Indian
Menopause Society

Clinical practice guidelines on postmenopausal osteoporosis:

*An executive summary and recommendations - **Update 2019**

Lead Author - Meeta
Authors - C. V. Harinarayan, Raman Marwah, Rakesh Sahay, Sanjay Kalra, Sushrut Babhulkar
Indian Menopause Society, Hyderabad, India

GUIDELINES

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

Lead Author - Meeta,
Authors - C. V. Harinarayan, Raman Marwah, Rakesh Sahay, Sanjay Kalra, Sushrut Babhulkar

For review on vitamin D: Michael F Holick, Professor of Medicine, Physiology and Biophysics and Molecular Medicine. Director, Vitamin D, Skin, and Bone Research Laboratory. Programme Director General Clinical Research Unit. Director, Biologic Effects of Light Research Centre, Director, Bone Healthcare, Boston.
External Review Board: A Muruganathan, Anil K Jain, Dinesh K Dhanwal, G R Sridhar, Hema Divakar, K V Radha Krishna, Prof Nihal Thomas, N S Neki, P K Shah, S K S Marya, Sandhya Kamath, Sarita Bajaj, Thomas Paul.
Advisory Board: Asha Kapadia, Atul Munshi, Duru Shah, Rama Vaidya, Saroj Srivastava, Sonia Malik, Sunila Khandelwal, Urvashi Prasad Jha.
External Review Board: A Muruganathan, Anil K Jain, Dinesh K Dhanwal, G R Sridhar, Hema Divakar, K V Radha Krishna, Prof Nihal Thomas, N S Neki, P K Shah, S K S Marya, Sandhya Kamath, Sarita Bajaj, Thomas Paul.
Resource Faculty: Alap Shah, Amita Pandey, Anil Mahajan, Ashok Vaidya, Beena Bansal, Bharti Kalra Prof. Dr C.V. Harinarayan, Dilip Mehta, Hemant Tiwari, I.V. Reddy, Jyothi Unni, Ketan Mehta, Manisha Sahay, Meeta, Nagamani, Neelam Agarwal, Rabindera Nath Mehrotra, Raghava Dutt Mulukutla, Rakesh Sahay, Major General (Dr) Raman Kumar Marwaha, Ram Prabhoo, Rama Vaidya, Ranu Patni, Rashmi Shah, Sanjay Bhadada, Sanjay Kalra, Sailesh. B, Seema Puri, Sharad Kumar, Shashank Joshi, Shushrut Babhulkar, Siddharth Sarkar, Sudha Sharma, Sunila Khandelwal, Sushil Gupta, Vishal R. Tandon, Vivek Arya, U.R.K. Rao, Yatan Pal Singh Balhara.

* 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.

Suggested Citation: Meeta Meeta, CV Harinarayan, Raman K Marwaha, Rakesh Sahay, Sanjay Kalra, Sushrut Babhulkar. 2019: Clinical Practice Guidelines of Management of Postmenopausal Osteoporosis, published by Indian Menopause Society.

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.

Address for Correspondence: Dr. Meeta,
Tanvir Hospital, Plot No. 100, Phase-I, Kamalapuri Colony,
Hyderabad - 500 073, India. E-mail: drmeeta919@gmail.com

*** INDIAN MENOPAUSE SOCIETY WEBSITE:**
www.indianmenopausesociety.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)[1], 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 monogram 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 stake holders 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 documentss 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

1. AGREE Next Steps Consortium, 2009. The AGREE II Instrument [Electronic version]. Available from: http://www.agreetrust.org. [Last accessed on 2012 Feb 10].

2. Atkins D, Best D, Briss PA, Eccles M, Falck-Ytter Y, Flottorp S, et al. Grading quality of evidence and strength of recommendations. BMJ 2004;328:1490.2. Atkins D, Best D, Briss PA, Eccles M, Falck-Ytter Y, Flottorp S, et al. Grading quality of evidence and strength of recommendations. BMJ 2004;328:1490.

INTRODUCTION

Among the several challenges faced by the growing elderly population with increasing longevity in India, post-menopausal osteoporosis (PMO) is emerging as one of the major public health issues. Osteoporosis is an asymptomatic or "silent" disease and generally presents as a fragility fracture. Typical osteoporotic fractures are those of the hip, spine and wrist. Global data indicates that 20% of women with hip fracture die within 1 year of the fracture and 50% of them never regain their functional independence.[2] Vertebral fractures can also have significant morbidity and are associated with increased long-term mortality.[1] World Health Organization (WHO) has identified osteoporosis as an important non-communicable disease. Osteoporotic fractures impose great financial, medical, and social burden on society. These guidelines are intended to be used as a resource document by the health-care providers involved in post-menopausal women's health at all levels of health-care with specific reference to India. Though framed for India, it is hoped that these guidelines will be useful for menopause practitioners across the globe.

BASIC CONCEPTS

Definitions

1. Osteoporosis: WHO defines osteoporosis as "a systemic skeletal disease characterized by low bone mass (measured as bone mineral density—BMD) and micro architectural deterioration of bone tissue with a consequent increase in bone fragility and susceptibility to fractures involving the wrist, spine, hip, pelvis, ribs, or humerus."[3]

2. Fragility fracture, the end point of inadequate skeletomuscular 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. A sarcopenia diagnosis is confirmed by the presence of low muscle quantity or quality and or low physical performance.

5. Fraility: 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

DIAGNOSIS OF OSTEOPOROSIS	
Normal	T-Score above or better than -1.0
Low bone mass	T-Score between -1.0 and -2.5
Osteoporosis	T-Score below or worse than -2.5 (including)
Severe Osteoporosis	T-Score below or worse than -2.5 (including) with fragility fracture

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)[4-6]

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 –2 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.

TYPES OF 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.[8]

       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.

EPIDEMIOLOGY

Table 2: PREVALENCE OF OSTEOPOROSIS AND OSTEOPENIA: INDIAN STUDIES

Author / Reference	Main study	Main findings
Babu AS.[9]	N = 609 (538 females, 71 males) Average age = 52 yrs QUS	Normal = 17.2 % Osteopenia = 40.6 % Osteoporosis = 42.2 %
Paul TV.[10]	N = 150 (ambulatory postmenopausal women) Age = ≥ 50 yrs DXA	Osteoporosis at: spine = 48 %; femoral neck = 16.7 %; at any site = 50 %
Makker A[11]	N = 1104 (615 women, 489 men) Age = 20 to 86 yrs DXA	41-50yrs: hip % Ope 42.1 Opo 7.9; spine % Ope 44.7 Opo 7.9 51-60yrs: hip % Ope 44.9 Opo 7.5; spine % Ope 59.8 Opo 8.4 61-70yrs: hip % Ope 11.3 Opo 35.9; spine % Ope 49.0 Opo 18.9 71-86yrs: hip % Ope 65.2 Opo 29.0; spine % Ope 50.7 Opo 29.0
Sharma S.[12]	N = 158 women Calcaneal QUS	Bet. 55-64 yrs: Ope = 36.79 % ; Opo = 20.25 % After 65 yrs: 100 % had Ope or Opo
Shatrugna V.[13]	N = 289 women Age = 30 to 60 yrs DXA	Normal = 19 % Osteopenia = 52 % Osteoporosis = 29 %
Gandhi AB.[14]	N = 200 women Age = >40 yrs DXA	Age 40-65 yrs: Osteopenia = 34 %; Osteoporosis = 8 % Age > 60 yrs: Osteopenia & Osteoporosis = ~ 100 %
Savardekar LS.[15] Shah RS	N = 450 women Age = 25 to 75 yrs DXA	Age in yrs: 25-34 Ope Opo; 35-44 Ope Opo; 45-54 Ope Opo; 55-64 Ope Opo; 65-75 Ope Opo hip % 51 10; 43 11; 55 25; 45 47; 18 80 spine % 52 11; 45 16; 39 45; 14 80; 14 84
Aggrawal N.[16]	N = 500 postmenopausal women Mean age = 57 yrs DXA	Osteoporosis at hip = 15.8 %; Osteoporosis At spine = 28.6 % Age above 81 yrs: Osteoporosis in 66.7 %

Pande KC.[17]	N = 261 women Age = 50 to 79 yrs Digital x-ray radiogrammetry	Low bone mass = 50 %
Krishna U.[18]	N = 206 postmenopausal women DXA	Normal = 13.1 % Osteopenia = 38.4 % Osteoporosis = 4 %
Meeta[19]	N = 376 postmenopausal women DXA	Osteoporosis at Total hip = 4.2%; at spine = 22.07% Osteopenia at Total hip = 17.82%; at spine = 35.11
Meeta, Shaantanu Dhonde[20]	N = 450 postmenopausal women DXA	Normal = 34% Osteopenia = 42% Osteoporosis = 24%
Nikose[21]	N = 3532 Mean age = 29.32 ± 9.8 QUS	Age group: <30 Normal 373 Osteopenic 398 Osteoporotic 379 Total 1141; 31-45 378 431 384 1190; >46 382 435 372 1201; Total 1133 (32.07%) 1264 (35.78%) 1135 (32.13%) 3532 (100%)
Thokchom[22]	N = 92 pre and post menopausal women DXA	Age groups(years): 35-45 Total % 37 40.2 Normal 21 Osteopenia 16 Osteoporosis 0; 46-55 21 22.9 4 16 1; 56-65 25 27.2 1 22 2; 66-75 9 9.7 0 1 8; (Total) 26 55 11
Kaur[23]	N = 250 post-menopausal women Age range = 45 to 80 yrs DXA	Osteoporosis = 26.4 %
Hemalata[24]	N = 201 patients, Age = > 50 yrs 50 to 60 yrs = 62 % QUS	Females with osteoporosis (53%); osteopenia (33%) Males with osteoporosis (34%); osteopenia (52%)
James D[25]	N = 384 adult patients 181 females and 169 males, Age = 40 years and above Anterior–posterior radiograph of the pelvis (Singh's Index)	285 (84%) radiographs were graded as Singh's Grade 3 or below indicating definite osteoporosis
Kadam[26]	N = 421 adults (women = 228), Age range = 40 to 75 yrs Mean age = 53.3 ± 8.4 years. 44.3% = postmenopausal 49.2 ± 3.5 yrs = mean age at menopause DXA	Osteoporosis at LS = 14.5% men; 18% in women Osteoporosis at TH = 5.7% men; 12.7% postmenopausal women Osteopenia at LS = 39.4% men; 21.6% women Osteopenia at TH = 56% men; 44.8% women
Shaki[27]	N = 1400 peri- and post-menopausal women Age range = 23 to 50 yrs QUS	Osteoporosis in 81% Osteopenia in 19%
Chitten[28]	N = 956; 505 (53%) women; 451 (47%) men QUS	Osteopenia = 48.4% , Osteoporosis = 6.6% Osteoporosis = 9.3% of women; 3.5 % of men Osteopenia = 51.2% of men; 45.9% of women osteopenia in 35-55 years = 54% (men); 51% (women)
Borgohain[29]	282 patients, 80.6% were female 22 and 84 years of age DXA	Normal = 64 (22.7%) Osteopenia = 135 (47.9%) Osteoporosis = 83 (29.4%)

QUS: Quantitative Ultrasound, DXA: Dual energy X-ray absorptiometry,

This table has been prepared by Dr Sujeet NC and Dr Usharani HP under guidance from the authors.

SCREENING AND DIAGNOSIS

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 a 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, hypogonadism, 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 occiput to wall distance in standing position is ideally zero, inability to touch the occiput 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[20]
    b. Life expectancy of an Indian woman is 70.3 years (WHO statistics 2018)
    c. Accrual of low peak bone mass[16,30,31-35]
    d. Early age of presentation of fracture. Accelerated bone loss in the immediate five years of menopause.[4,16,32,36-39]
    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.[11-13,16-18,36-37,40-53]

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).

RADIOGRAPHY

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

BONE TURNOVER MARKERS

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

33. BTMs 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[54]. Assess the total calcium intake from dietary sources by using the NOF(National osteoporosis foundation) tool depicted on table[4]. 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

S.NO	DIATERY PRODUCT	SERVING	CALCIUM(mg)
1	Milk, Curd(Buffalo)	1 Glass(250ml)	520
2	Milk, Curd(Cow)	1 Glass(250ml)	300
3	Milk, Curd(Low Fat)	1 Glass(250ml)	300
4	Khoa	100gms	600
5	Paneer	100gms	320
6	Cheese Slice	20gms	160
7	Ragi	100gms(1 katori)	360
8	Horse Gram Whole	100gms(1 katori)	270
9	Soyabean	100gms	240
10	Moth Bean/Bengal Gram	100gms	200
11	Rajma	100gms	260
12	Red/Green/Black Gram (Whole)	100gms(1 katori)	100
13	Chickpea/Kabuli Chana	100gms	120
14	Drum Stick Leaves/Parsly	100gms	300
15	Radish Leaves/Methi Leaves	100gms	270
16	Mint/Parsly/Coriander	100gms	200
17	Okra(Bhindi)	100gms	85
18	Cabbage	100gms	60
19	Dried Figs	5 Whole	95
20	Almonds	1 Handful 25gms	60
21	Sesame Seeds(Til)	1 Tablespoon 15gms	363
22	Orange	1 Medium Size	50
23	Fish Rohu	25gms	160
24	Broccoli	100gms	118
25	Cumin	6gms/Table spoon	60

T.Longhva, R. Ananthan, K. Bhaskarachary and K. Venkaiah, Indian Food Composition Tables, 2017 by National Institute of Nutrition, Indian Council of Medical Research.

a. Encourage dietary intake (table 5), supplements are added to correct the deficient balance. The risk of cardiovascular events, calculi 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 hypercalciuria,

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 hypercalciuria.

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.

Table 3: RECOMMENDED DIETARY ALLOWANCE OF CALCIUM

GROUP	CALCIUM(mg)
Adult Women	600
Pregnancy	1,200
Lactation	1,200
Postmenopausal Women	800

Table 4: QUICK DIETARY CALCIUM ASSESSMENT CHART

SOURCE	CALCIUM(mg)*	NO. Of SERVINGS	TOTAL CALCIUM(mg)
Dietary	300-525/1glass 300/1 Katori curds	x	
Nondietary	200-300	x	
Total intake calcium in mg			

Approximate estimates, Calculate the total daily dietary intake by entering the sources and the number servings from dietary and nondietary sources before supplementation.

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[55] (table 6).

Table 6: US ENDOCRINE SOCIETY 2011 RDA (Recommended Dietary Allowance of Vitamin D)

LIFE STAGE GROUP	RDA(IU)	UPPER LIMIT
Adults(18 years and above)	1,500-2,000	10,000
Pregnancy and Lactation	1,500-2,000	10,000
Children and Adults at risk*	2-3 times the normal requirement for their ages	

*Obseity, HIV infection, on glucocorticoids, anticorwulsant, antifungal, and antiviral therapy. A desirable range is between 30 and 60 ng/ml, although levels up to 100 ng/ml are unlikely to result in vitamin D toxicity. Except in granuloma disorders, wherein it is advisable to maintain the serum levels of 25 (OH) D upto >30 ng/ml.

a. It is preferable to get vitamin D through sunlight by exposing 15-30% of body surface area (face, neck, and both arms and forearms) without sunscreen for at least 30 minutes between 10 am and 3 pm, depending on the season, latitude, altitude, pollution, and skin pigmentation. This is equivalent to consuming 340-490 IU of vitamin D every day based on reports that 100 IU of vitamin D intake will raise serum 25(OH) D by 1ng/ml.

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/ day. 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 are (Grade B):

   i. Cholecalciferol (vitamin D3) is available in the form of oral tablets (Conventional Miscellized or Nanoemulsion formulations) granules and oral spray. Dosages of 1000 IU, 2,000 IU and 60,000 IU are available.

   ii. Intramuscular (IM) injections of vitamin D3 are available in doses of 3,00,000 IU and 6,00,000 IU per ampoule. Injections of cholecalciferol 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 6,00,000 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 3,00,000 IU IM, twice a year or 6,00,000 IU IM 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 hypercalcaemia has been reported when the dose exceeds 10,000 IU /day.

i. Vitamin D derivatives: Calcitriol, the active form of vitamin D is reserved only for patients with chronic renal and hepatic disease. Alfacalcidol is a synthetic analogue of the active vitamin D metabolite calcitriol (1,25-dihydroxyvitamin D3), and it is metabolized to calcitriol by its 25-hydroxylation in the liver. It is less potent than calcitriol. The use of vitamin D derivatives necessitates monitoring of serum and possibly urine calcium. There is the risk of hypercalcaemia and hypercalciuria. Adverse effects of prolonged hypercalcemia include impairment of renal function and nephrocalcinosis

j. In postmenopausal women, the intake of vitamin D should be in addition to sunlight exposure. Vitamin D supplementation (≥500–2,000 IU/day) was favourable in the reduction of hip fracture and any non-vertebral fracture in persons 65 years of age or older.

37. Vitamin K: For women of postmenopausal age, 180–350 µg/day of vitamin K_{2-7} may need to be supplemented along with the recommended intake of calcium, magnesium, vitamin D, and a balanced diet. Current RDA of vitamin K_{2-7} WHO/FAO of 65-80 µg/day is too low and needs to be raised up to at least 100 µg/day throughout life, with larger doses when needed.[56,57] Both bone and cardiovascular health of women with osteoporosis would benefit from vitamin K_{2-7} intake [58-69] (Grade C).

38. Exposure to complex nutrients and food constituents interact to affect bone mass, it is, however, left to individual clinician to decide on supplementing vitamin A, vitamin B_{12}, and phytoestrogens (Grade B).

PHYSICAL ACTIVITY / EXERCISE

39. Adequate physical activity is needed to maintain bone health. Appropriate resistance, weight bearing aerobics and core stabilizing exercisers are needed to maintain bone health (Grade B). Balance exercises are necessary to prevent falls. Brisk walking 4–5 times a week for 30 minutes is part of maintaining health but on its own would not be sufficient for bone health.

40. Patients with severe osteoporosis should avoid engaging in motions, such as forward flexion exercises, using heavy weights, or even performing side-bending exercises, because pushing, pulling, lifting, and bending exert compressive forces on the spine that may lead to fracture (Grade A).

41. Prevention of falls: Patients should receive a multifactorial risk assessment and intervention because, it is the most consistently effective strategy to prevent falls[70-72] (Grade A).

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. Fragility 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, OSTA, FRAX (Interventional threshold – 10 years risk score ≥3% for hip fracture and ≥20% for major osteoporotic fracture), the cost benefit analysis, and risk benefit outcome.

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 skeletotropic 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 drug holidays, 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, risedronate 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 benefitted with raloxifine.

54. In older postmenopausal women, injectable agents such as denosumab, zoledronic acid or teriparatide can be considered as initial therapy for those who have the highest fracture risk, older women who have had multiple vertebral fractures or hip fractures, or who have very low T-scores, those who have upper GI problems and might not tolerate or absorb oral medication and patient preference.

55. Bisphosphonates are drugs for treating postmenopausal women, with proven efficacy in the prevention of vertebral and nonvertebral fractures, including hip fractures (Grade A).

MENOPAUSAL HORMONE THERAPY (MHT)

56. Estrogen progesterone therapy/estrogen therapy (EPT/ET) may be used for prevention and treatment of osteoporosis in the early post-menopause in symptomatic women unless there is a contraindication. (Grade A)

57. Pre-MHT workup and an annual follow-up are essential when prescribing MHT. The dose and duration of MHT should be individualized, and a risk–benefit assessment carried out annually. A full gynecological assessment is mandatory prior to starting MHT and at regular intervals thereafter. Self- breast examination is advised monthly and clinical breast examination at least annually. A mammogram where available should be carried out 1–3 yearly, if the initial mammogram is normal (Grade C).

58. All preparations, including low dose, non-oral routes of estrogen are effective in preserving bone mass. In women with hypertriglyceridemia, obesity, glucose intolerance, history of deep vein thrombosis and tobacco users, non-oral route should be preferred (Grade B).

59. MHT should not be started solely for bone protection after ten years of menopause. Extended use of MHT in women with reduced bone mass is an option after considering the risk–benefit analysis compared to the other available therapies for osteoporosis. (Grade B).

60. MHT is indicated as primary therapy to prevent bone loss in women with premature menopause and secondary amenorrhea (Grade C).

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

DISEASE	ESTROGEN	WHO/CIOMS DEFINITION OF RISK	ESTROGEN+ PROGESTERONE	WHO/CIOMS DEFINITION OF RISK
Venous thromboembolism	4	Rare > 1/10,000 and <1/1,000	11	Rare > 1/10,000 and <1/1,000
Stroke	1	Rare > 1/10,000 and <1/1,000	4	Rare > 1/10,000 and <1/1,000
Breast cancer			5	Rare > 1/10,000 and <1/1,000
Caridovascular disease			5	Rare > 1/10,000 and <1/1,000

WHI: Women's health initiative; WHO: World health organization; CIOMS: Council for international organizations of medical sciences; VTE: Venous thromboembolism; CVD: Cardiovascular disease; MHT: Menopausal hormone therapy

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).

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 (R: GRADE A)

DISEASE	NUMBER OF LESS EVENTS WITH ESTROGENS
Myocardial Infarction	12
Breast cancer	8
	Number of less events with E/E+P
Total deaths	10
Adverse events	18
Fractures	5
Colorectal cancer	6

WHI: Women's health initiative; MHT: Menopausal hormone therapy; GRADE: Grades of recommendation, assessment, development, and evaluation

65. Tibolone may be preferable to MHT in symptomatic menopausal women with mammographically dense breast tissue (Grade A) It can be used as an add-back therapy with GnRH analogs for vasomotor symptoms and to maintain bone mineral density (Grade B).Tibolone should be used with caution in women over 60 years and should not be used in those who have strong risk factors for stroke (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 an 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 vasomotor 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 mcg/ 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 antiresorptive therapy (bisphosphonates) following discontinuation of teriparatide (Grade A).

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

CALCITONIN

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.[73]

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.[73-75]

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.[73]

77. Denosumab is cost-effective.[76] 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-resorptives 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[78,79], denosumab can also be given along with teriparatide[80]; 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.

Meeta et al: Guidelines on postmenopausal osteoporosis

Table 9: DRUGS FOR OSTEOPOROSIS THERAPY[81,82]

DRUG	DOSAGE	ROUTE	POSITION IN THERAPY	VERTEBRAL*	HIP*	NON-VERTEBRAL*	PRECAUTIONS	ADVANTAGES	DISADVANTAGES	CONTRAINDICATIONS	ADVERSE EFFECTS
ALENDRONATE	5/10 mg daily 35/70 mg weekly 150 mg monthly	Oral	1st line	Yes, 50 %	Yes, 51-56 %	Yes, 49%	Hypocalcemia, Vit D status, should not be used in patients with eGFR below 30 ml/min, Pregnancy, Lactation, Pediatric, ONJ, AFF	Most commonly used drug	Inconvenient administration - Stay 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	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.	Dyspepsia,Oesophagitis abdominal pain, Musculoskeletal
RISEDRONATE	5 mg daily 35 mg weekly 150 mg monthly	Oral	1st line	Yes, 41-49 %	Yes, 30 %	Yes, 36 %	Hypocalcemia, Vit D status, should not be used in patients with eGFR below 30 ml/min, Pregnancy, Lactation, Pediatric, ONJ, AFF	–	Inconvenient administration - Stay 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	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.	Rash, Abdmoinal pain, Dyspepsia, Diarrhoea, Arthralgia
ZOLEDRONATE	5 mg yearly	IV	1st line	Yes, 70 %	Yes, 41 %	Yes, 25 %	Hypocalcemia, Vit D status, should not be used in patients with eGFR below 30 ml/min, Pregnancy, Lactation, Pediatric, ONJ, AFF	1st line drug,	Anaphylaxis, Including fatal events	Hypocalcemia, Hypersensitivity, Compromised renal function	Acute reaction (flu like symptoms, fever, myalgia) may occur within 3 days of infusion, hypotension, fatigue, eye inflammation, more nausea, vomiting, abdominal pain
TERIPARATIDE	20 mcg daily	SC	For severe osteoporosis	Yes, 65 %	Insufficient data	Yes, 53 %	Hypocalcemia, Vit D status, Hypersensitivity, Local tissue damage, Pregnancy, Lactation, Pediatric	Potent bone forming activity, Large increase in spine BMD over 2 years	Reserved line drug, 2 years usage, daily injections required,	Hypocalcemia, Hypersensitivity	Headache, Hypercalcemia (High-Quality); Hypercalciuria, Renal adverse effects, Nausea, Rhinitis, Arthralgia
DENOSUMAB	60 mg every 6 months	SC	1st line	Yes, 68 %	Yes, 40 %	Yes, 20 %	Hypocalcemia, Vit D status, Pregnancy, Lactation, Pediatric,	1st line drug, Rise of BMD reported over 10 years at spine, hip and non-vertebral sites, can be used in patients in eGFR 15-30 ml/min	Loss of effect and drop in BMD after discontinuation (should be continued on bisphosphonates)	Hypocalcemia, Hypersensitivity	Dermatitis, Rash, Mild bone/Muscle pain, UTIs
MHT	Various regimes	Various regimes	1st line with menopausal symptoms (<10 yrs menopause)	Yes, 30-70 %	Yes, 40 %	Yes, 27 %	Blood clots, Cancer (such as breast, uterine, or endometrial), Heart or liver disease, Heart attack, Known or suspected pregnancy, Stroke	Less musculoskelatal symptoms of aches and pains and possibly sarcopenia (or muscle wasting).	Breast cancer VTE, stroke, potentiation of preexisting breast cancer, increased risk of gall stones, depression, headache, premenstrual syndrome, breast tenderness, skin irritation, weight gain, menstrual bleeding	Active endometrial and hormone dependent cancer, Active breast cancer, Thromboembolic disease, suspected pregnancy or abnormal vaginal bleeding, severe active liver disease, systemic lupus erythematosus	Bloating, Breast swelling or tenderness, Headaches, Mood changes, Nausea, Vaginal bleeding
RALOXIFENE	60 mg daily	Oral	At risk of breast cancer, without Vasomotor symptoms, < 10 yrs menopause	Yes, 40 %	No	No	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.	Benefit of a reduced incidence of invasive estrogen receptor–positive breast cancer both during treatment and for at least 5 years after completion	Daily oral administration	Pregnancy, lactation, Active history of thromboembolic disorders	Venous thromboembolism, Stroke, Myocardial infarction, Cancer (breast, endometrial, ovary), Dementia, Gallbladderdisease, and Urinary incontinence
TIBOLONE	2.5 mg daily	Oral	1st line < 10 yrs menopause	Yes, 50 %	Yes, 26 %	Yes, 26 %	To stop tibolone a few weeks before any operation to reduce the risk of a blood clot, drug interaction with Warfarin	Increases BMD, decreases cholesterol and triglycerides similar to conventionalMHT	Reduction of HDL levels and its high cost.	Pregnancy and lactation, Breast cancer, Oestrogen-dependent malignant tumours (e.g. endometrial cancer) Undiagnosed genital bleeding, Untreated endometrial hyperplasia, Thromboembolism acute liver disease, Hypersensitivity to the active substance(s), Porphyria	Vaginal discharge, Endometrial wall thickening, Postmenopausal haemorrhage, Breast tenderness, Genital pruritus, Vaginal candidiasis, Vaginal haemorrhage, Pelvic pain, Cervical dysplasia, Genital discharge, Vulvovaginitis, Abnormal hair growth, Lower abdominal pain
CALCITONIN	200 IU daily	Nasal spray	2nd line	Yes, 21 %	No	No	Serious hypersensitivity reactions, including fatal anaphylaxis, reported; consider skin testing prior to treatment	Ease of administration	Circulating antibodies to calcitonin-salmon may develop, and may cause loss of response to treatment	Hypersensitivity to calcitonin-salmon	Rhinitis, Epistaxis, and Allergic reactions,

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

This table has been prepared by Dr Sujeet NC and Dr Usharani HP under guidance from the authors.

OSTA (Osteoporosis Self Assessment Tool for Women)

Input:

Weight [ ] [kg ▾]

Age [ ] [yr ▾]

*OST = 0.2 * (Weight - Age)*

Result:

OST _____ [score ▾]

Decimal Precision: [2 ▾]

Score

-20-4 score:	High Risk
-3-1 score:	Moderate Risk
1-20 score:	Low Risk

REFERENCES

Osteoporosis Self Assessment Tool for Women [Internet]. Osteoporosis Self Assessment Tool for Women Calculator. [cited 2019Jul26]. Available from: https://reference.medscape.com/calculator/osteoporosis-self-assessment-women

Osteoporosis Risk SCORE (Simple Calculated Osteoporosis Risk Estimation)

Input:

Race
- ○ Black (0)
- ○ Non-Black (5)

Rheum Arth
- ○ Present (4)
- ○ Absent (0)

Fracture Hx (0)
- ○ No Nontraumatic Fractures
- ○ 1 Nontraumatic (4)
- ○ 2 Nontraumatic (8)
- ○ 3 or more Nontraumatic (12)

Age [ ] [yr ▾]

Estrogen
- ○ Prior use (0)
- ○ NO prior use (1)

Weight [ ] [lb ▾]

Result:

SCORE _____ [score ▾]

Decimal Precision: [0 ▾]

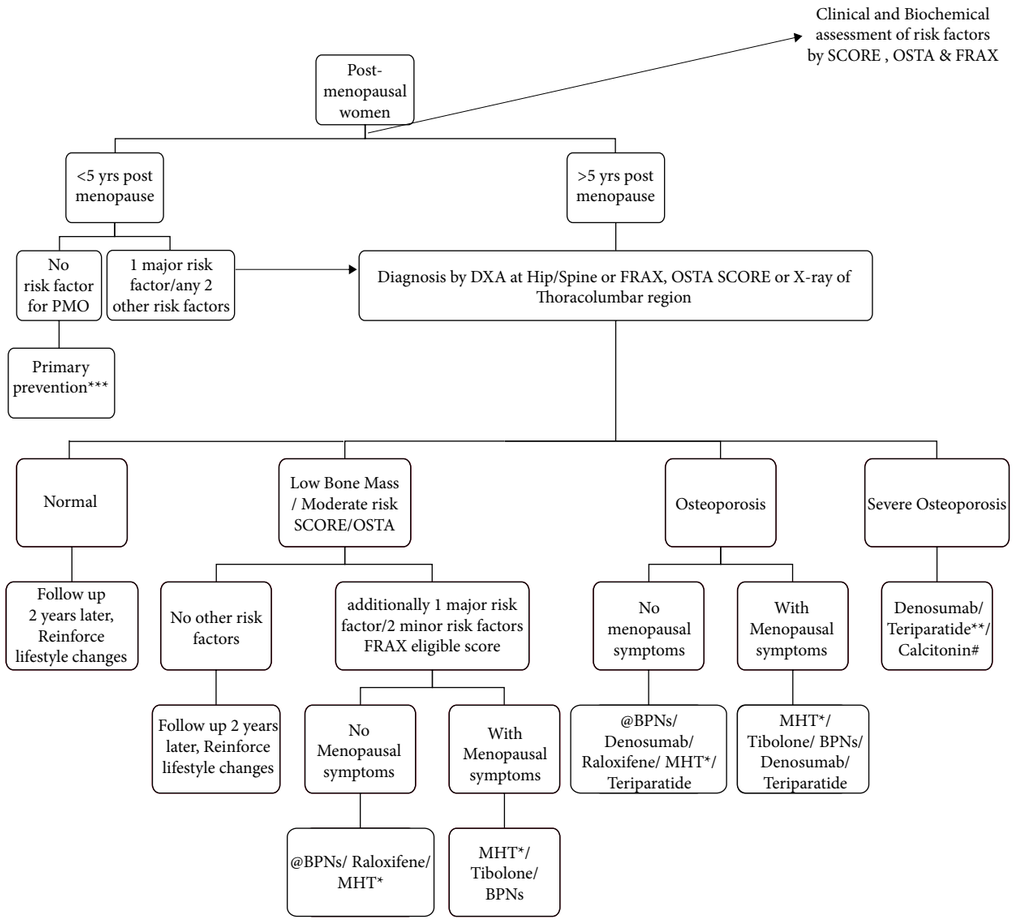
SCORE

16-50 Points:	High Risk
7-15 Points:	Moderate Risk
0-6 Points:	Low Risk

REFERENCES

Osteoporosis Risk SCORE (Simple Calculated Osteoporosis Risk Estimation) [Internet]. Osteoporosis Risk SCORE Calculator. [cited 2019Jul26]. Available from: https://reference.medscape.com/calculator/osteoporosis-risk-score

ALGORITHM FOR ASSESSING AND MANAGING BONE HEALTH:



*** Primary Prevention for all –
Nutrition, Lifestyle Modification, Adequate Vitamin D and Calcium, Exercise, Avoid bone depleting agents,

@Bisphosphonates
Drug holiday after 3 years for IV zoledronate, 5 years for oral, Consider continuation after a drug holiday

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

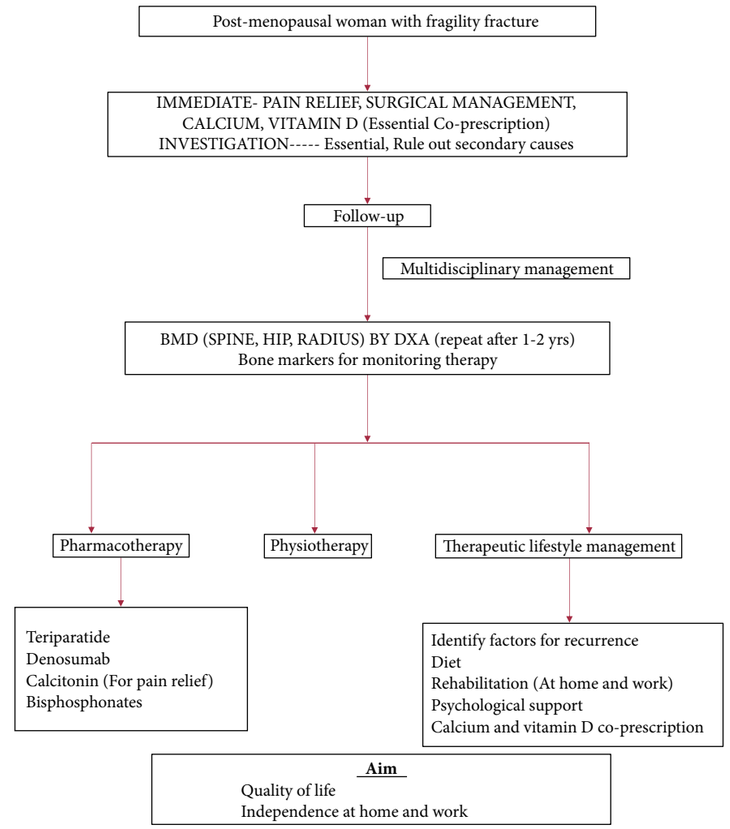
** Teriparatide
Can be used upto 2 years, effective on vertebral fractures

*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

FRAX: WHO fracture risk algorithm, SCORE: Simple calculated osteoporosis risk estimation, OSTA: Osteoporosis self assessment tool for Asians, DXA: Dual-energy X-ray absorptiometry, PMO: Post-menopausal osteoporosis.

SUMMARY



Fix The Fracture; Treat The Osteoporosis

REFRENCES

1. *Kado DM, Browner WS, Palermo L, Nevitt MC, Genant HK, Cummings SR. Vertebral fractures and mortality in older women: A prospective study. Study of Osteoporotic Fractures Research Group. Arch Intern Med 1999;159:1215-20.*

2. *Cooper C, Campion G, Melton LJ 3rd. Hip fractures in the elderly: A world-wide projection. Osteoporos Int 1992;2:285-9.*

3. *Consensus development conference: Prophylaxis and treatment of osteoporosis. Am J Med 1991;90:107-10.*

4. *NIH consensus development panel on osteoporosis prevention, diagnosis, and therapy, March 7-29, 2000: Highlights of the conference. South Med J 2001;94:569-73.*

5. *Kanis JA. Assessment of Osteoporosis at the Primary Health Care Level 2008 World Health Organisation Scientific Group. WHO Collaboration Centre for Metabolic Bone Diseases, UK: University of Shiffield; 2007.*

6. *Dawson-Hughes B, National Osteoporosis Foundation Guide Committee. A revised clinician's guide to the prevention and treatment of osteoporosis. J Clin Endocrinol Metab 2008;93:2463-5.*

7. *Lewiecki EM, Gordon GB, Baim S, Leonard MB, Nicholas J. International Society for Clinical Densitometry 2007 Adult and Pediatric, Vol. 43. BishopBone: Elseiver; 2008. p. 1115-21.*

8. *Parfitt AM. The coupling of bone formation to bone resorption: A critical analysis of the concept and of its relevance to the pathogenesis of osteoporosis. Metab Bone Dis Relat Res 1982;4:1-6.*

9. *Fried LP, Tangen CM, Walston J, Newman AB, Hirsch C, Gottdiener J, et al. Frailty in older adults: Evidence for a phenotype. J Gerontol A Biol Sci Med Sci 2001;56:M146-56.*

10. *Cole ZA, Dennison EM, Cooper C. Osteoporosis epidemiology update. Curr Rheumatol Rep 2008;10:92-6.*

11. *Joshi VR, Mangat G, Balakrishnan C, Mittal G. Osteoporosis – Approach in Indian scenario. J Assoc Physicians India 1998;46:965-7.*

12. *Makkar A, Mishra G, Singh BP, Peak bone density at multiple skeletal sites in Indian subjects. Arch Osteoporos 2008;3:25-3.*

13. *Chibber G, Roy R, Eunice M, Srivastava M, Ammini AC. Prevalence of osteoporosis among elderly women living in Delhi and rural Haryana. IJEM 2007;1:11-4.*

14. *Patni R. Normal BMD values for Indian females aged 20-80 years. J Midlife Health 2010;1:70-3.*

15. *Harinarayan CV, Ramalakshmi T, Prasad UV, Kumar EG, Srinivasa Rao PV. Ultrasound bone mineral density of oscalcis-its relationship with bone mineral markers and 25(OH) vitamin D in endemic fluorotic and non-fluorotic villages.J Clin Sci Res 2012;1:157-62.*

16. *Shatrugna V, Kulkarni B, Kumar PA, Rani KU, Balakrishna N. Bone status of Indian women from a low-income group and its relationship to the nutritional status. Osteoporos Int 2005;16:1827-35.*

17. *Gandhi A, Shukla AR. Evaluation of BMD of women above 40 years of age. J Obstet Gynecol India 2005;55:265.*

18. *Meeta. Evaluation of Risk Factors for Dexa Referral in Indian Women Poster Presented at International Menopause Meeting, Spain; 2008. Abstract book*

19. *Harinarayan CV. Prevalence of vitamin D insufficiency in postmenopausal south Indian women. Osteoporos Int 2005;16:397-402.*

20. *Singh M. Early age of natural menopause in India, a biological marker for early preventive health programs. Climacteric 2012;15:581-6.*

21. *Nikose S, Singh P, Khan S, Arora M, Taywade S,et al. (2015) Prevalence of Osteoporosis in Female Population in Rural Central India [By CalcanealUltrasound]. J Women's Health Care 4: 262*

22. *Thokchom S, Chhugani M. A Study to Find out the Prevalence for Osteoporosis and Osteopenia in Pre and Post Menopausal Women in India: A Cross Sectional Study. Int J Sci Res. 2015;4(10):270-3.*

23. *Kaur M. Prevalence and Associated Risk Factors of Osteoporosis in Post-Menopausal Women in North India. Malaysian Journal of Nutrition. 2013 Sep 1;19(3).*

24. *Hemalata RM, Sreekala VK. The Prevalence of Osteoporosis and Osteopenia in Persons above 50 Years Attending a Tertiary Care Hospital in South India. Prevalence. 2016 Dec;4(12).*

25. *James D, Williams S. Determining prevalence of osteoporosis in health-seeking population of rural central India using singh's index: A resource optimization model to fight a silent epidemic. CHRISMED Journal of Health and Research. 2018 Jul 1;5(3):173.*

26. *Kadam NS, Chiplonkar SA, Khadilkar AV, Khadilkar VV. Prevalence of osteoporosis in apparently healthy adults above 40 years of age in Pune City, India. Indian journal of endocrinology and metabolism. 2018 Jan;22(1):67.*

27. *Shaki O, Rai SK, Kashid M, Chakrabarty BK. Prevalence of osteoporosis in peri-and postmenopausal women in slum area of Mumbai, India. Journal of mid-life health. 2018 Jul;9(3):117.*

28. *Chitten JJ, James B. Prevalence of Osteopenia and Osteoporosis in Orthopaedic outpatients in Southern India. Journal of Clinical & Diagnostic Research. 2018 Mar 1;12(3).*

29. *Borgohain B, Phukan P, Sarma K. Prevalence of osteoporosis among vulnerable adults residing in the northeastern region of India: A preliminary report from a tertiary care referral hospital. Journal of Orthopedics, Traumatology and Rehabilitation. 2017 Jul 1;9(2):84*

30. *ICMR Taskforce Study. Population based reference standards of peak bone mineral density of Indian males and female. An ICMR multicentre task force study. New Delhi: Indian Council of Medical Research; 2010.*

31. *Marwaha RK, Tandon N, Shivaprasad C, Kanwar R, Mani K, Aggarwal R, et al. Peak bone mineral density of physically active healthy Indian men with adequate nutrition and no known current constraints to bone mineralization. J Clin Densitom 2009;12:314-21.*

32. *Gupta A. Osteoporosis in India— The nutritional hypothesis. In: Mithal A, Rao DS, Zaidi M, editors. Metabolic Bone Disorders. Lucknow: Hindustani Book Depot; 1998. p. 115.*

33. *Teotia SP, Teotia M. Nutritional bone disease: The continuing challenge to neonatal bone health. Postgrad Med 2009;23:30-8.*

34. *Nangia S, Arya V, Gujral RB, Mithal A. Spinal bone mineral density in normal Indian females In: Mithal A, Rao DS, Zaidi M, editors. Metabolic Bone Disorders. Lucknow: Hindustani Book Depot; 1998. p. 213.*

35. *Nangia S, Arya V, Gujral RB, Mithal A. Femoral bone mineral density in normal Indian females. In: Mittal A, Rao DS, Zaidi M, editors. Metabolic bone disorders Indian Society for Bone and Mineral Research; 1998. p. 215.*

36. *Savardekar LS, Shah RS, Iddya U, Balaiah D, Parihar A, Jaknkaria B. Bone density in normal Indian women: Assessment by USG and DEXA. Obs Abd Gynae Today 2004;9:772-6.*

37. *Dhanwal DK, Siwach R, Dixit V, Mithal A, Jameson K, Cooper C. Incidence of hip fracture in Rohtak district, North India. Arch Osteoporos 2013;8:135.*

38. *Singh M, Magon N, Singh T. Major and minor discordance in the diagnosis of postmenopausal osteoporosis among Indian women using hip and spine dual-energy X-ray absorptiometry. J Midlife Health 2012;3:76-80.*

39. *Shatrugna V. Osteoporosis in Asian region: Newer questions. In: Shetty P, Gopalan C, editors. Diet, Nutrition and Chronic diseases: An Asian Perspective. London: Smith Gordon Co; 1998. p. 81-3.*

40. *Krishna U, Mehta RU. Osteoporosis–Incidence and implications. J Obstet Gynecol India 2000;50:150-6.*

41. *Babu AS, Ikbal FM, Noone MS, Joseph AN, Samuel P. Osteoporosis and osteopenia in India: A few more observations. Indian J Med Sci 2009;63:76-7.*

42. *Sharma S, Tandon VR, Mahajan A, Kour A, Kumar D. Preliminary screening of osteoporosis and osteopenia in urban women from Jammu using calcaneal QUS. Indian J Med Sci 2006;60:183-9.*

43. *Pande KC. Prevalence of low bone mass in healthy Indian population. J Indian Med Assoc 2002;100:598-600, 602.*

44. *Meeta. Osteoporosis Revisted. Osteoporosis Alert. Issue 1.*

45. *Paul TV, Thomas N, Seshadri MS, Oommen R, Jose A, Mahendri NV. Prevalence of osteoporosis in ambulatory postmenopausal women from a semiurban region in Southern India: Relationship to calcium nutrition and vitamin D status. Endocr Pract 2008;14:665-71.*

46. *Aggrawal N, Bathla S, Juneja S. Measurement of bone mineral density by dexa scan in postmenopausal women. Obs Gynae Today 2004;9:768-71.*

47. *Meeta. Two hundred and six reasons to be informed about osteoporosis. Poster at the Annual Indian Menopause Society meeting at Chandigarh; 2006, Feb 4-5.*

48. *Unni J, Garg R, Pawar R. Bone mineral density in women above 40 years. J Midlife Health 2010;1:19-22.*

49. *Meeta, Shaantanu, Tanvir. Assessment of risk factors for osteoporosis in Indian women submitted for publication -yet to be and published, -details from drmeeta919@gmail.com*

50. *International Osteoporosis Foundation. The Asian Audit: Epidemiology, costs and burden of osteoporosis in Asia 2009, 2009. Available from: http://www.iofbonehealth. org. [Last accessed on 2013 Jan 2].*

51. *Sankaran B. Clinical studies: Incidence of fracture neck of femur and intertrochanteric fractures in three Delhi hospitals. In: Sankaran B, editor. Osteoporosis. New Delhi: South East Asia Regional Office, World Health Organisation; 2000. p. 9-18.*

52. *Jha RM, Mithal A, Malhotra N, Brown EM. Pilot case-control investigation of risk factors for hip fractures in the urban Indian population. BMC Musculoskelet Disord 2010;11:49.*

53. *Marwaha RK, Tandon N, Gupta Y, Bhadra K, Narang A, Mani K, et al. The prevalence of and risk factors for radiographic vertebral fractures in older Indian women and men: Delhi Vertebral Osteoporosis Study (DeVOS). Arch Osteoporos 2012;7:201-7.*

54. *National Institute of Nutrition, ICMR. Dietary Guidelines for Indians: A Manual. 2011. Annexure 3. page 89-90*

55. *Holick MF, Binkley NC, Bischoff-Ferrari HA, Gordon CM, Hanley DA, Heaney RP, et al. Evaluation, treatment, and prevention of vitamin D deficiency: An Endocrine Society clinical practice guideline. J Clin Endocrinol Metab 2011;96:1911-30.*

56. *Subcommittee on the Tenth Edition of the Recommended Dietary Allowances, Food and Nutrition Board. Recommended Dietary Allowances. 10th ed., Washington, DC: National Academy Press; 1989.*

57. *Kaneki M, Hodges SJ, Hosoi T, Fujiwara S, Lyons A, Crean SJ, et al. Japanese fermented soybean food as the major determinant of the large geographic difference in circulating levels of vitamin K2: Possible implications for hip-fracture risk. Nutrition 2001;17:315-21.*

58. *Geleijnse JM, Vermeer C, Grobbee DE, Schurgers LJ, Knapen MH, van der Meer IM, et al. Dietary intake of menaquinone is associated with a reduced risk of coronary heart disease: The Rotterdam Study. J Nutr 2004;134:3100-5.*

59. *Gast GC, de Roos NM, Sluijs I, Bots ML, Beulens JW, Geleijnse JM, et al. A high menaquinone intake reduces the incidence of coronary heart disease. Nutr Metab Cardiovasc Dis 2009;19:504-10.*

60. *Ikeda Y, Iki M, Morita A, Kajita E, Kagamimori S, Kagawa Y, et al. Intake of fermented soybeans, natto, is associated with reduced bone loss in postmenopausal women: Japanese Population-Based Osteoporosis (JPOS) Study. J Nutr 2006;136:1323-8.*

61. *Kawana K, Takahashi M, Hoshino H, Kushida K. Circulating levels of vitamin K1, menaquinone-4, and menaquinone-7 in healthy elderly Japanese women and patients with vertebral fractures and patients with hip fractures. Endocr Res 2001;27:337-43.*

62. *Amizuka N, Li M, Guo Y, Liu Z, Suzuki R, Yamamoto T. Biological effects of vitamin K2 on bone quality. Clin Calcium 2009;19:1788-96.*

63. *Sokoll LJ, Booth SL, O'Brien ME, Davidson KW, Tsaioun KI, Sadowski JA. Changes in serum osteocalcin, plasma phylloquinone, and urinary gamma-carboxyglutamic acid in response to altered intakes of dietary phylloquinone in human subjects. Am J Clin Nutr 1997;65:779-84.*

64. *Yasui T, Uemura H, Umino Y, Yamada M, Kuwahara A, Matsuzaki T, et al. Undercarboxylated osteocalcin concentration in postmenopausal women receiving hormone therapy daily and on alternate days. Menopause 2006;13:314-22.*

65. *Kanellakis S, Moschonis G, Tenta R, Schaafsma A, van den Heuvel EG, Papaioannou N, et al. Changes in parameters of bone metabolism in postmenopausal women following a 12-month intervention period using dairy products enriched with calcium, vitamin D, and phylloquinone (vitamin K(1)) or menaquinone-7 (vitamin K(2)): The Postmenopausal Health Study II. Calcif Tissue Int 2012;90:251-62.*

66. *Emaus N, Gjesdal CG, Almås B, Christensen M, Grimsgaard AS, Berntsen GK, et al. Vitamin K2 supplementation does not influence bone loss in early menopausal women: A randomised double-blind placebo-controlled trial. Osteoporos Int 2010;21:1731-40.*

67. *Knapen MH, Drummen NE, Smit E, Vermeer C, Theuwissen E. Three-year low-dose menaquinone-7 supplementation helps decrease bone loss in healthy postmenopausal women. Osteoporos Int 2013. [Epub ahead of print]*

68. *Mehta DS, Vaidya RA, Dound YA, Nabar NS, Pandey SN, Vaidya AD. Therapeutic Activity and Safety of Vitamin K2-7 in Muscle Cramps. Indian Pract 2010;63:287-91.*

69. *Ensrud KE, Ewing SK, Taylor BC, Fink HA, Stone KL, Cauley JA, et al. Frailty and risk of falls, fracture, and mortality in older women: The study of osteoporotic fractures. J Gerontol A Biol Sci Med Sci 2007;62:744-51.*

70. *Sinaki M. Exercise for patients with osteoporosis: Management of vertebral compression fractures and trunk strengthening for fall prevention. PM R 2012;4:882-8.*

71. *Sakuma K, Yamaguchi A. Sarcopenia and age-related endocrine function. Int J Endocrinol 2012;2012:127362.*

72. *Menon B, Harinarayan CV. The effect of anti epileptic drug therapy on serum 25-hydroxyvitamin D and parameters of calcium and bone metabolism – A longitudinal study. Seizure 2010;19:153-8.*

73. *Adami S, Libanati C, Boonen S, Cummings SR, Ho PR, Wang A, Siris E, Lane J, FREEDOM Fracture-Healing Writing Group, Adachi JD, Bhandari M, de Gregorio L, Gilchrist N, Lyritis G, Moller G, Palacios S, Pavelka K, Heinrich R, Roux C, Uebelhart D (2012) Denosumab treatment in postmenopausalwomen with osteoporosis does not interfere with fracture-healing:results from the FREEDOM trial. J Bone Joint Surg Am 94(23):2113-2119.*

74. *Kendler et al. Effects of denosumab on bone mineral density and bone turnover in postmenopausal women transitioning from alendronate therapy. J Bone Miner Res. 2010 Jan;25(1):72-81.*

75. *Miller et al. Denosumab or Zoledronic Acid in Postmenopausal Women With Osteoporosis Previously Treated With Oral Bisphosphonates. J Clin Endocrinol Metab. 2016; 1945-7197*

76. *Parthan A, Kruse M, Yurgin N, Huang J, Vishwanathan H, Taylor D. Cost effectivenes of Denosumab versus oral Bisphosphonates for Postmenopausal osteoporosis in the US. Applied health Economics and Health Policy.Oct 2013;11(5):485-497.*

77. *Serge Fet al. (2017). Osteoporosis drug treatment: duration and management after discontinuation. A position statement from the Swiss Association against Osteoporosis (SVGO/ASCO). Swiss Med Wkly, [online] 147(11484). Available at: https://smw.ch/article/doi/smw.2017.14484 [Accessed 7 Jul. 2019].*

78. *Boonen S, et al. Denosumab treatment in postmenopausal women with osteoporosis does not interfere with fracture-healing: results from the FREEDOM trial. J Bone Joint Surg Am. 2012;94:2113-2119.*

79. *Iolascon G, Resmini G, Tarantino U. Effects of Denosumab on cortical and trabecular microfracture: evidences from clinical studies. Aging Clin Exp Res 2013;25:S19-S22.*

80. *Tsai JN et al. Teriparatide and denosumab, alone or combined, in women with postmenopausal osteoporosis: the DATA study randomised trial. Lancet. 2013 Jul 6;382(9886):50-6*

81. *Compston J, Cooper A, Cooper C, Gittoes N, Gregson C, Harvey N, Hope S, Kanis JA, McCloskey EV, Poole KE, Reid DM. UK clinical guideline for the prevention and treatment of osteoporosis. Archives of osteoporosis. 2017 Dec 1;12 (1):43.*

82. *Camacho PM et al. American Association of Clinical Endocrinologists and American College of Endocrinology Clinical Practice guidelines for the diagnosis and treatment of postmenopausal osteoporosis—2016. Endocrine Practice. 2016 Sep;22 (s4):1-42.*

How to cite this article: Meeta Meeta, CV Harinarayan, Raman K Marwaha, Rakesh Sahay, Sanjay Kalra, Sushrut Babhulkar. 2019: Clinical Practice Guidelines of Management of Postmenopausal Osteoporosis, published by Indian Menopause Society.

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*

Evaluate for causes of secondary osteoporosis

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

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

No prior fragility fractures or moderate fracture risk**

- Alendronate, denosumab, risedronate, zoledronic acid***
- Alternate therapy: Ibandronate, raloxifene

Reassess at least yearly for response to therapy and fracture risk

Increasing or stable BMD and no fractures

Consider a drug holiday after 5 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

- Switch to injectable antiresorptive if on oral agent
- Switch to teriparatide if on injectable antiresorptive or at very high risk of fracture

Prior fragility fractures or indicators of higher fracture risk**

- Denosumab, teriparatide, zoledronic acid***
- Alternate therapy: Alendronate, risedronate

Ressess at least yearly for response to therapy and fracture risk

Denosumab

Continue therapy or consider adding teriparatide if progression of bone loss or recurrent fractures

Teriparatide for up to 2 years

Sequential therapy with oral or injectable antiresorptive agent

Zoledronic acid

- 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 ≥ 3%. Non US countries/regions may have different thresholds.

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

*** Medicators are listedalphabetically.

**** Consider a drug holiday after 6 years of IV zoledronic acid. During the holiday, another agent such as teriparatide or raloxifene could be used.

LMRC No:GGI-CO-A1-OP-300028601-MB-I19-155

For the use of a Registered Medical Practitioner, Hospitals or Laboratory Only.