sup>

### Data Analysis

The data collected was reviewed and tabulated into Microsoft Tools. The postmenopausal population and risk factors were accounted in percentages while, BMI in mean values. The OST were estimated in High, Moderate and Low risk scores in the range of numbers and the affected population percentage was obtained. The OST score and risk factors were analyzed for its Correlation using Spearman's rho in SPSS Software.

### ETHICAL CONSIDERATIONS

The study protocol (KLECOP/EC/07/BMT/2018-19) was approved by Institutional ethics committee of KLE College of Pharmacy. The data collected were treated with the utmost confidentiality both during and after the study.

### RESULT AND DISCUSSION

Even when better diagnostics are available in the current scenario, only a few percent can afford those when it comes to its availability and cost. The BMD testing and DXA scan being the golden standard for the diagnosis of osteoporosis, is still not the best possible way for a greater population in India. Here comes the credibility of the risk factor analysis and risk assessment tools which helps to understand the disease much early along with the need for those available costly diagnostics.

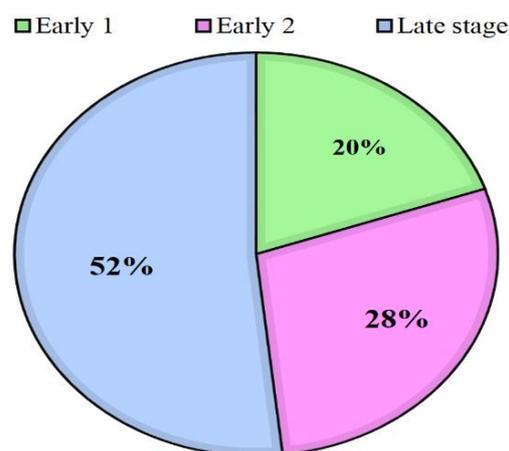


Figure 1: Postmenopausal Population

In this study, 400 women were recruited based on the postmenopausal classification and BMI along with Risk factors. These were evaluated for a better correlation with OST for a proper risk assessment on the basis of a greater prone population. The women were divided as: Early 1 stage, who were in 1-2 years of menopause, Early 2 stage, in 3-6 years of menopause and Late stage, 6 or more than 6 years.<sup>8</sup> Out of which, 79 were in Early 1, 114 in Early 2 and 207 in Late Stage as illustrated in figure 1.

Relatively a greater number of participants that is more than a half belonged to Late Stage, confirming greater possibilities of Osteoporotic risk. This is controversial to a study in which the population was with more women in Early with 33%.<sup>9</sup> The average BMI of the entire population was found to be 19.5 which was borderline of the normal BMI (18.5 to 24.9) (Figure 2). Being a true factor for risk analysis based on average weight this makes the women at a higher risk of developing osteoporosis. Comparing to another study the population had increased number in overweight women with an average of 26.14 which is way more than the mean BMI in this study.<sup>10</sup>

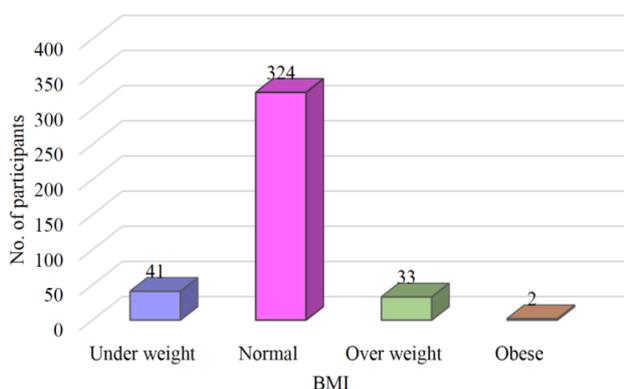


Figure 2: BMI of the population

Being the majors in contributing to osteoporosis, the risk factors like Diabetes Mellitus, History of Surgery, History of Fracture, Familial History of Osteoporosis, Rheumatoid Arthritis, Osteoarthritis, Early menopause, Hysterectomy, History of Fall and Other Bone diseases were analyzed in the whole population and in different progressions of postmenopausal stage. The greater frequency was accounted

for attaining Early Menopause 243(60.75%), History of Fall 223(55.75%), History of Fracture 184(46%), Familial History of Osteoporosis 73(18.25), Diabetes Mellitus 169(42.25%) and the other risk factors were counted as 68(17%). The women in the postmenopausal stage of Early 1 had Early Menopause (77 %) as the major risk, which was seen to be gradually reducing to the stages of Early 2 and Late. Exhibition of this feature by this stage, indicated that reproductive phase of the current younger population has changed with time which may have been caused due to the diet and lifestyle changes. Early 2 showed History of Fall (58%) and History of Fracture (57%) as the major risks whereas, Late stage were presented with higher percentage for all the risk factors, 49% were having Diabetes Mellitus and History of Fracture, 45% of them had Familial History of Osteoporosis, 54% attained Early Menopause and 58% had History of Fall. The Late stage in postmenopause thereby gets complicated with these increased rates of associated risk factors greater degree of vulnerability. The risks of other bone diseases were seen to be higher in Early 1 over Early 2 and Late in few respondents (Figure 3). This agrees with a study done on risk factor assessment, their population experienced history of fracture, history of fall and early menopause as major risks.<sup>11, 12</sup>

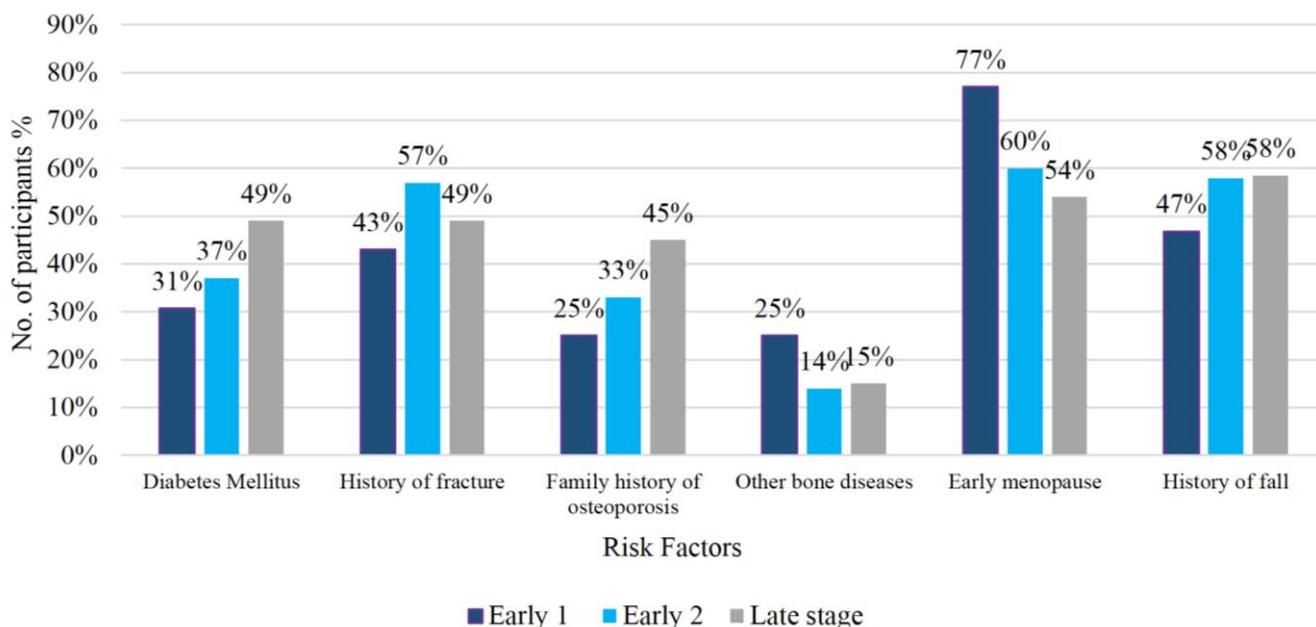


Figure 3: Risk factors in the population

The Osteoporotic risk was assessed using the Osteoporosis Self-Assessment Tool, the estimated score in the whole population were 147 with low risk, 175 with moderate risk and 78 in higher risk (Figure 4). More than half the population were in Moderate to Higher risk. Higher score was evidently found in Late stage women. It emphasized the relevancy of OST in predicting Osteoporotic risk with basic parameters in relation with the associated risk factors in the

population. These results contradicted with a study where, high risk population dominated but agrees with another study, where the population had more of low risk women.<sup>13</sup> A higher risk score was assessed in 74 women in Late stage which predominated Early 2 with 3 women and One in Early 1, which further questions the risk pattern in the progression of postmenopausal stage.

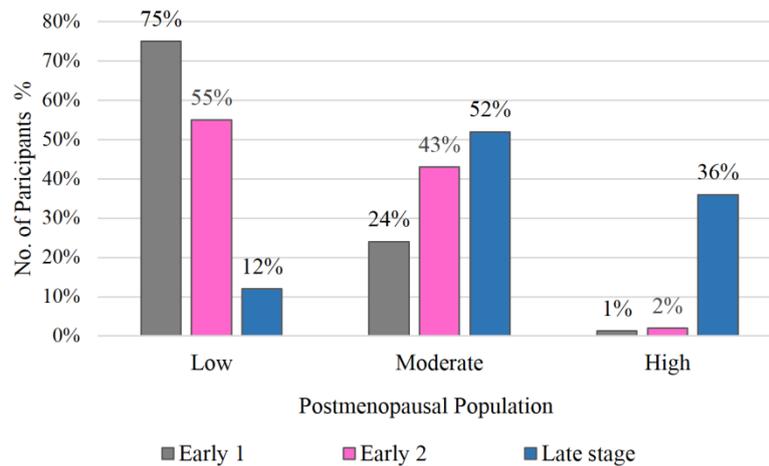


Figure 4: OST Score of the population

The OST risk score, the Postmenopausal stage and the Risk factors were correlated using Spearman’s rho Analysis (Table 1). It was found that, OST is positively significant with the progression of Postmenopausal stage which significantly increased the risk of being in Late Stage. OST Scores were

also positively correlated with History of Fracture, Diabetes Mellitus and Familial History of Osteoporosis similar to a study where, most of the respondents are at moderate risk for developing osteoporosis.<sup>14</sup>

Table 1: Correlations between OST score and Risk factors

OST score	Risk Factors									
	Postmenopausal stage	Diabetes Mellitus	History of surgery	History of fracture	Family history of	Rheumatoid Arthritis	Early menopause	Hysterectomy	History of fall	Osteoarthritis
1	0.587*	0.215*	0.145*	0.16*	0.286*	-0.05	-0.361*	0.043	0.86	0.008

Now, the positively correlated factors agree with all the prominent risk factors exhibited in the late stage women. While comparing the high risk scores and the risk factors exhibited by the Late stage women, it is clear from the data that there exists a fraction of osteoporotic risk in the Late postmenopausal stage, making them more prone to osteoporosis. These findings indicated the need for proper health assessment and protocol to be followed by the late stage Postmenopausal women. Rather waiting for the final stage it should be integrated with the menopausal attainment. In the protocols for the Osteoporosis management, the risk analysis should be best placed along with the basic physical examinations, which can help for the early prevention and treatment. Besides waiting for the occurrence of symptoms, it should be initiated from the gynecological care units in order to make a proper follow-up on the menopausal women at all stages. Making this possible at every corner of health system and patient education regarding the use and interpretation of OST can help in discretizing people for those expensive diagnostics like DXA at the lowest rates and can help all the classes in the society besides their economic state in early evaluation of the risk and thereby avoiding greater expenses in future. This emphasizes the importance of Osteoporotic risk assessments and utility tools like OST. Several studies provided the evidences on the effectiveness of OST in early assessment of risk. On evaluating the population, OST was found to be simple, inexpensive and effective weight- and age-based risk assessment tool which can act more efficiently in correlation with estimation of other risk factors.

**CONCLUSION**

Among the population, 78 postmenopausal women were assessed with osteoporotic risk using Osteoporosis self-assessment tool. The resulted positive correlation of OST score with the risk factors like menopausal stage, History of fracture, Familial history of osteoporosis and Diabetes Mellitus enhances the credibility of OST in assessing the risk of osteoporosis. Being a non-curable disease, risk factors for osteoporosis can be assessed using simple tools like OST which can help in reducing the risks and early treatment. This tool can effectively help in selecting patients for BMD measurement and expensive specialized investigations.

The study suggests the need for creating awareness to the public on the use of OST to identify risk of osteoporosis. For early diagnosis and to prevent worsening of the disease, the initial steps should be taken up by the primary gynecological care units.

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**CONFLICT OF INTEREST**

The authors declare no conflict of interest.

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