Commentary

Utility of FRAX (fracture risk assessment tool) in primary care and family practice setting in India

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Abstract

The prevalence of osteoporosis in postmenopausal women is about 35 to 50% and the mortality associated with hip fractures is about 20%. Despite these figures, osteoporosis continues to be under diagnosed in the primary care setting. One of the reasons for this is attributed to the poor availability of DXA (Dual Energy X-ray Absorptiometry) scanners in rural areas. The fracture risk assessment tool (FRAX) is an online web-based tool that takes into account multiple factors that help in predicting the 10-year risk of developing hip or major osteoporotic fractures. The tool was developed and validated in independent cohorts. The advantages of using the FRAX tool are that, it is inexpensive, easily available, and does not need the technical expertise that is required in the use of a DXA scanner. Besides these merits, it is a tool that is easy to use for the rural health care worker as well as the family physician in identifying those subjects at risk for developing osteoporotic fractures. These benefits make it a suitable fracture prediction tool in the primary care setting in India.

Keywords: Frax, India, osteoporosis, primary Care

Introduction

Despite the availability of various treatment modalities for prevention of osteoporotic fractures, their incidence is on the rise, mainly owing to the increased life expectancy of the world population.[1] The treatment of osteoporosis is aimed at preventing the occurrence of fragility fractures, which pose significant economic burden and lead to a loss of independence, increased morbidity, and a high risk of mortality.[2] The prevalence of osteoporosis in postmenopausal women has been reported to 35 to 50% in Indian studies and the mortality after 1 year of sustaining a hip fracture is about 20 to 30%.[2,3] Osteoporosis continues to be under-diagnosed among those at risk (e.g., postmenopausal women and elderly men) and unfortunately, many remain untreated even after having sustained a fragility fracture. The reasons cited for this include less awareness among primary care and family physicians about the need for referral and treatment, limited access to an ideal diagnostic modality like dual-energy X-ray absorptiometry (DXA) scan, and lack of precise fracture risk prediction tools.[4,5]

Although osteoporosis is defined by low bone mineral density (BMD), its clinical significance depends on the occurrence of fractures following low-velocity trauma. Besides low BMD, there are several other causes, which predispose to fractures like increased propensity to falls, lifestyle factors including smoking and alcohol consumption, systemic disorders, and medications, especially glucocorticoids.[6] It was realized that the estimation of fracture risk should incorporate additional parameters (risk factors for fragility fractures) in its assessment.

Although DXA scan has been realized to be the "gold standard" in diagnosing osteoporosis, its widespread availability is limited in a developing country like India.[7] This problem assumes greater proportions in rural settings especially in primary care and family practice settings. An ideal screening tool for assessing

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osteoporotic fracture risk should be widely available, inexpensive and easy to use, and make therapeutic decisions from the perspective of family practice.[8] These characteristics will offset the constraints posed by the high costs and limited availability of a DXA scanner. Thus, an ideal tool to assess osteoporotic fracture risk in a developing country like India may depend on the composite assessment of multiple risk factors that increase the propensity to fracture. The Fracture Risk Assessment Tool (FRAX) is a web-based internationally validated tool, which has been developed to assess fracture risk of patients based on various risk factors.[8]

Development of FRAX Tool

The World Health Organization (WHO) collaborating Center at Sheffield analyzed different potential risk factors from 60,000 men and women belonging to 12 prospective cohorts recruited from the general population. The cohorts included the subjects from the Rotterdam study in the Netherlands, the European Vertebral Osteoporosis Study (EVOS) from 13 centers in Europe, the Canadian Multicentre Osteoporosis Study (CaMos) and cohorts from Rochester (USA), Sheffield (England), the Dubbo Osteoporosis Epidemiology Study (DOES, Australia), the Epidémiologie de l'ostéoporose (EPIDOS) and Os des Femmes de Lyon (OFELY) studies (France), as well as those from Kuopio (Finland), Hiroshima (Japan), and two from Gothenburg (Sweden).[3] The total follow-up was over 250,000 person-years. The following risk factors were chosen, based on whether they would be amenable to pharmacological intervention:

i. Age
ii. Bone mineral density
iii. Body mass index (BMI)
iv. Prior fragility fracture
v. Use of oral glucocorticoids
vi. Parental history of fracture
vii. Current smoking
viii. Alcohol intake
ix. Rheumatoid arthritis.

Four models were then constructed from the risk factor analysis. Fracture probabilities were computed. These included the probability of hip fracture and other major osteoporotic fractures (with and without BMD). Fracture and death as continuous hazard were estimated using a Poisson regression.[9]

The performance characteristics of these risk factors gave birth to "FRAX tool," which is widely used to predict the 10-year probability of hip fracture or major osteoporotic fracture (hip, spine, distal forearm, and proximal humerus)[10,11].

Validation of FRAX tool

The validation of FRAX was subsequently done in other independent cohorts that did not participate in the original model preparation. Some of these cohorts included the Study of Osteoporotic Fractures (SOF) in the United States, two cohorts from the Geelong study in Australia, the Osteoporosis Ultrasound Study (OPUS) drawn from five European countries, the Prospective Epidemiological Risk Factors Study (PERF) from Denmark, the York cohort in the United Kingdom, the Health Improvement Network (THIN) research database from the United Kingdom, the Swiss Evaluation of Measurement of Osteoporotic Fracture Risk (SEMOF) study in Switzerland, the Women's Health Initiative (WHI) from the United States, and the Miyama cohort from Japan.[12]

The usage of FRAX in initiating treatment for osteoporosis varies from country to country. In the UK, women with a previous fragility fracture are eligible for anti-osteoporotic treatment without doing FRAX or BMD. However, those without a past history of a fragility fracture would be treated if they met the age specific cut-off for their FRAX score as set up by NOGG (National Osteoporosis Guideline Group). If their threshold of FRAX is in the lowest category, then they do not warrant any further assessment or therapeutic intervention. BMD is performed only in those who have no previous history of fragility fracture and belong to the intermediate risk category as per their FRAX score.[13]

However, in the United States, FRAX is only done in women who have their BMD in the osteopenic range (T-Score between -1 and -2.5 SD) and are offered treatment in those with a 10-year probability of major osteoporotic fractures equal to or exceeding 20%, or when 10-year probability of hip fracture exceeds 3%.[6]

As the FRAX tool was validated mostly in cohorts from a Caucasian ethnicity, its use in other countries may require revised cut-offs for therapeutic decision making and follow-up for the occurrence of incident fractures.[14,15]

Till date, the FRAX tool is the most widely used fracture risk assessment tool throughout the world.[16] It is presently used in many countries comprising about 80% of the world population.[17] The main objective of using the FRAX tool is to enable medical professionals especially in family practice and in primary care setting to identify those patients who would benefit from pharmacological therapy in reducing fracture risk.[18] However, like any other scientific tool, FRAX is beset with merits and limitations, as outlined below.

Merits of Using the FRAX Tool

The major benefit of FRAX includes its extensive data driven origin from multiple cohorts and its further validation in different populations.[11] It has also been integrated as part of the National Osteoporosis Foundation (NOF) guidelines and therapeutic decisions for management of osteoporosis could now be based on the FRAX score of an individual.[19] The FRAX model is further calibrated by local epidemiological studies to generate region specific risks in different populations. The currently available version is available in 34 languages and applicable to 64 countries.

Limitations of the FRAX Tool

Although FRAX can be utilized to predict fracture risk using both clinical risk factors and bone mineral density in a global setting, it has certain limitations.[20] The first and the most cited limitation of FRAX is that it does not encompass all the important factors that may predict fracture risk in a given individual like physical activity, vitamin D deficiency, likelihood of fall assessment, bone turnover markers, or the rate of bone loss on sequential BMDs.[21]

Relevance of FRAX in the primary care and family practice settings in India

The major brunt of osteoporosis and its fracture-related complications are borne by postmenopausal women. There are more than 100 million postmenopausal women in India, and more than two-thirds of them reside in rural areas.[4,14] Therefore, primary care physicians and family care practitioners play an important role in pre-emptively screening them for fracture risk. As the availability of DXA scanners is limited in resource poor conditions, FRAX may be utilized to identify those at risk for osteoporotic fractures. In a recent study by Asirvatham *et al.*, out of a total of 239 patients, 207 had identical fracture risk predictions utilizing FRAX, with and without BMD.[22] Thus, FRAX proves to be an inexpensive tool to make fracture risk predictions, where availability of DXA is restricted.[23] Also, the use of DXA scanners requires suitable technical expertise for their standardization and calibration as well as for accurate positioning of skeletal regions of interest. The costs involved in performing a DXA scan is often prohibitive; this further substantiates the utilization of FRAX in the primary care setting. The easy availability of this simple online tool makes it possible for primary health-care workers especially in the rural setting as well as family medicine physicians to objectively identify subjects at risk for osteoporotic fractures. Initiation of treatment in at-risk subjects as identified by the FRAX tool, also endorses good health economics as it is more cost-effective to prevent rather than to treat osteoporotic fractures especially at hip.[24]

In conclusion, FRAX tool has been shown to have good utility in the management of osteoporosis in many nations. Hence, primary care and family physicians across the country need to avail themselves of this widely available and user friendly tool to assess the fracture risk secondary to osteoporosis and plan therapeutic decisions in Indian postmenopausal women.

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Conflicts of interest

There are no conflicts of interest.

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