Clinical practice guidelines on postmenopausal osteoporosis:
*An executive summary and recommendations - Update 2019

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Authors - C. V. Harinarayan, Raman Marwah, Rakesh Sahay, Sanjay Kalra, Sushrut Babhulkar
Indian Menopause Society, Hyderabad, India
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* This is a short Summary and Recommendations from the detailed document on Clinical Practice Guidelines on Postmenopausal Osteoporosis (PMO). The detailed references are listed in the main document.  


EDITORIAL

Guidelines are a method of translating the best available evidence into clinical, communicable, organisational and policy making statements in the hope of improving health care and or policies. This document is meant for the health care professionals, paramedics and policy makers. The quality of evidence and the level of recommendation was carried out using the grades of recommendation, assessment, development, and evaluation (GRADE) system.  

“Working with what you have, where you are and not with what you wish for” is the principle each one of us follow in the clinical practice to give the best to our patients. This guideline hopes to bridge the gap between evidence based practice, backed by scientific evidence and experience based practice based on the published and unpublished Indian data and expert opinions. Unlike protocols, guidelines are meant to aid the clinician in decision making. The target readers of this guideline are the adult women, members of the Indian Menopause Society (IMS), allied professionals, health-care providers, and policy makers.  

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* INDIAN MENOPAUSE SOCIETY WEBSITE:  
www.indianmenopause.org
OBJECTIVES

- To recognize post-menopausal osteoporosis (PMO) as a major health issue among health-care professionals, policy makers, and the public.
- To assist health-care practitioners in providing optimal care to post-menopausal women with the available resources. Osteoporosis is a costly debilitating disease, hence it is important to instill preventive measures, diagnose early, encourage modifications of risk factors associated with osteoporosis. Counseling on nutritional factors, abuse of tobacco, heavy alcohol consumption, and on life-style should be mandatory. Treat with pharmacologic agents only when indicated.
- To fill the lacunae of medical care after managing fragility fracture.
- To aid primary care physicians to decide when to refer patients with difficult problems to the relevant specialists.
- To stimulate interest in research on osteoporosis.

SYSTEM FOR GRADING: EVIDENCE USED IN THE DOCUMENT

The quality of evidence and the level of recommendation was carried out using the grades of recommendation, assessment, development, and evaluation (GRADE), system. Recommendations are based on strong evidence, suggestions on experience based evidence, this method is adapted to unite the diverse conditions of India with the best available data and the rich experience based evidence from the experts.

A. GRADE: Grades of evidence:

- High quality – GRADE A: Further research is very unlikely to change our confidence in the estimate of effect.
- Moderate quality – GRADE B: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
- Low quality – GRADE C: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
- Very low quality – GRADE D: We are very uncertain about the estimate.

B. In terms of the strength of the recommendation, strong recommendations use the phrase “recommend,” and weak recommendations use the phrase “suggest.” Research questions are placed at the end of each chapter in the monograph of the book.

BENEFITS OF USING THE GUIDELINE

Benefits of using these guidelines are: (i) Improved early identification and better management of women at risk for fragility fractures; (ii) down grading the disease burden after an episode of fragility fracture by improving the assessment, management and follow-up of these women; (iii) understanding the urgent need of conducting preventive health programs by all stakeholders related to women’s health, and (iv) in addition, in view of the paucity of Indian data it is hoped that this guideline will help stimulate interest in research in various aspects of PMO.

CONCLUSIONS

Osteoporosis has significant medical, social, and financial implications.

The onus is on the Government and Non-Government Organizations to develop specialty menopause and osteoporosis clinics akin to antenatal clinics in the private and public sectors besides developing management of menopause as a medical specialty within obstetrics and gynecology care. The aim of the guideline is to provide a resource documents to aid the busy clinician to give optimal care to the ageing woman. Limitations are the paucity of robust research evidence in India. This is one of the endeavors of the Indian Menopause Society to work toward the slogan: “Fit @ Forty, Strong @ Sixty, Independent @ Eighty”.

ACKNOWLEDGEMENT

We thank the experts who took time out of their busy family life, academics, and work to contribute to the document on PMO in India.

EDITORIAL INDEPENDENCE

The views expressed are independent of any extraneous influences.

REFERENCES

3. Definitions

1. Osteoporosis: WHO defines osteoporosis as “a systemic skeletal disease characterized by low bone mass (measured as bone mineral density—BMD) and microarchitectural deterioration of bone tissue with a consequent increase in bone fragility and susceptibility to fractures involving the wrist, spine, hip, pelvis, ribs, or humerus.”

2. Frailty, fragility fracture, the end point of inadequate skeletalmuscular health has been defined by the WHO as “a fracture caused by injury, which would be insufficient to fracture normal bone: the result of reduced compressive and/or torsional strength of bone.” Clinically, a fragility fracture can be defined as one, which occurs as a result of minimal trauma, such as a fall from a standing height or less, or no identifiable trauma.

3. The most common sites of fragility fracture are the hip, spine, and forearm. The other sites are pelvis, proximal femur, proximal humerus, proximal tibia, and fractures involving three ribs simultaneously.

4. Sarcopenia: 2018 definition, European Working Group on Sarcopenia in Older People (EWGSOP) uses low muscle strength as the primary parameter of sarcopenia. Sarcopenia diagnosis is confirmed by the presence of low muscle quantity or quality and or low physical performance.

5. Frailty: Fried et al. have standardised the definition as three or more of the following criteria: unintentional weight loss, self-reported exhaustion, weakness (grip strength), slow motor performance (walking speed), and low physical activity.

CRITERIA FOR DIAGNOSIS OF OSTEOPOROSIS

6. The diagnosis of an osteoporosis is by the presence of fragility fracture (clinical or radiological), and or by BMD (T-score below or equal to -2.5) in a postmenopausal women (Table 1).

7. The “gold standard” method of BMD testing is by dual X-ray absorptiometry (DXA). Its value is expressed in standard deviation units (SD) from the population mean in young adults (T score) or from the mean in an age-matched population (Z score).

Table 1: DIAGNOSIS OF OSTEOPOROSIS

<table>
<thead>
<tr>
<th>Diagnosis of Osteoporosis</th>
<th>T-Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>T-Score above or better than -1.0</td>
</tr>
<tr>
<td>Low bone mass</td>
<td>T-Score between -1.0 and -2.5</td>
</tr>
<tr>
<td>Osteoporosis</td>
<td>T-Score below or worse than -2.5 (including)</td>
</tr>
<tr>
<td>Severe Osteoporosis</td>
<td>T-Score below or worse than -2.5 (including) with fragility fracture</td>
</tr>
</tbody>
</table>

8. The reference range recommended by the IOF (International Osteoporosis Foundation), ISCD, (International Society Of Clinical Densitometry) WHO and NOF (National Osteoporosis Foundation) for calculating the T-score in postmenopausal women is the National Health and Nutrition Examination Survey (NHANES) III reference database in Caucasian women aged 20–29 years. (GRADE C)**

9. The International Society for Clinical Densitometry diagnostic criteria for osteoporosis in postmenopausal women and in men age 50 and older is if the T-score of the lumbar spine, total hip, or femoral neck is < -2.5 or less. In certain circumstances the 33% radius (also called 1/3 radius) may be utilized.7

10. The Z-score describes the number of SDs by which the BMD in an individual differs from the mean value expected for age and sex. It is mostly used in children adolescents, and premenopausal women. A Z-score below -1 is regarded as abnormal and should be referred to as “low for age.” A low Z score in a postmenopausal woman indicates the need to evaluate for secondary osteoporosis.
11. Osteoporosis is classified as primary (includes type I & type II) and secondary.

   a. Primary osteoporosis is seen in postmenopausal women in whom there is no specific pathogenetic mechanism other than age.
   
   i. Type I or postmenopausal osteoporosis affects mainly trabecular bone occurring in the early part of the menopause transition. There is an accelerated bone loss at the rate of 1-2 % per year (range 1-5 percent yearly) due to declining estrogen levels and is seen in the first 5-7 years after menopause.6

   ii. Type II or senile osteoporosis is age-related and bone loss occurs at a rate of 1% per year in both sexes and affects the cortical and trabecular bone. Secondary osteoporosis is due to specific causes.

12. Osteoporosis and Osteomalacia: Bone is a dynamic tissue with a continuous remodelling leading to formation of new bone and resorption of old bone. A mismatch of this process forms the basis for osteoporosis, while defective mineralization of the newly formed osteoid is called osteomalacia.

### Table 2: PREVALENCE OF OSTEOPOROSIS AND OSTEOPENIA: INDIAN STUDIES

<table>
<thead>
<tr>
<th>Author / Reference</th>
<th>Main study</th>
<th>Main findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Babu AS.7</td>
<td>N = 609 (538 females, 71 males) Mean age = 32 yrs DXA</td>
<td>Normal = 48.5% Osteopenia = 42.2%</td>
</tr>
<tr>
<td>Paul TV.8</td>
<td>N = 150 (ambulatory post-menopausal women) Age &gt; 50 yrs DXA</td>
<td>Osteoporosis at spine = 48.8%; femoral neck = 56.7%; at any site = 50%</td>
</tr>
<tr>
<td>Makker A.8</td>
<td>N = 1104 (653 women, 451 men) Age = 20 to 86 yrs DXA</td>
<td>41-50 yrs: 51-65 yrs: 66-75 yrs: 78 yrs: hip % = 44.7; 39.8; 8.4; 4.8; 1.2; spine % = 61.2; 54.9; 11.3; 33.9; 65.2</td>
</tr>
<tr>
<td>Sharma L.10</td>
<td>N = 158 women Calscan QUS</td>
<td>Normal = 19% Osteopenia = 59% Osteoporosis = 29%</td>
</tr>
<tr>
<td>Shatrugna V.11</td>
<td>N = 289 women Age = 30 to 65 yrs DXA</td>
<td>Normal = 19% Osteopenia = 33% Osteoporosis = 29%</td>
</tr>
<tr>
<td>Gandhi A.B.11</td>
<td>N = 200 women Age = 40 yrs DXA</td>
<td>Osteoporosis = 34% Osteopenia = 8% Age &gt; 60 yrs: Osteoporosis &amp; Osteopenia = 100%</td>
</tr>
<tr>
<td>Sarodekar LS, Shah R5</td>
<td>N = 450 women Age 25 to 75 yrs DXA</td>
<td>hip % = 27.9; 31.0; 31.0; 44.4; 30.2; spine % = 32.1; 45.1; 38.8; 34.7; 36.7</td>
</tr>
<tr>
<td>Agrawal N.10</td>
<td>N = 370 post-menopausal women Mean age = 57 yrs DXA</td>
<td>Osteoporosis at hip = 15.8%; Osteopenia at spine = 28.6% Age above 85 yrs: Osteoporosis in 66.7%</td>
</tr>
</tbody>
</table>

(Pame RC.17) N = 281 women Age = 50 to 79 yrs Digital X-ray radiography

<table>
<thead>
<tr>
<th>Author / Reference</th>
<th>Main study</th>
<th>Main findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Krishna U.10</td>
<td>N = 281 post-menopausal women DXA</td>
<td>Normal = 11.3 % Osteoporosis = 36.4 % Osteopenia = 4%</td>
</tr>
<tr>
<td>Meeta10</td>
<td>N = 370 post-menopausal women DXA</td>
<td>Osteoporosis at Total hip = 4.2% at spine = 22.07% Osteopenia at Total hip = 17.82% at spine = 35.11</td>
</tr>
<tr>
<td>Meeta, Shanthani D10</td>
<td>N = 450 post-menopausal women DXA</td>
<td>Normal = 9% Osteoporosis = 42% Osteopenia = 24%</td>
</tr>
<tr>
<td>Nikoma10</td>
<td>N = 3552 Mean age = 29.8 ± 9.8 yrs QUS</td>
<td>Age group: Normal = 276 (40.4%); Osteopenia = 1527 (43.4%); Osteoporosis = 1141 (36.2%); Total = 1228 (35.78%); 1135 (35.1%); 3532 (108%)</td>
</tr>
<tr>
<td>Thokchom10</td>
<td>N = 92 pre and post-menopausal women DXA</td>
<td>Age group (yrs): Total: 71.6 ± 22.6; 16 ± 1 46-55: 21.28 ± 4.0 ± 6 66-75: 9.97 ± 3.6 ± 14.6</td>
</tr>
<tr>
<td>Kaur10</td>
<td>N = 250 post-menopausal women Age range = 45 to 80 yrs DXA</td>
<td>Osteoporosis = 28.4%</td>
</tr>
<tr>
<td>Hemalata10</td>
<td>N = 201 patients, Age &gt; 50 yrs DXA</td>
<td>Females with osteoporosis (53%); osteopenia (33%) Males with osteoporosis (34%); osteopenia (32%)</td>
</tr>
<tr>
<td>James D.10</td>
<td>N = 384 adult patients 181 females and 193 males, Age = 40 years and above, Anterior–posterior radiograph of the pelvis</td>
<td>285 (84%) radiographs were graded as Singh’s Grade 1 or below indicating definite osteoporosis</td>
</tr>
<tr>
<td>Kadam10</td>
<td>N = 421 adult women (228); Age range = 40 to 75 yrs Mean age = 53.3 ± 8.4 years Osteoporosis at: Total hip = 44.2% postmenopausal DXA</td>
<td>Osteoporosis at L5 = 14.5% men; 18% in women Osteoporosis at TH1: 5.7% men; 12.7% postmenopausal women Osteoporosis at L5: 39.6% men; 21.6% women Osteoporosis at TH1: 36% men; 44.4% women</td>
</tr>
<tr>
<td>Shaki10</td>
<td>N = 1400 post- and pre-menopausal women Age range = 25 to 70 yrs DXA</td>
<td>Osteoporosis in 81% Osteopenia in 19%</td>
</tr>
<tr>
<td>Chitten10</td>
<td>N = 956; 105 (33%) women; 451 (47%) men QUS</td>
<td>Osteoporosis = 48.4%; Osteopenia = 6.6% Osteoporosis &gt; 9.5% of women, 3.5 % of men Osteoporosis = 51.2% of men; 43.9% of women osteoporosis in 35–55 years = 54% (men); 51% (women)</td>
</tr>
<tr>
<td>Borghain10</td>
<td>N = 200 postmenopausal women Age range = 25 to 79 yrs DXA</td>
<td>Normal = 64 (22.7%) Osteopenia = 135 (47.9%) Osteoporosis = 83 (29.4%)</td>
</tr>
</tbody>
</table>

(QUS: Quantitative Ultrasound; DXA: Dual-energy X-ray absorptiometry.
This table has been prepared by Dr. Subhash NC and Dr. Usha Pratap under guidance from the authors.)
13. Osteoporosis is asymptomatic unless a fracture occurs. Fracture risk is defined by BMD (both primary and secondary causes) and clinical risk factors for osteoporotic fracture. For treatment purpose, combining BMD with clinical risk factors provides a better estimate of fracture risk. We simply should not treat T-scores, but must take a patient's full clinical status into account when we make therapeutic decisions.

14. Early diagnosis in the asymptomatic period is essential, and timely management of osteoporosis will prevent the associated morbidity and mortality. Osteoporotic fracture risk screening of large scale whole population groups is not likely to be cost-effective, so more selective approaches, i.e., targeted screening for disease detection is advocated. In the absence of a validated population screening tool for PMO in India, a case finding strategy utilizing clinical risk factors with the addition of DXA as needed is suggested (Grade C).

15. Asymptomatic women: Opportunistic screening for women above 40 years is suggested.

16. Risk Assessment Factors for fractures are derived by history and clinical examination. It is important to distinguish between those risk factors which lead to reduced bone mass from those which predispose to osteoporotic fractures with a BMD not in the osteoporotic range

17. Risk assessment tools like The Osteoporosis Self-Assessment Tool for Asians (OSTA), Simple Calculated Risk Estimation Score [SCORE] are simple and cost effective to screen women at risk for osteoporotic fracture.

18. FRAX (WHO Fracture Risk Assessment Tool): for online use is available for India (http://www.shef.ac.uk/FRAX). FRAX is used to identify patients in the osteopenia group most likely to benefit from treatment. It predicts the 10-year absolute risk for fracture in an individual and the cost-effective analysis determines the interventional threshold above which treatment is cost-effective. FRAX is country specific, and until more Indian data is available on prevalence of osteoporotic fractures and mortality rates, it may not serve the true purpose for the usage of FRAX in the Indian context (Grade C).

19. Major risk factors defined by WHO are (Grade A):

   a. Age: Advancing age is a single most significant risk factor 
   b. Low body mass index (BMI) 
   c. Prior history of a fracture 
   d. Parental history of hip fracture 
   e. Smoking 
   f. Alcohol 
   g. Use of Glucocorticoid 
   h. Rheumatoid arthritis

20. Environmental factors: include nutrition (calcium intake using the quick dietary calculator, protein), physical activity and sunlight exposure, risk of falling which are important modifiable risk factors.

21. Secondary osteoporosis: Case finding for secondary osteoporosis is practiced in high-risk disease subgroups, such as chronic glucocorticoid users and patients with rheumatoid arthritis, collagen vascular disease, or inflammatory bowel disease, hyperparathyroidism, thyroid dysfunction, type 2 diabetes, use of aromatase inhibitors in breast cancer survivors. (Grade A).

22. Symptomatic women presenting with fragility fracture, complain of severe pain, which is sudden in onset with minimal trauma, or chronic pain localized to the mid back, may radiate to the abdomen. Generalized bone pain indicates osteomalacia or metastasis. A multifactorial fall assessment is recommended. In vitamin D deficiency, proximal muscle is affected more than the distal, so activity, such as using a squatting toilet, climbing stairs, and getting out of low chair can be particularly difficult. Tenderness on the pretibial and sternum can be elicited.

23. Physical examination: Should include recording the height and weight annually, checking for balance and gait, get up and go test by asking the women to get up from chair without using their arms. The occupant to wall distance in standing position is ideally zero, inability to touch the occupant to wall, while standing implies a thoracic fracture. Inability to insinuate the four fingers of the hand between the lower rib cage and anterior superior iliac crest implies a lumbar fracture. Kyphosis and Dowager's hump are seen in the late stage of osteoporosis (Grade A).

24. Laboratory tests:

   a. Essential (Grade A)
   i. Complete blood picture, ESR
   ii. Random blood sugar
   iii. Serum calcium
   iv. Preferably fasting serum phosphorus
   v. Serum creatinine
   vi. Serum albumin
   vii. Alkaline phosphatase
   viii. Serum TSH
   ix. 25 hydroxy vitamin D
   x. X-ray of thoracolumbar spine (lateral view)
   xi. PTH (based on clinical judgment).

25. It is suggested to conduct central DXA of spine and hip in all women five years beyond the natural age of menopause and in women less than five years since menopause with one high clinical risk or more than two clinical risk factors. This suggestion is based on the following: (Grade C).

   a. Early age of natural menopause, i.e., 46.7 years in an Indian women
   b. Life expectancy of an Indian woman is 70.3 years (WHO statistics 2018)
   c. Accrual of low peak bone mass
   d. Early age of presentation of fracture. Accelerated bone loss in the immediate five years of menopause.
   e. Stratification by age shows that the prevalence of low bone mass is more than 40% from the age of 40 years and increases to more than 80% by the age of 65 years.

26. Indications for DXA (Grade B)

   a. All postmenopausal women more than five years of menopause 
   b. Postmenopausal women less than five years of menopause with risk factors 
   c. Women in menopause transition with secondary causes 
   d. Radiological evidence of osteopenia and presence of vertebral compression fracture 
   e. Women with fragility fractures by radiology or DXA 
   f. Ideally before initiating pharmacotherapy for osteoporosis 
   g. Emerging indications are to measure total body fat and lean tissue mass.

27. The lowest BMD score obtained from all the sites is used for diagnosis (Grade A).

28. Screen postmenopausal women for secondary osteoporosis if history or examination shows systemic disease or low Z scores on DXA (Grade A).

29. To monitor therapy, the interval to the next DXA should depend on the calculated individual risk and would mostly be scheduled between 1 and 5 years later.

30. Peripheral DXA (X-ray based) may be used as a mass screening tool because of its high negative predictive value (Grade C).

31. X-ray abnormality is a feature of advanced bone disease. We recommend X-rays in all the diagnostic protocols for osteoporosis (Grade A).

32. Bone turnover markers (BMs) are not a part of the routine tests to be used for clinical diagnosis (Grade B).

33. BMs is used to assess compliance and efficacy of therapy and preferably follow the broad guidelines given below (Grade B).

   a. Type of marker:
      i. Bone resorption: Serum CTX
      ii. Bone formation: PINP, bone-specific alkaline phosphatase

   Use one marker of bone resorption and one marker of bone formation. More specifically, markers for bone resorption when on anti-resorptives and bone formation markers when on anabolic agents.

   b. Monitoring: Baseline, and at 3 or 6 months after treatment has been initiated

   c. Timing of sample: Morning (before 9 am) after an overnight fast for CTX and anytime for PINP

   d. Try to use the same laboratory services and same assay or method for monitoring intervals of measurement, and compare the difference with the least significance change in terms of percentages or absolute values.
MANAGEMENT

34. Therapeutic lifestyle management is an essential part in the management of osteoporosis. This includes a balanced diet, adequate physical activity and exposure to sunlight, avoidance of bone depleting agents like tobacco, alcohol, etc. Low sodium intake: daily salt intake should not exceed 5 g (1 tsp). Protein should be 1 gm/kg body weight. Decrease caffeine intake (<3 cups/day), limit alcohol and avoid use of tobacco (Grade B).

35. The recommended dietary allowance (RDA) of calcium intake for Adult Indian women is given in Table 4. Assess the total calcium intake from dietary sources by using the NOF (National osteoporosis foundation) tool depicted on table 6. If needed, supplements are used to correct the deficient balance. The intake should exceed >800 mg/day (Grade B).

Table 5: INDIAN FOODS WITH CALCIUM RICH CONTENT

<table>
<thead>
<tr>
<th>S.NO</th>
<th>DIETARY PRODUCT</th>
<th>SERVING</th>
<th>CALCIUM (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Milk, Card(Buffalo)</td>
<td>1 Glass (250ml)</td>
<td>520</td>
</tr>
<tr>
<td>2</td>
<td>Milk, Card(Cow)</td>
<td>1 Glass (250ml)</td>
<td>300</td>
</tr>
<tr>
<td>3</td>
<td>Milk, Card(Low Fat)</td>
<td>1 Glass (250ml)</td>
<td>300</td>
</tr>
<tr>
<td>4</td>
<td>Khova</td>
<td>100gms</td>
<td>600</td>
</tr>
<tr>
<td>5</td>
<td>Pusser</td>
<td>100gms</td>
<td>320</td>
</tr>
<tr>
<td>6</td>
<td>Cheese Slice</td>
<td>25gms</td>
<td>160</td>
</tr>
<tr>
<td>7</td>
<td>Ragi</td>
<td>100gms (1 katori)</td>
<td>360</td>
</tr>
<tr>
<td>8</td>
<td>Horse Gram Whole</td>
<td>100gms (1 katori)</td>
<td>270</td>
</tr>
<tr>
<td>9</td>
<td>Soyabean</td>
<td></td>
<td>240</td>
</tr>
<tr>
<td>10</td>
<td>Moth Bean/Rajgul Gram</td>
<td>100gms</td>
<td>200</td>
</tr>
<tr>
<td>11</td>
<td>Rajma</td>
<td>100gms</td>
<td>260</td>
</tr>
<tr>
<td>12</td>
<td>Red/Green/Black Gram (Whole)</td>
<td>100gms (1 katori)</td>
<td>100</td>
</tr>
<tr>
<td>13</td>
<td>Chickpea/Kabuli Chana</td>
<td>100gms</td>
<td>120</td>
</tr>
<tr>
<td>14</td>
<td>Drum Stick Leaves/Parsley</td>
<td>100gms</td>
<td>300</td>
</tr>
<tr>
<td>15</td>
<td>Radish Leaves/Methi Leaves</td>
<td>100gms</td>
<td>270</td>
</tr>
<tr>
<td>16</td>
<td>Mint/Parly/Coriander</td>
<td>100gms</td>
<td>200</td>
</tr>
<tr>
<td>17</td>
<td>Okra(Bhunds)</td>
<td>100gms</td>
<td>85</td>
</tr>
<tr>
<td>18</td>
<td>Cabbage</td>
<td>100gms</td>
<td>60</td>
</tr>
<tr>
<td>19</td>
<td>Drum Figs</td>
<td>5 Wheel</td>
<td>95</td>
</tr>
<tr>
<td>20</td>
<td>Almonds</td>
<td>1 Handful 25gms</td>
<td>60</td>
</tr>
<tr>
<td>21</td>
<td>Sesame Seeds(Til)</td>
<td>1 Tablespoon</td>
<td>363</td>
</tr>
<tr>
<td>22</td>
<td>Orange</td>
<td>1 Medium Size</td>
<td>50</td>
</tr>
<tr>
<td>23</td>
<td>Fisk offa</td>
<td>25gms</td>
<td>160</td>
</tr>
<tr>
<td>24</td>
<td>Broccoli</td>
<td>100gms</td>
<td>118</td>
</tr>
<tr>
<td>25</td>
<td>Cumin</td>
<td>6gms/Table spoon</td>
<td>60</td>
</tr>
</tbody>
</table>

36. Vitamin D deficiency can be considered as a National nutritional deficiency pandemic. In the background of widespread vitamin D deficiency in all age groups, it is prudent to adopt the US Endocrine Society 2011 RDA (Table 6).

Table 6: US ENDOCRINE SOCIETY 2011 RDA

<table>
<thead>
<tr>
<th>LIFE STAGE GROUP</th>
<th>RDA (IU)</th>
<th>UPPER LIMIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adults (15 years and above)</td>
<td>1,500-2,000</td>
<td>10,000</td>
</tr>
<tr>
<td>Pregnancy and Lactation</td>
<td>1,500-2,000</td>
<td>10,000</td>
</tr>
<tr>
<td>Children and Adults at risk*</td>
<td>2-3 times the normal requirement for their ages</td>
<td></td>
</tr>
</tbody>
</table>

*Obese, HIV infection, on glucocorticoids, anticonvulsant, antifungal and antiviral therapy. A desirable range is between 30 and 80 IU/day, although levels up to 100 IU/day are unlikely to result in vitamin D toxicity. Except in gastrointestinal disorders, where it is advisable to maintain the serum levels of 25 (OH) D up to 30 ng/ml.

Table 3: RECOMMENDED DIETARY ALLOWANCE OF CALCIUM

<table>
<thead>
<tr>
<th>GROUP</th>
<th>CALCIUM (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult Women</td>
<td>600</td>
</tr>
<tr>
<td>Pregnancy</td>
<td>1,200</td>
</tr>
<tr>
<td>Lactation</td>
<td>1,200</td>
</tr>
<tr>
<td>Postmenopausal Women</td>
<td>1,500</td>
</tr>
</tbody>
</table>

Table 4: QUICK DIETARY CALCIUM ASSESSMENT CHART

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>CALCIUM (mg)</th>
<th>NO. OF SERVINGS</th>
<th>TOTAL CALCIUM (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dietary</td>
<td>300-525/glass</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Nondietary</td>
<td>200-300</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

**Approximate intake. Calculate the total daily intake by summing the servings from dietary and non-dietary sources before supplementation.**

a. Encourage dietary intake (table 5), supplements are added to correct the deficient balance. The risk of cardiovascular events, calcifi are not observed with the recommended doses of calcium b. Limit 500 mg calcium at one time from food and/or supplements. Spread calcium sources throughout the day.

c. Dietary calcium restriction is no longer recommended for patients with hypercalcemia,

d. Excess amounts more than 2,500 mg a day, effects kidneys and can reduce the absorption of other minerals like iron, zinc and magnesium.

e. The data on supplemental calcium intake is currently controversial. In cases where calcium supplementation is medically necessary, patients should be encouraged to take their calcium supplements with a meal and should be monitored for hypercalcemia.

f. Absorption of calcium is decreased when taken with foods rich in fibres and fat, Iron, zinc, spinach, coffee, alcohol and antacids. Thyroid medications, corticosteroids, tetracyclines and anticonvulsants and calcium should be taken separately.

b. Dietary sources are limited, Government of India has permitted fortification of food which would enable population at large an intake of 30-50% (200-300 IU) of Recommended Daily Allowance (RDA) of vitamin D assuming consumption of milk/milk products per day is 700 ml and oil 30 ml/d. Implementing intake from the natural sources have practical limitations. Hence, it is recommended to use vitamin D as supplements (Grade A).

c. Recommendations for management of vitamin D deficiency and maintenance (Grade B):

i. Cholecalciferol (vitamin D3) is available in the form of oral tablets (Conventional Miscellaneously or Nanoemulsion formulations) granules and oral spray. Dosages of 1000 IU, 2000 IU and 60,000 IU are available.

ii. Intramuscular (IM) injections of vitamin D3 are cost effective may be recommended in cases of malabsorption and to increase compliance. The disadvantage are painful, and an erratic blood levels.

d. Cholecalciferol is the preferred therapy for correction of deficiency and maintenance.

e. Management of deficiency: Cholecalciferol (vitamin D3), 60,000 IU orally once a week for eight weeks preferably with milk. One IM injection of 6,000,000 IU is given to correct the deficiency (not to be repeated before three months and may be given after confirmation of persistent low levels of vitamin D). This is followed by maintenance therapy.

f. Maintenance therapy: Cholecalciferol 60,000 IU once a month in summer or twice a month in winter. Vitamin D supplements of 2,000 IU/day, or Injection of cholecalciferol 3,000 IU IM, twice a year or 6,000,000 IU once a year.

g. Cholecalciferol, 1,000 IU daily, will raise blood levels, on average, by approximately 10 ng/mL.

h. Upper acceptable limit: The dose for treatment should not exceed 4000 IU/day and hypercalcemia has been reported when the dose exceeds 10,000 IU/day.
PHARMACOTHERAPY

42. It is good to understand the term prevention and treatment in the context of osteoporosis.

a. The term prevention is used to denote the prevention of bone loss in postmenopausal women with low bone mass (T-score between -1 and -2.5) and increased fracture risk.

b. Treatment is defined as reduction in fracture risk in postmenopausal women with osteoporosis.

43. Indications for pharmacotherapy:

a. Fracture fractures (clinical, height loss of >4cm, kyphosis or morphometric by X-rays or VFA by DXA)

b. BMD T-scores ≤ -2.5 at the femoral neck or spine, wrist by DXA.

c. Women with low bone mass by DXA with one major or two other minor risk factors (or) eligible by OSTA (Osteoporosis Self-assessment Tool for Asians), FRAX, SCORE (Simple Calculated Osteoporosis Risk Estimation).

d. In the absence of BMD measurements by DXA, intervention is individualized, based on the clinical risk assessment fracture risk tools like the SCORE, existing risk factors and bone density.

44. The choice of medication depends on drug-related (risk-benefit), patient profile (age, years since menopause, symptoms, comorbidities) and environment-related factors (economics and social). Patients should be educated in PMO and its treatment and empowered to take part in shared decision making to improve adherence. They should be calcium and vitamin D replete.

45. Patients should be monitored initially, every 3–6 months for 2–3 contacts, then annually for clinical assessment. Assess for side effects and compliance. We suggest that markers of bone resorption and formation may be tested at baseline and after 3–6 months of therapy in certain situations and research settings (Grade C).

46. We suggest that DXA should be performed every two years on the same machine in order to monitor osteoporosis therapy (Grade B).

a. Measurement error must be considered when interpreting serial BMD assessments in order to determine whether the change is real and not simply random fluctuation or artefact.

b. Each centre should determine its precision error in order to estimate the least significant change (LSC) (i.e., the change in BMD required to have 95% confidence that the change is real).

47. However, most older osteoporosis therapies do not cause large increases in BMD, and the antifracture effect of treatment is only partly explained by the relatively small changes in BMD. Stable BMD is consistent with successful treatment.

48. Non-responders to PMO therapy may be due to poor adherence, poor calcium/vitamin D health, untreated secondary osteoporosis, concomitant therapy with skeletal drugs, inappropriate choice of drugs, or wrong choice of monitoring strategies (Grade C).

49. Duration of therapy has to be individualized depending on the patient's profile, drug used, and response to therapy.

50. There is no specific recommendation on combination therapies, sequential therapies and holiday drugs, these should be planned as per individual patient's need. Although teriparatide and denosumab combination has been documented with highest BMD outcomes till date, and some guidelines recommend sequential therapies for maintaining BMD gains and long term protection against fracture.

51. There are no head-to-head trials of the various drugs comparing their effects on fracture rates. The details of drug therapy are given in tables.

52. Hormone therapy, alendronate, risendronate may be considered as initial options for most early postmenopausal women with low or moderate fracture risk. In women who are intolerant of oral bisphosphonates or in whom they are contraindicated, intravenous bisphosphonates or denosumab should be considered. (Grade A recommendation).

53. Women with breast cancer risk and with osteoporosis of spine may be benefited with raloxifene.
61. Progestogens should be added to estrogen therapy in women with uterus (Grade A).

62. If menopausal hormone therapy is given to women below the age of 60 or within 10 years of menopause, the risks are rare. Tables 6 and 7 elaborate the risks and benefits in terms that can be used during counselling for easy and understandable communication

**Table 7: BASED ON WHI, NUMBER OF EXCESS EVENTS ON MHT VS PLACEBO PER 10,000 WOMEN PER YEAR OF MHT USE BETWEEN THE AGE GROUP OF 50-59 YEARS**

<table>
<thead>
<tr>
<th>DISEASE</th>
<th>ESTROGEN WHO/CIMS DEFINITION OF RISK</th>
<th>PROGESTERONE WHO/CIMS DEFINITION OF RISK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Venous thromboembolism</td>
<td>4 Rare &gt;1/10,000 and &lt;1/1,000</td>
<td>11 Rare &gt;1/10,000 and &lt;1/1,000</td>
</tr>
<tr>
<td>Stroke</td>
<td>5 Rare &gt;1/10,000 and &lt;1/1,000</td>
<td>9 Rare &gt;1/10,000 and &lt;1/1,000</td>
</tr>
<tr>
<td>Breast cancer</td>
<td>2 Rare &gt;1/10,000 and &lt;1/1,000</td>
<td>5 Rare &gt;1/10,000 and &lt;1/1,000</td>
</tr>
<tr>
<td>Cardiovascular disease</td>
<td>6 Rare &gt;1/10,000 and &lt;1/1,000</td>
<td>7 Rare &gt;1/10,000 and &lt;1/1,000</td>
</tr>
</tbody>
</table>

**Table 8: BASED ON WHI, NUMBER OF LESS EVENTS ON ESTROGEN VS PLACEBO PER 10,000 WOMEN PER YEAR OF MHT USE BETWEEN THE AGE GROUP OF 50-59 YEARS (GRADE A)**

<table>
<thead>
<tr>
<th>DISEASE</th>
<th>NUMBER OF LESS EVENTS WITH ESTROGENS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Myocardial Infarction</td>
<td>12</td>
</tr>
<tr>
<td>Breast cancer</td>
<td>8</td>
</tr>
<tr>
<td>Total deaths</td>
<td>10</td>
</tr>
<tr>
<td>Adverse effects</td>
<td>18</td>
</tr>
<tr>
<td>Fractures</td>
<td>5</td>
</tr>
<tr>
<td>Colorectal cancer</td>
<td>6</td>
</tr>
</tbody>
</table>

63. Harms: Based on WHI, number of excess events on MHT vs placebo per 10,000 women per year of MHT. Use between the age group of 50–59 years (Grade A) (Table 7).

64. Benefits of hormone therapy are shown in table 8. It does not increase the risk of VTE and CVD events (Grade B). It does not induce endometrial hyperplasia or carcinoma in postmenopausal women (Grade A).

66. Selective estrogen receptor modulators (SERMs, e.g. raloxifene at 60 mg daily) has been shown to be beneficial in reducing new vertebral fracture risk by 69% in postmenopausal women with osteoporosis and 47% in postmenopausal women with osteopenia over 3 years simultaneous reduction by 76% in the risk of invasive breast cancer (Grade A).

67. Raloxifene can be used as therapy for the prevention and treatment of osteoporosis especially for women with an increased risk of breast cancer. It has shown to reduce the risk of invasive breast cancer by 76% (Grade A).

68. Raloxifene and estrogen are associated with a similar increased risk of venous thromboembolism (VTE) (Grade A). However, no cases of VTE were reported amongst healthy postmenopausal Asian women whilst on therapy.

69. Bazedoxifene - is a SERM that has been purposely synthesized to specifically improve skeletal and lipid parameters, while benefiting or having no effect on hot flushes. Conjugated estrogens/bazedoxifene (CE/BZA) is the first FDA-approved medication that combines conjugated estrogens with an estrogen agonist/antagonist, bazedoxifene and is an option for vaso-motor symptoms as well as for prevention of osteoporosis. The combination of CE/BZA has been labeled the tissue selective estrogen complex (TSEC). Yet to be launched in India.

**TERIPARATIDE**

70. Teriparatide is reserved for treating women at high risk for fracture, including those with very low BMD and with a previous vertebral fracture. 20 mg/ day SC is given for 18 months. S. calcium and S. uric acid are monitored at 1, 6, and 12 months.

71. A recommendation can be made for treatment with anti-ersorptive therapy (bisphosphonates) following discontinuation of teriparatide (Grade A).

72. Adverse effects are headache, hypercalcemia; hypercalcuria, renal adverse effects, nausea, rhinitis, arthralgia. Contraindicated in hypocalcemia, hypersensitivity

**CALCICTIN**

73. Calcitonin is approved for postmenopausal osteoporosis treatment but not for prevention. It helps in relieving pain in vertebral fractures in short - term period only.

**DENOSUMAB**

74. It is a monoclonal antibody approved recently in India, specifically targets RANKL and is approved for postmenopausal women with osteoporosis at high risk of fracture.75

75. It increases both trabecular and cortical bone strength, reduces vertebral, non-vertebral and hip fracture risk, increases BMD more than bisphosphonates thereby providing benefits over 10 years therapy without any drug holiday.76

76. 60 mg is given subcutaneously once in six months which has good patient convenience, well tolerated even in patients with creatinine clearance <30 ml/ min where bisphosphonates and teriparatide are contraindicated.77

77. Denosumab is cost-effective.78 When the antiresorptive drugs are discontinued, there is rebound bone resorption over variable time frames leading to the risk of multiple vertebral fractures, which is also seen with denosumab discontinuation. Thus Swiss association guidelines have mandated the sequential administration of alendronate or zoledronic acid for two years, starting it 6 months from last dose of denosumab. Follow-on therapy of alendronate or zoledronic acid helps maintain the continuous BMD gained while on denosumab and prevents the increased risk of multiple vertebral fractures on discontinuation of denosumab.77

**SURGICAL MANAGEMENT**

78. Vertebral fractures

a. Vertebral compression fractures (VCFs) are common but are often silent consequences of osteoporosis.

b. All vertebral compression fractures without neurological deficit be treated conservatively for three weeks as majority get better during this period.

c. Percutaneous vertebroplasty and kyphoplasty have a definite role in the management of those vertebral compression fractures that do not respond to non-operative treatment (Grade A).

79. Hip fractures

a. Occult hip fractures are not uncommon. In intra-capsular fractures, internal fixation could be considered, if the fracture can be reduced anatomically (Grade B).

b. Hemi-arthroplasty should be cemented to eliminate thigh pain secondary to loosening and is ideal for elderly patients with limited life expectancy (Grade A).

c. Total hip replacement should be considered when internal fixation is inappropriate or contraindicated in physiologically younger patients for improved quality of life (Grade B).

80. All patients who suffer from fracture should be subjected to BMD after surgery where possible and appropriate treatment for osteoporosis initiated (Grade A).

81. Post-fracture fixation – patient specific osteoporosis related medical management to avoid subsequent fractures (Grade A).

82. Post operatively start appropriate pharmacological therapy for osteoporosis. Drugs like teriparatide which facilitates osteoblastic bone formation can be started. (Grade A). Anti-resorptive like denosumab when started before or after 6 weeks of postfracture, did not affect fracture healing as it is fracture neutral and does not accumulate at the fracture rims.79,80 denosumab can also be given along with teriparatide.81 Bisphosphonates are started four to six weeks later (Grade B). All need to be calcium and vitamin D replete.

83. Anabolic steroids may be used in very old frail women with sarcopenia for a period of six months.
<table>
<thead>
<tr>
<th>DRUG</th>
<th>DOSAGE</th>
<th>ROUTE</th>
<th>POSITION IN THERAPY</th>
<th>VERTEGAL</th>
<th>REP</th>
<th>NON-VERTEGAL</th>
<th>PRECAUTIONS</th>
<th>ADVANTAGES</th>
<th>DISADVANTAGES</th>
<th>CONTRAINDICATIONS</th>
<th>ADVERSE EFFECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALDENOSONATE</td>
<td>5 mg daily</td>
<td>SC</td>
<td>1st line</td>
<td>Yes, 10 %</td>
<td>Yes, 4 %</td>
<td>Yes, 60 %</td>
<td>Hypocalcemia, Vit D status, should not be used in patients with eGFR below 30 ml/min, Pregnancy, Lactation, Pediatric, ONJ, AFF</td>
<td>Most commonly used drug</td>
<td>Inconvenient administration - Store upright for 30 min on intake, drink lots of water, no food before taking the drug, drug holiday may be needed after 3–5 years</td>
<td>Hypocalcemia, Hypersensitivity, Compromised renal function, Upper GI disease - Abnormalities of the esophagus which delay esophageal emptying such as stricture of achalasia, patients at increased risk of aspiration.</td>
<td>Dyspepsia, Oesophagitis abdominal pain, Musculoskeletal</td>
</tr>
<tr>
<td></td>
<td>5 mg weekly</td>
<td>SC</td>
<td>1st line</td>
<td>Yes, 10 %</td>
<td>Yes, 4 %</td>
<td>Yes, 60 %</td>
<td>Hypocalcemia, Vit D status, should not be used in patients with eGFR below 30 ml/min, Pregnancy, Lactation, Pediatric, ONJ, AFF</td>
<td>–</td>
<td>Inconvenient administration - Store upright for 30 min on intake, drink lots of water, no food before taking the drug, drug holiday may be needed after 3–5 years</td>
<td>Hypocalcemia, Hypersensitivity, Compromised renal function, Upper GI disease - Abnormalities of the esophagus which delay esophageal emptying such as stricture of achalasia, patients at increased risk of aspiration.</td>
<td>Rash, Abdominal pain, Dyspepsia, Diarrhoea, Arthralgia</td>
</tr>
<tr>
<td></td>
<td>15 mg monthly</td>
<td>SC</td>
<td>1st line</td>
<td>Yes, 10 %</td>
<td>Yes, 4 %</td>
<td>Yes, 60 %</td>
<td>Hypocalcemia, Vit D status, should not be used in patients with eGFR below 30 ml/min, Pregnancy, Lactation, Pediatric, ONJ, AFF</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>RANITIDINE</td>
<td>20 mcg daily</td>
<td>SC</td>
<td>For severe osteoporosis</td>
<td>Yes, 40 %</td>
<td>Yes, 10 %</td>
<td>–</td>
<td>Hypocalcemia, Vit D status, Hypersensitivity, Local tissue damage, Pregnancy, Lactation, Pediatric</td>
<td>Potent bone forming activity, Large increase in spine BMD over 2 years</td>
<td>Resolved line drug, 2 years usage, daily injections required.</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>60 mg daily</td>
<td>SC</td>
<td>1st line</td>
<td>Yes, 40 %</td>
<td>Yes, 10 %</td>
<td>–</td>
<td>Hypocalcemia, Vit D status, Pregnancy, Lactation, Pediatric</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>5 mg daily</td>
<td>SC</td>
<td>1st line</td>
<td>Yes, 40 %</td>
<td>Yes, 10 %</td>
<td>–</td>
<td>Blood clots, Cancer (such as breast, uterine, or endometrial), Heart or liver disease, Heart attack, Known or suspected pregnancy, Stroke</td>
<td>Loss of effect and drop in BMD after discontinuation (should be continued on bisphosphonates)</td>
<td>Active endometrial and hormone dependent cancer, Active breast cancer, Thromboembolic disease, suspected pregnancy or abnormal vaginal bleeding, severe acute liver disease, systemic lupus erythematosus</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 mg monthly</td>
<td>SC</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>3-5 years</td>
<td>SC</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>60 mg daily</td>
<td>SC</td>
<td>1st line</td>
<td>Yes, 40 %</td>
<td>Yes, 10 %</td>
<td>–</td>
<td>With a low risk of deep vein thrombosis (DVT) and for whom bisphosphonates or denosumab are not appropriate, or with a high risk of breast cancer.</td>
<td>Benefit of a reduced incidence of invasive estrogen receptor–positive breast cancer both during treatment and for at least 5 years after completion</td>
<td>Pregnancy, lactation, Active history of thromboembolic disorders</td>
<td>Venous thromboembolism, Stroke, Mycocardial infarction, Cancer (breast, endometrial, ovary), Dementia, Gallbladder disease, and Urinary incontinence</td>
<td></td>
</tr>
<tr>
<td></td>
<td>75 mg daily</td>
<td>SC</td>
<td>1st line</td>
<td>Yes, 40 %</td>
<td>Yes, 10 %</td>
<td>–</td>
<td>To stop thrombolysis a few weeks before any operation to reduce the risk of a bleed clot, drug interaction with Warfarin</td>
<td>Increase BMD, decreases cholesterol and triglycerides similar to conventional MHT</td>
<td>Pregnancy and lactation, Breast cancer, Oestrogen-dependent malignant tumours (e.g. endometrial cancer) Uncontrolled genital bleeding, Untreated endometrial hyperplasia, Thromboembolism acute liver disease, Hypercalciuria to the active substance(s), Porphyria</td>
<td>Vaginal discharge, Endometrial wall thickening, Postmenopausal haemorrhage, Breast tenderness, Genital pruritus, Vaginal candidiasis, Vaginal discharge, Pelvic pain, Cervical dysplasia, Genital discharge, Vulvovaginitis, Abnormal bar growth, Lower abdominal pain</td>
<td></td>
</tr>
<tr>
<td></td>
<td>200 IU daily</td>
<td>SC</td>
<td>2nd line</td>
<td>Yes, 25 %</td>
<td>Yes, 10 %</td>
<td>–</td>
<td>Serious hypersensitivity reactions, including fatal anaphylaxis, reported, consider skin testing prior to treatment</td>
<td>Ease of administration</td>
<td>Circulating antibodies to calcitriol-salmon may develop, and may cause loss of response to treatment</td>
<td>Hypercalciuria to calcitriol-salmon</td>
<td>Rhinitis, Epistaxis, and Allergic reactions,</td>
</tr>
</tbody>
</table>

*% reduction in fracture in individual pivotal studies only and not in head-to-head studies.

This table has been prepared by Dr. S. B. Mehta and Dr. S. U. N. Mehta under guidance from the authors.
**OSTA (Osteoporosis Self Assessment Tool for Women)**

**Input:**

- Weight: 
- Age: 

**OST = 0.2 * (Weight - Age)**

**Result:**

- Score: 

**Decimal Precision:**

<table>
<thead>
<tr>
<th>Score</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>-20-4</td>
<td>High Risk</td>
</tr>
<tr>
<td>-3-1</td>
<td>Moderate Risk</td>
</tr>
<tr>
<td>1-20</td>
<td>Low Risk</td>
</tr>
</tbody>
</table>

**Osteoporosis Risk SCORE (Simple Calculated Osteoporosis Risk Estimation)**

**Input:**

- Race: 
- Rheum Arth: 
- Fracture Hx: 
- Age: 
- Estrogen: 
- Weight: 

**Result:**

**SCORE:**

<table>
<thead>
<tr>
<th>SCORE</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>16-50 Points</td>
<td>High Risk</td>
</tr>
<tr>
<td>7-15 Points</td>
<td>Moderate Risk</td>
</tr>
<tr>
<td>0-6 Points</td>
<td>Low Risk</td>
</tr>
</tbody>
</table>

**REFERENCES**


ALGORITHM FOR ASSESSING AND MANAGING BONE HEALTH:

Clinical and Biochemical assessment of risk factors by SCORE, OSTA & FRAX

Post-menopausal women

< 5 yrs post menopause

No risk factor for PMO

Primary prevention***

Follow up 2 years later, Reinforce lifestyle changes

Low Bone Mass / Moderate risk

SCORE/OSTA

> 5 yrs post menopause

1 major risk factor/any 2 other risk factors

Diagnosis by DXA at Hip/Spine or FRAX, OSTA SCORE or X-ray of Thoracolumbar region

Osteoporosis

No other risk factors

Follow up 2 years later, Reinforce lifestyle changes

With Menopausal symptoms

Denosumab/ Teriparatide**

Calcitonin#

Severe Osteoporosis

With Menopausal symptoms

MHT*/

Bisphosphonates

Nutrition, Lifestyle Modification, Adequate Vitamin D and Calcium, Exercise, Avoid bone depleting agents,

@Bisphosphonates

Denosumab

Effective on vertebral, hip and non-vertebral fractures, long term management without drug holiday, even for those with Cr Cl <30 ml/min

Raloxifene

Effective on vertebral fractures at high risk of breast cancer

** Teriparatide

Can be used upto 2 years, effective on vertebral fractures

*MHT

Menopausal hormone therapy to be used within 10 yrs of menopause, pre-initiation workup, review annually, individualize therapy

Calcitonin#

Analgesic, short term for three months in vertebral fractures, 5 yrs post-menopause


SUMMARY

Post-menopausal woman with fragility fracture

IMMEDIATE: PAIN RELIEF, SURGICAL MANAGEMENT, CALCIUM, VITAMIN D (Essential Co-prescription) INVESTIGATION: --- Essential, Rule out secondary causes

Follow up

Multidisciplinary management

KMD (SPINE, HIP RADIUS) BY DXA (repeat after 1-2 yrs)

Bone markers for monitoring therapy

Pharmacotherapy

Physiotherapy

Therapeutic lifestyle management

Aim

Quality of life

Independence at home and work

Fix The Fracture; Treat The Osteoporosis
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Meeta et al: Guidelines on postmenopausal osteoporosis

AACE (AMERICAN ASSOCIATION OF CLINICAL ENDOCRINOLOGIST) AND ACE (AMERICAN COLLEGE OF ENDOCRINOLOGY) 2016 POSTMENOPAUSAL OSTEOPOROSIS TREATMENT ALGORITHM

Lumbar spine or femoral neck or total hip T-score of ≤ -2.5, a history of fragility fracture, or high FRAX fracture probability

Correct calcium/vitamin D deficiency and address cause of secondary osteoporosis

- Recommend pharmacologic therapy
- Education on lifestyle measures, fall prevention, benefits and risks of medications

No prior fragility fractures or moderate fracture risk

- Alendronate, denosumab, risedronate, zoledronic acid
- Alternate therapy: Bisphosphonate, calcitonin

Reassess at least yearly for response to therapy and fracture risk

Increasing or stable BMD and no fractures

Consider a drug holiday after 3 years of oral and 3 years of IV bisphosphonate therapy

Resume therapy when a fracture occurs, BMD declines beyond LSC (Least Significant Change), BTM's rise to pre-treatment values or patient meets initial treatment criteria

Progression of bone loss or recurrent fractures

- Assess compliance
- Re-evaluate for causes of secondary osteoporosis and factors leading to suboptimal response to therapy

Reassess at least yearly for response to therapy and fracture risk

Denosumab

Teriparatide for up to 2 years

Zoledronic acid

- If stable continue therapy for 6 years
- If progression of bone loss or recurrent fractures, consider switching to teriparatide

- If stable continue therapy for 6 years
- If progression of bone loss or recurrent fractures, consider switching to teriparatide

* 10 year major osteoporotic fracture risk ≥ 20% or hip fracture risk ≥ 1%. Non US countries/regions may have different thresholds.

** Indicators of higher fracture risk in patients with low bone density would include advanced age, frailty, glucocorticoids, very low T scores, or increased fall risk.

*** Mediators are listed alphabetically.

**** Consider a drug holiday after 6 years of IV zoledronic acid.

During the holiday, another agent such as teriparatide or raloxifene could be used.