
بسم الله الرحمن الرحيم

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INTRODUCTION:

It is generally believed that osteoporosis is a common disease in Saudi Arabia. A systematic review of the prevalence of osteoporosis among the Saudi population revealed that 36.6% of the Saudi women aged ≥ 50 years were osteopenic while 34% had osteoporosis. Moreover, in three studies on males, 46.3% of men aged ≥ 50 years were osteopenic while 30.7% had osteoporosis. The researcher claimed that the percentage of males with osteopenia was significantly higher than that of females [1].

In 2005, a cross-sectional study using a randomly selected sample from the Jeddah district was carried out to investigate the prevalence of osteoporosis. The study found that the prevalence of osteoporosis amongst Saudis aged ≥ 50 years ranged between 30.5% and 49.6% according to the Saudi Reference T-score value [2]. It is widely believed that the etiology for this high prevalence in the Saudi population is multiple. Possible causes include lifestyle, vitamin-D deficiency and genetic factors [3]. Multiple studies in the KSA have consistently shown that osteoporosis is far more common in the KSA than in Western countries [4-7].

The osteoporosis impact on the recourse of the health care sector can be quite immense (8). The estimated cost of hip fractures alone (one of the complications of osteoporosis) was around 1 billion USD [9]. A study of the worldwide projections for hip fractures reported that, in the year 1990, about one-quarter of all hip fractures occurred in Asia, whereas this could rise to one-third in 2025 and one-half in 2050. It was concluded that the psychosocial and economic impact of hip fractures will increase markedly worldwide, particularly in Asia. In addition, there is an urgent need to develop strategic preventive plans [10]. General practitioners are considered to be the corner-stone for implementing preventive measures. Early detection and management of chronic diseases is crucial within any health care system [11] and the KSA is not an exception. Screening for disease; identifying the most prevalent risk factors; and strategic, measurable follow-up care could be applied easily within the scope of general practice [11]. However, some chronic diseases such as osteoporosis are more likely to be misdiagnosed and undertreated in general practice [12]. This could be attributed to its prolonged course, lack of warning signs prior to a fracture, cross-diagnosis, insufficient knowledge about the disease diagnosis, prevention and treatment modalities [12]. The current guidelines are designed to provide clear, evidence-based recommendations to assist general practitioners in managing patients with osteoporosis.

The Scientific Committee of Osteoporosis Control Program, Ministry Of Health was given the task of formulating practical guidelines to primary care physicians for screening, investigation and management of osteoporosis in Saudi society. Committee members reviewed the available guidelines formulated by the American Association of Clinical Endocrinologists (AACE); 2010 [13], the Osteoporosis Canada (OC); 2010, the Royal College of Physician (RCP) (UK); 2014 [14], National Osteoporosis Foundation (NOF); 2013 [15] and the Royal Australian College of General Practitioners (RACGP); 2010 [16].

• OBJECTIVES

The purpose of these guidelines is to support clinical judgment, not to replace it. The guidelines proposed by our committee were outlined taking into account the following:

- *The importance of producing simple, practical and applicable guidelines to be adopted in centers with less advanced facilities.*
- *The high prevalence of the disease among Saudi women and men.*
- *Consideration about the clinical risk factors.*

• DEFINITION OF OSTEOPOROSIS :

The World Health Organization (WHO) defines osteoporosis as "A systemic skeletal disease characterized by low bone mass and micro- architectural deterioration of bone tissue with a resultant increase in fragility and risk of fracture" [17]. The National Institute of Health (NIH) has redefined osteoporosis as a skeletal disorder characterized by compromised bone strength that increases the risk of fracture. Bone strength primarily reflects the integration of bone density and bone quality. Bone quality refers to architecture, turnover, damage accumulation and mineralization. Currently there is no accurate measure of overall bone quality [18].

• OSTEOPOROSIS RISK ASSESSMENT

Assessment of risk for osteoporosis of all postmenopausal women and men aged ≥ 50 should be carried out to identify the need for Bone Mineral Density (BMD) testing [19]. As a rule of thumb, the more the risk factors present, the greater the risk of osteoporosis and fracture [20, 21]. Many factors have been identified as risk factors for Osteoporosis (Table 1)

TABLE 1: Conditions, Diseases and Medications That Cause or Contribute to Osteoporosis and Fractures

Lifestyle factors		
Low calcium intake [21-23]	Inadequate physical activity [24, 25]	Falling [21, 26]
Vitamin D insufficiency [27]	Immobilization [28]	Low body weight [2, 29]
Alcohol Abuse [30]	Smoking (active or passive) [31, 32]	
Genetic factors [33]		
Cystic fibrosis	Homocystinuria	Porphyria
Osteogenesis Imperfecta	Hypophosphatasia	Hemochromatosis
Family History of fracture [34]	Idiopathic Hypercalciuria	Marfan syndrome
Hypogonadal states [35]		
Androgen insensitivity	Hyperprolactinemia	Anorexia nervosa
Premature ovarian failure	Premature menopause	Athletic amenorrhea
Turner's & Klinefelter's synd.	Panhypopituitarism	Bulimia
Endocrine disorders		
D.M. (Types 1 & 2)	Cushing's syndrome [36]	Adiposity [29, 37, 38]
Thyrotoxicosis [39-41]	Hyperparathyroidism [39-41]	
Gastrointestinal disorders		
Celiac disease [42]	Pancreatic disease [43]	Bariatric surgery [44, 45]
Primary biliary cirrhosis [46]	Mal-absorption [47]	Inflam. Bowel Dis. [48]
Hematologic disorders [49]		
Multiple myeloma	Leukemia and lymphomas	Sickle cell disease
Hemophilia	Thalassemia	
Rheumatologic and autoimmune diseases		
Ankylosing spondylitis	Rheumatoid arthritis [50]	Systemic Lupus [51]
Central nervous system disorders [49]		
Epilepsy	Parkinson's disease	Stroke
Multiple sclerosis	Spinal cord injury	
Miscellaneous conditions and diseases		
AIDS/HIV [52]	Congestive heart failure [53]	COPD [54, 55]
Idiopathic scoliosis [56, 57]	Depression [58, 59]	Sarcoidosis [60]
Posttransplant bone disease [61]	End stage renal disease [62, 63]	Aluminum (in antacids)

Medications [64, 65]		
Glucocorticoids [66]	Proton pump inhibitors	Anticonvulsants
Heparin	GnRH antagonists and agonists	SSRIs
Barbiturates	Lithium	Chemotherapy
Methotrexate	Tamoxifen® (premenopausal use)	Parenteral Nutrition
From: The Surgeon General's Report [49] with modification		

Some other factors [67] were suggested by The WHO 10-year fracture risk model (Table 2). These factors are known to increase fracture risk independently of BMD and therefore can be combined with the above factors and the BMD measurements to assess an individual patient's risk of future fracture.

Table 2: Risk Factors Included in the WHO Fracture Risk Assessment

Current age	Rheumatoid arthritis
Gender	Current smoking
Femoral neck BMD	Parental history of hip fracture
Low body mass index	Alcohol intake (≥3 drinks/d)
A prior osteoporotic fracture	Oral glucocorticoids >5 mg/d >3 m

From: WHO Technical Report [67] [68] [69]

*Table 3: Exclusion of Causes of Secondary Osteoporosis**	
Consider the Following Diagnostic Studies for Causes of secondary Osteoporosis	
Blood or Serum	
Test	**Indication**
Complete blood count (CBC), ESR or CRP	Anemia, leukemia, Inflammatory causes of spinal deformities, marrow infiltration
Chemistry levels (Ca, P, Mg and renal function tests)	Primary hyperparathyroidism or secondary hyperparathyroidism & renal failure
Serum 25 (OH) D level	Chronic malnutrition, malabsorption and Vitamin D Deficiency
Liver function tests	Chronic liver disease and alcohol abuse
Serum bone-specific or total Alkaline Phosphatase (AP) activity	Paget's disease, metastatic bone disease and osteomalacia
Fasting glucose levels	Diabetes mellitus
Total testosterone and gonadotropin levels in younger men	Hypogonadism
TSH level	Thyrotoxicosis
Parathyroid hormone (PTH)	Hyperparathyroidism
Consider in selected patients	
Tissue transglutaminase antibodies	Celiac disease
Iron and ferritin levels	Anaemia and Hemochromatosis
Serum protein electrophoresis	Monoclonal gammopathy of undetermined significance (MGUS) and myeloma
COL1A genetic testing	Osteogenesis imperfecta
Urine	
24-hour urinary calcium	Hypercalciuria
Protein electrophoresis (UPEP)	Multiple Myloma
24-hr Urinary cortisol	Cushing's syndrome
*From: Clinician's Guide to Prevention and Treatment of Osteoporosis (69)	

• OSTEOPOROSIS DIAGNOSIS:

The Dual-energy X-ray absorptiometry (DXA) report provides bone mineral content in a given area of bone. This gives a BMD in grams per square centimeter (g/cm2) [70]. However, The BMD values in (g/cm2) are not used for diagnosing osteoporosis [71]. Instead, a working group of the World health organization (WHO) proposed to define osteoporosis on the basis of the T-score measured by central DXA at the lumbar spine, total hip or femoral neck (or 1/3 radius if the lumber spine or hip cannot be measured) in a postmenopausal woman and men 50 years and older. A BMD T-score that is 2.5 standard deviation or more below the young-adult mean BMD is defined as osteoporosis, provided that other causes of low BMD have been excluded (such as osteomalacia). Prior to age 50, the WHO T-score system is not applicable [17, 69].

Bone Densitometry:

It is considered as the gold standard for Osteoporosis diagnosing [72]. Results are generally scored by two measures, T- score and Z-score. These scores indicate the degree of variability of the patient's BMD from the mean. Negative scores indicate lower BMD and vice versa.

- T-score is the number of standard deviations away from the average value of the reference group. For Osteoporosis, it is widely used for screening, diagnosis and therapeutic decision for patients at risk. Also, monitoring therapeutic response in patients under treatment. It is the BMD at the scanned site when compared to that of the young normal reference mean (30 years of the same sex and ethnicity). Values for thirty-year-olds are used in post-menopausal women and men ≥ 60 because they better predict risk of future fracture (73). The criteria of the WHO are shown in Figure 1

- Z-score is used as a T-score substitute in premenopausal women, men < 60 and in children. It is the number of standard deviations (SD) a patient's BMD differs from the average BMD for their age, sex, and ethnicity. It is most useful when the score is < 2 SD below the normal score [73].

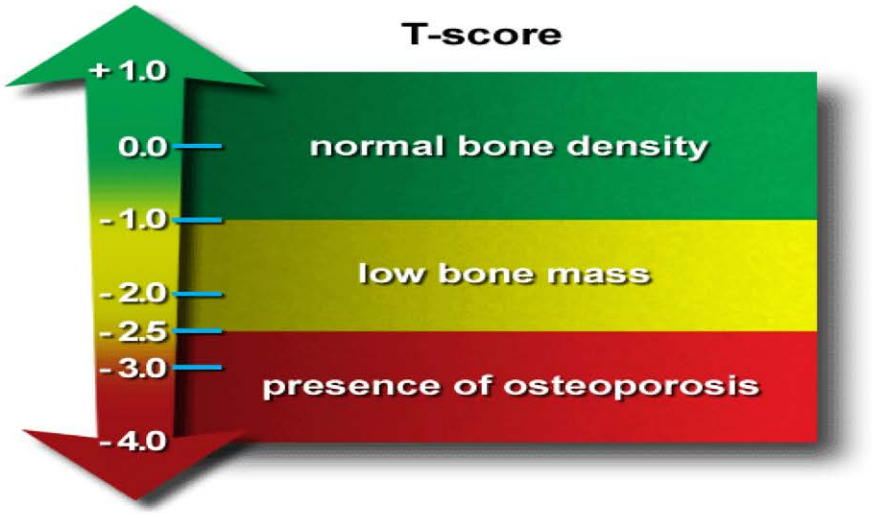


Fig. 1: Osteoporosis; WHO diagnostic categories; BMD and T-scores. Data from World Health Organization (69)

N. B. Fragility fracture is defined as "any fracture that occurs as a result of minimal trauma, such as fall from a standing height, or no identifiable trauma" [74]. Typical fractures in patients with Osteoporosis include vertebral (spine), proximal femur (hip), distal forearm (wrist) and proximal hummers. It is appropriate to consider a clinical diagnosis of Osteoporosis in individuals who have sustained fragility fracture(s) even if BMD is not in the osteoporotic range, as the majority of fractures occur in those who have a T-score above -2.5 [75].

BMD limitations:

1. It is affected by patient's size and tissue thickness overlying bone.
2. There is no reference standard BMD for children for many methods.
3. Vitamin D deficiency if presented with low BMD.
4. Crushed vertebrae can result in falsely high bone density so it must be excluded from analysis.

Table 4: The WHO definition of Osteoporosis [69]

Category	Bone Mineral density value
Normal	A value for BMD within 1 SD of the young adult female reference mean (T-score at -1.0 and above)
Osteopenia	A value for BMD more than 1 but less than 2.5 SD below the young adult female reference mean (T-score between -1.0 and -2.5).
Osteoporosis	A value for BMD 2.5 or more SD below the young adult female reference mean (T-score at or below -2.5)
Severe osteoporosis (established osteoporosis)	A value for BMD 2.5 or more SD below the young adult female reference mean in the presence of one or more fragility fractures.

PATHOPHYSICIOLOGY :

About 90% of peak bone mass (PBM) is acquired by the late 20's and early 30's of age [75]. The PBM age showed wide variation according to sex and scanned site, with men achieving lumbar spine PBM earlier than women [76].

☐ BMD declines with age, particularly after the age of 40

☐ Determinants of peak BMD include heredity (70%-80%) and lifestyle factors (20%-30%) such as insufficient dietary calcium and/or vitamin D intake, exercise, smoking, malabsorption and medication such as glucocorticoids (Figure 2)

☐ Age related bone loss continues, with bone loss eventually going back down to pre-adolescent levels. (Figure 3)

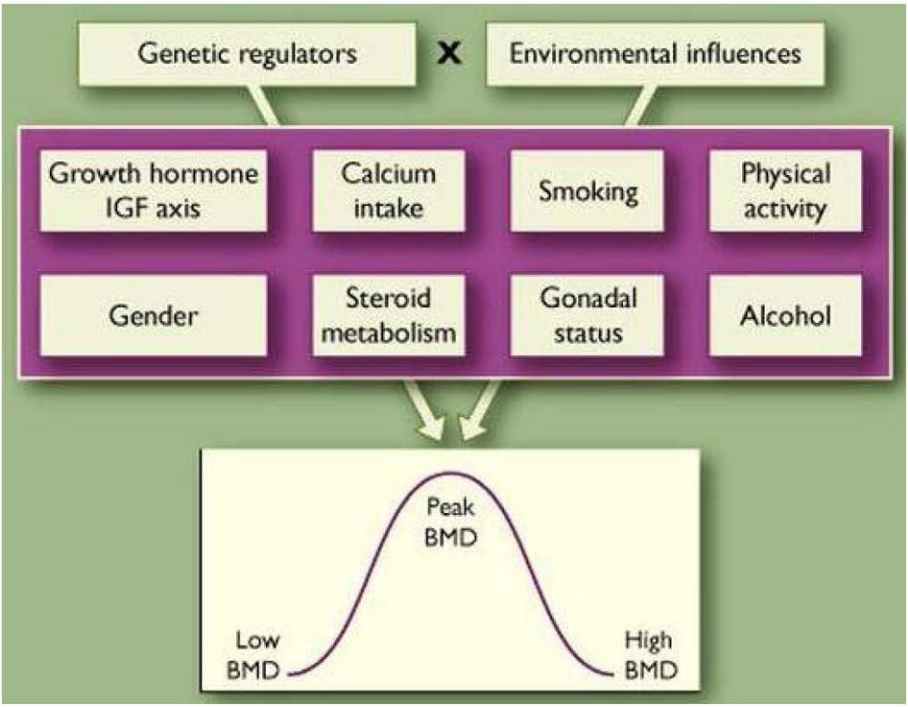


Fig. 2: determinants of peak bone mass [77]

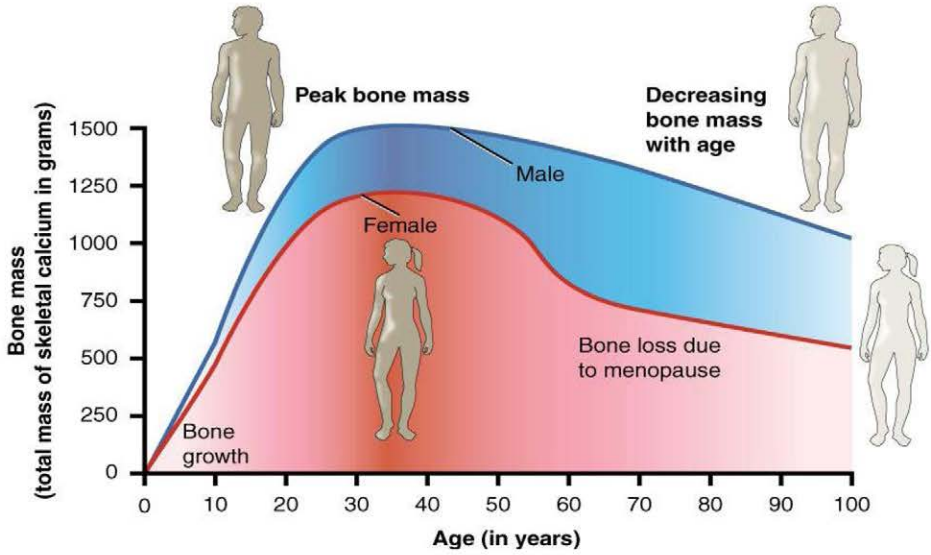


Fig. 3: changes in bone density with age [78]

Recommendations for Osteoporosis Screening:

Osteoporosis is a common and costly disease that is associated with high morbidity and mortality. The DXA is a safe screening test that provides practitioners with accurate information about BMD with minimal radiation exposure for patients. Given this knowledge, patients found to have osteoporosis can be started on treatment and counseled regarding the importance of lifestyle changes to reduce risk of osteoporotic fracture. Screening for osteoporosis in patients at risk is beneficial because osteoporosis is easily detectable and highly treatable.

Table 5: Who should get a BMD test? [17, 79]

Older adults (age ≥ 60 year)	Younger adults (age < 50 year)
√ All women and men ≥ 60 years √ Postmenopausal women and men 50–59 with risk factors for fracture including: ☐ Fragility fracture after age 40 ☐ Vertebral fracture or low BMD identified on x-ray ☐ Parental hip fracture ☐ High alcohol intake ☐ Current smoking ☐ Low body mass index (less than 18.5 kg/m2) ☐ High risk medication use: i.e. prolonged glucocorticoid use ☐ Rheumatoid arthritis ☐ Other disorders that leads to bone loss	√ Younger men or women < 50 with a disease or condition associated with low bone mass or bone loss: ☐ Hypogonadism ☐ Early menopause (< 45 y) ☐ Fragility fractures ☐ High-risk medication use ☐ Rheumatoid arthritis ☐ Chronic inflame. conditions ☐ Cushings disease ☐ Malabsorption syndrome ☐ Uncontrolled hyperthyroidism ☐ Primary hyperparathyroidism ☐ Other disorders associated with rapid bone loss/fractures

PREVENTION AND TREATMENT GOALS:

☐ ***Identify and treat any secondary cause for Osteoporosis :***

The initial management of Osteoporosis is evaluation for secondary Osteoporosis; include a detailed history of clinical risk factors for fractures and the underlying medical conditions and medications that cause bone loss, a thorough physical examination and laboratory tests.

☐ ***Calcium :***

Dietary sources of calcium are the preferred option, and calcium supplementation should only be targeted to those who do not get sufficient calcium from their diet. Calcium-rich foods such as dairy products contain additional nutrients that may also contribute to bone health. Table 6

Table 6: calcium amounts in food [80]

Calcium content of some common foods	Portion	Calcium*
Food Product – 250 to 300+ mg Ca		
Buttermilk	1 cup/250mL	300 mg
Fortified orange juice	1 cup/250mL	300 mg
Fortified rice or soy beverage	1 cup/250mL	300 mg**
Milk – whole, 2%, 1%, skim, chocolate	1 cup/250mL	300 mg***
Milk, evaporated	1/2 cup/125 mL	367 mg
Milk – powder, dry	1/3 cup/75 mL	270 mg
Yogurt – plain, 1-2% M.F.	3/4 cup/175 mL	332 mg
Food Product – 160 to 249 mg Ca		
Almonds, dry roast	1/2 cup/125 mL	186 mg
Beans – white, canned	1 cup/250 mL	191 mg
Cheese – Blue, Brick, Cheddar, Edam, Swiss	1 ¼"/3 cm cube	245 mg
Cheese – Mozzarella	1 ¼"/3 cm cube	200 mg
Drinkable yogurt	4/5 cup/200 mL	191 mg
Frozen yogurt, vanilla	1 cup/250 mL	218 mg
Fruit-flavoured yogurt	3/4 cup/175 mL	200 mg
Ice cream cone, vanilla, soft serve	1	232 mg
Kefir (fermented milk drink) – plain	3/4 cup/175 mL	187 mg
Molasses, blackstrap	1 Tbsp/15 mL	180 mg
Salmon, with bones – canned	1/2 can/105 g	240 mg
Sardines, with bones	1/2 can/55 g	200 mg
Soybeans, cooked	1 cup/250 mL	170 mg
Food Product – 125 to 159 mg Ca		
Beans – baked, with pork, canned	1 cup/250 mL	129 mg
Beans – navy, soaked, drained, cooked	1 cup/250 mL	126 mg
Collard greens – cooked	1/2 cup/125 mL	133 mg
Cottage cheese, 1 or 2%	1 cup/250 mL	150 mg
Figs, dried	10	150 mg
Instant oatmeal, calcium added	1 pouch/32 g	150 mg
Soy flour	1/2 cup/125 mL	127 mg
Tofu, regular – with calcium sulfate	3 oz/84 g	130 mg

Table 7: Daily Calcium Requirements [80]

Age	Daily Calcium Requirement
19 to 50	1000 mg
50+	1200 mg
pregnant or lactatingwomen 18+	1000 mg

Calcium supplements (calcium carbonate or calcium citrate) may be suggested for women who cannot get enough calcium in their diet Calcium doses greater than 500 mg/day should be taken in divided doses (e.g. once in morning and evening).

☐ ***Vitamin D:***

Vitamin D supplementation is recommended as vitamin D deficiency has a high prevalence. Also, various adverse extra-skeletal effects may contribute to low BMD and increase risk of falls. In addition, the efficacy of anti-osteoporotic drugs has only been demonstrated in the presence of vitamin D and calcium supplementation [81].

Vitamin D supplements should be recommended in amounts sufficient to bring the serum 25(OH)D level to approximately 20 ng/ml (50 nmol/L) and a maintenance dose recommended to maintain this level, particularly for individuals with Osteoporosis. Many patients with OP will need more than the general recommendation of 800-1,000 IU per day. Adults who have vitamin D deficient may be treated with 50,000 IU of vitamin D2 or D3 once a week or the equivalent daily dose (7,000 IU vitamin D2 or D3) for 8-12 wks to achieve a 25(OH)D blood level of approximately 75 nmol/L (30 ng/ml). This regimen should be followed by maintenance therapy of 1,500–2,000 IU/d or whatever dose is needed to maintain the target blood level (82-84).the target blood level [82-84].

☐ ***Sunlight:***

The main source of vitamin D is from exposure to sunlight. Vitamin D is produced when our skin is exposed to ultraviolet B (UVB) light from the sun [85]. The amount of sun exposure required to produce adequate levels of vitamin D is relatively low. However, many Saudis do not have adequate vitamin D levels [86- 88]. Sun exposure times required will vary based on the season, location in the kingdom, skin type and area of skin exposed [87].

A recent study was carried out to determine the best time for sun exposure in the central region of the Riyadh province, KSA. It was found that The optimum time to get sun exposure for vitamin D production, during summer time is from 8:30am and before 10:30am, as well as after 2pm until 4pm.while during wintertime it's from 10 am till 2 pm. These timings are important on a public health perspective, as it's free, safe and enjoyable. Furthermore it's a highly efficacious way for management and prevention of vitamin D deficiency [86].

☐ ***Exercise- strength, aerobic, flexibility, balance:***

Exercise may decrease fracture risk by improving bone mass in premenopausal women and helping to maintain BMD for women after menopause. Furthermore, exercise may decrease the tendency of falling due to bone or muscle weakness. Physical activity reduces the risk of hip fracture in older women as a result of increased muscle strength. Most experts recommend exercising for at least 30 minutes three times per week.

☐ ***Fall prevention:***

Falling significantly increases the risk of osteoporotic fractures in older adults. Taking measures to prevent falls can decrease the risk of fractures. Such measures may include the following:

- ☐ Correct visual and hearing impairment .
- ☐ Reviewing drug regimens to replace medications that may increase the risk of falls with those that are less likely to do so.
- ☐ Bathroom grab-bars and nonskid mats
- ☐ Avoid slippery mats.
- ☐ Keep electric and telephone cords way.
- ☐ Nightlight in bedroom and bathroom.
- ☐ Handrails on steps and stairs.
- ☐ Walking aids, if needed.
- ☐ Exercise for strength and balance.

Other measures

Get sufficient amount of sunlight during the safe optimum times, stop smoking, eat healthy food and watch your weight

Who Should Be Considered for Treatment?

Postmenopausal women and men age 50 and older presenting with the following should be considered for treatment: after evaluation for secondary causes of Osteoporosis:

☐ T-score -2.5 or less at Femoral Neck or Lumbar Spine

☐ Hip or vertebral (clinical or morphometric) fracture regardless of the T-score

☐ Low BMD osteopenia- (T-score (-1.0 to -2.5) at the femoral neck or lumbar spine) and a 10y probability of a hip fracture (FRAX) e3% or a 10y probability of a major OP-related fracture e20% based on the U.S. (89)

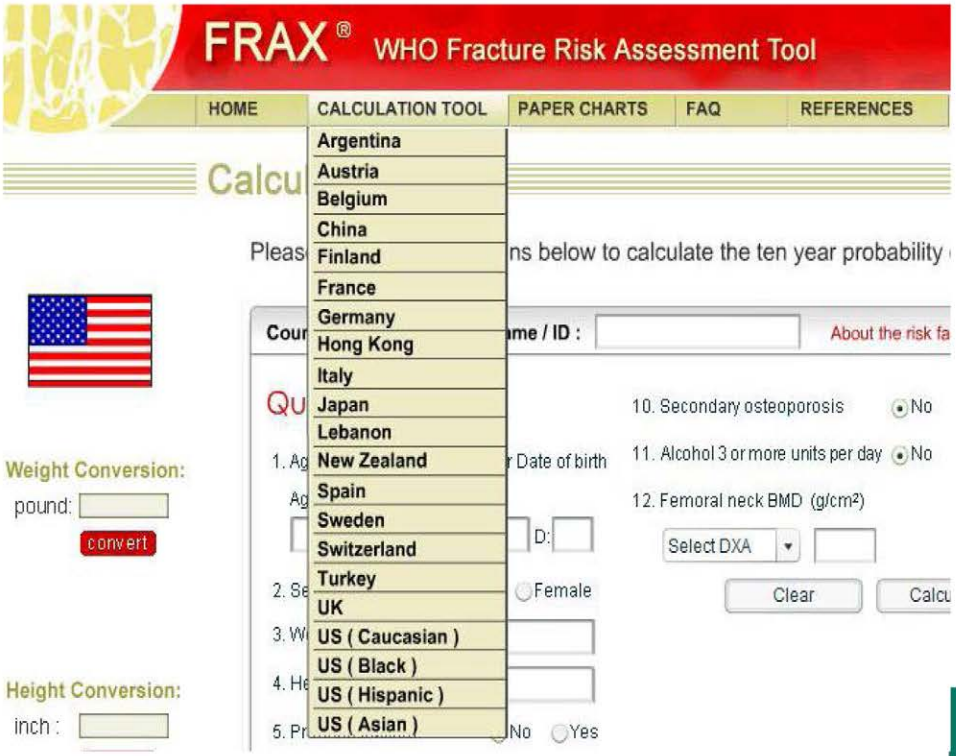
What is FRAX?

FRAX® was developed by the WHO Collaborating Centre for Metabolic Bone Diseases at Sheffield University (90). It was developed to calculate the 10-y probability of bone fracture risk. FRAX integrates clinical risk factors and BMD at the femoral neck (Table 8) to calculate the 10-y probability of hip fracture and the 10-y probability of a major osteoporotic fracture (clinical spine, hip, forearm or shoulder fracture).

Table 8: Clinical Risk Factors Considered in FRAX

Age	The model accepts ages from 40 to 90 years
Sex	Male or female
Weight	This should be entered in kg
Height	This should be entered in cm
Previous fracture	A previous fracture denotes more accurately a previous fracture in adult life. Enter yes or no
Parent fractured hip	History of hip fracture in the patient's mother or father. Enter yes or no.
Current smoking	Current tobacco smoking. Enter yes or no.

Glucocorticoids (GCs)	Current exposure to oral GCs or history of exposure to oral GCs for >3 months at a dose of prednisolone of ≥5mg daily (or equivalent doses of other GCs). Enter yes or no.
Rheumatoid arthritis	Confirmed diagnosis of RA. Enter yes or no.
Secondary OP	Whether the patient has a disorder strongly associated with Osteoporosis. Enter yes or no.
Alcohol ≥3 units/day	Enter yes or no
BMD	Select the make of DXA used. Then enter the actual femoral neck BMD (in g/cm2). Alternatively, enter the T-score based on the NHANES III female reference data. In patients without a BMD test, the field should be left blank



* THERPAY GUIDELINES:

Choice of drug in the absence of high quality head-to-head drug comparison trials to determine the relative efficacy of the individual drugs. The choice of therapy should be based upon efficacy, safety, cost, convenience, and other patient-related factors. For most postmenopausal women with Osteoporosis, we suggest oral bisphosphonates as first-line therapy [91, 92].

Table 9: Commonly used Osteoporosis Drugs

Medication	Approved benefits	Some Risks, side effects *	Comments
Antiresorptive agents (slow bone remodeling, increase bone density)			
Bisphosphonates : Alendronate Zoledronic acid	Prevention and treatment. Reduce the risk of vertebral, hip, and wrist fractures by 40%-50%	Well tolerated, but may cause upper GIT irritation (with oral bisphosphonates) . Hypocalcemia, Atypical femur fracture, jaw osteonecrosis I.V Bisphosphonates (Renal impairment)	***Alendronate :*** Taken first thing in the morning with a full glass of water at least 30 minutes before eating anything. Prevention: 35 mg orally once weekly Treatment: 70 mg orally once weekly ***Zoledronic acid*** 5mg I.V yearly
Selective estrogen receptor modulators (SERMs) i.e. Raloxifene	Prevention and treatment. Reduces vertebral fractures by 30%-50% (93)	Possible side effects include hot flashes, Vasodilatation Venous thromboembolism Stroke	60 mg orally once daily , Increases bone density less than bisphosphonates. May reduce breast cancer risk. Lowers LDL cholesterol.

Denosumab	Treatment in postmenopausal women & in men at high risk of fracture. About 68% Reduction of the incidence of vertebral fractures, hip fractures by about 40% and non-vertebral fractures by about 20% over 3 y	hypocalcemia skin infections (cellulitis)	60 mg SC every six months.
Anabolic agent (builds new bone)			
Parathyroid hormone (PTH) i.e. Teriparatide	Treatment only. May double the rate of bone formation. Reduces vertebral fractures by 65%-70% and cuts the risk of non-vertebral fractures to half.	Transient orthostatic hypotension. Osteosarcoma (in rat trials; not observed in clinical trials)	20 microgram SC once daily for up to 2 years maximum. Indicated mainly for Women or men ≥65 years old with prevalent vertebral Fractures and T-score ≤−2.5. also for Postmenopausal Women with T-score ≤−3.5

Note: the above is not the full list of side-effects or cautions for these medications.

Treatment Advise:

☐ GIT Intolerance

GIT Intolerance; Zoledronic acid, Denosumab, Teriparatide and SERMs

☐ Non Adherence to Treatment

For non-Adherence to Treatment give Zoledronic acid or Denosumab

☐Osteoporosis not responding to Bisphosphonates

For cases not responding to Bisphosphonates, give Teriparatide

☐ Bed ridden, cannot stand or sit for ½ hour

Bed ridden, cannot stand or sit for ½ hour Zoledronic acid, Teriparatide, Denosumab

☐History of bone tumor or radiotherapy:

Zoledronic acid, Alendronate, Ibandronate, Denosumab

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