



Prevention of Post-Menopausal Osteoporosis; A Breakthrough Update

***Corresponding Author(s): Muhammad Ahmad Alamgir**

Associate professor medicine BMDC, Bahawalpur Medical College, Ahmad pur Road, Bahawalpur, Pakistan.
 Email: alamgirkhan916@yahoo.com

Received: Feb 06, 2023

Accepted: Mar 09, 2023

Published Online: Mar 16, 2023

Journal: Annals of Community Medicine and Primary Health Care

Publisher: MedDocs Publishers LLC

Online edition: <http://meddocsonline.org/>

Copyright: © Alamgir MA (2023). *This Article is distributed under the terms of Creative Commons Attribution 4.0 International License*

Introduction

Once there was elderly blind man who used to carry a lamp whenever he went out after dark. One night someone asked the reason and he replied. "This lamp is not for me rather for people so that they may not end up hitting me". This story teaches someone to be mindful, consolidate and compassionate for elderly.

Number of citizens who are 60 years or above is rising while health and social factors are generally compromised. Demographic data shows that the senior's population is rising rapidly in developing countries, from 652 million in 2017 to expected 1.7 billion in 2050, whereas more developed countries will see an increase from 310 million to 427 million [1].

In next 25 years about 80 % of world seniors will be living in under develop countries and will face health related challenges [1]. The prognosis of elderly is determined by age, gender, comorbid conditions and functions. Considering gender differences among geriatrics, women are relatively living longer. A woman aged 60 years in 2019 is expected to live on average another 21 years globally [2]. According to demographic data, in 2021 women aged 50 and over, accounted for 26% of all females globally. 10 years earlier it was 22% [3].

As population of menopausal women is growing, they are also vulnerable to face disorders like cognitive decline, osteoporosis, frailty, sudden falls and cardiovascular events. During her lifetime, 1 of every 2 women will suffer osteoporotic fracture, 1/3rd will have coronary heart disease and 1/3rd will have stroke. Hospital admissions for osteoporotic fragile fractures is more than those of cardiovascular diseases, strokes and breast cancer combined [4]. Osteoporosis is characterized by weak or porous bone resulting in reduced bone strength. It is diagnosed by dual-energy X-ray absorptiometry (DEXA or DXA) scans. A T-score of -2.5 or lower is suggestive of low bone mineral density [4].

According to medical literature, after menopause there is reduced level of anabolic hormones like estrogen, and it is associated with reduced bone mineral density along with increased bone resorption. The prevalence of post-menopausal osteoporosis is on increase in Pakistan [5]. The evidence suggests that prevalence of osteoporosis is high in developing world ranging from 5.6 to 17.8% in pre-menopausal females and 20–49.3% in postmenopausal females [5]. Considering its devastating consequences in developed world, 1.5 million people are victims of fragile fracture in U. S and \$19 billion in related costs every year [6][7]. According to another estimate, more than 30 mil-

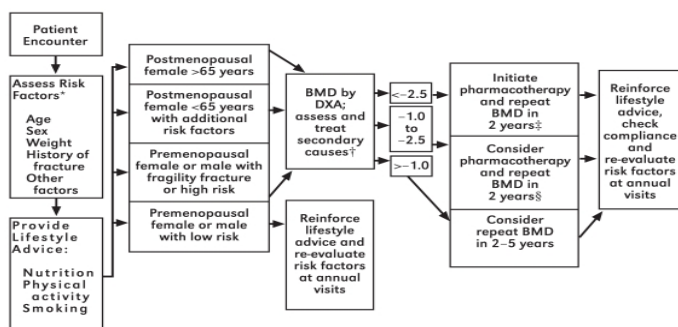


lion persons in Europe and a similar number of individuals in the United States are affected by osteoporosis. It is forecasted that there will be substantial increase in this number during next decade [8].

The situation is devastating in underdeveloped countries as there is lack of bone density screening test called DEXA scan. Further there is also lack of awareness of preventive measures about this disease entity. If we consider the prevalence of fragile fractures in lower-middle income countries, it is estimated that 50 percent will occur in Asia by year 2050[9]. The lifetime risk of fragile fracture is approximately 50% for women and 30% for men [9].

Research has focused on means of preventing and screening for reduced bone mineral density for women. In fact, osteoporosis is not treatable rather preventable. Real world adherence of drug therapy for this is very low and concerns has been raised that the preventive strategies will significantly reduce mortality and morbidity related to osteoporosis.

Flow diagram for treatment of osteoporosis. source NIH, Rockville (MD)2004: Office of the Surgeon General (US).



“An ounce of prevention is worth a pound of cure.”

Although there are several risk factors of osteoporosis, but my present review aims to sort out retrospectively the recent common evidence-based risk factors about osteoporosis among menopausal women because they are neglected section of our society and update some preventive approaches along with lifestyle modifications.

Physical activity may invest bone bank

Osteoporosis will not wait for your retirement. Loss of bone density may begin before menopause and can be prevented by regular exercise. Resistance and weight bearing exercise will strengthen bones and improve bone mineral density (BMD). In a recent meta-analysis of 59 studies, 40 trials compared physical exercise with no activity control. It was concluded that physical exercise has improved BMD of lumbar spine and small but significant effect on femoral neck. Overall effect of physical activity was significant for prevention of osteoporosis. Recommendation is 60 minutes multiple types of exercise e.g, brisk walking, jogging, biking, swimming or water aerobics 3-4 times per week [10].

Another research concluded that women in the regular exercise group were associated with, an 7% decrease in the prevalence of osteoporosis compared to those in the no exercise group [odds ratio (OR), 0.93; 95% confidence interval (95% CI), 0.87–0.97, $p = 0.038$]. Weight bearing and strengthening activity being most effective [11]. Types of exercise are main concern. It should be dynamic and have some strain pattern or bearable load on bone. It is beneficial if supported by nutritional energy [12].

Is metabolic syndrome linked with osteoporotic risk?

Metabolic syndrome (Mets) is characterized by combination of three or more risk factors of obesity, insulin resistance, dyslipidaemia, and hypertension [13]. Evidence based review shows that patients with pre- hypertension are also commonly associated with any of above mentioned atherosclerotic cardiovascular disease (ASCVD) risk factors [14]. These cardiovascular risk factors have complex pathological association with low BMD.

A Recent study enrolled 190 women with Mets and 190 were in control group, results showed that subjects with Mets had low BMD as compared to other group with age matched [15].

Another research had alarming findings. Among 1995 patients with CV risk factors (hypertension, diabetes or insulin resistance, smoking, dyslipidaemia), it was noted that BMD was itself predictor of cardiovascular events like coronary heart disease and stroke [16].

There is suggested hypothesis that among menopausal subjects, there is reduced estrogen /progesterone level and may have accelerated atherosclerosis along with dyslipidemia. Menopausal women with ASCVD risk factors are more likely to develop low BMD. Obesity and hypertension may be another contributory factors [17].

So above mentioned research suggests timely management of ASCVD risk factors along with diabetes to reduce mortality and morbidity among elderly women. Recently the American Diabetes Association (ADA) states that more than 100 million American are living with diabetes and prediabetes. It is imperative to maintain target values of lipids, strict glycemic control and blood pressure among elderly. Standard guideline for information of health care professional, now advises BP target of less than 130/80mm/hg and LDL target below 70 mg/dl for people with diabetes [18].

Diabetes itself has independent role to reduce BMD. Suggested mechanism is that diabetes reduces microcirculation to bone matrix and result in decreased osteoblastic as well as increased osteoclastic activity [19,20].

Calcium and sunshine vitamin

Calcium and phosphate are necessary for bone health. More than 90 % of calcium is stored in bones. The skeleton is living organ and its minerals are regulated by sunlight and hormones. Activated form of vitamin D (sunshine) helps absorption of calcium from intestine while parathyroid hormone regulates calcium level by absorbing calcium from kidneys, intestine and bones.

Some clinical trials concluded that vitamin D supplements do not improve BMD, however its therapy was very beneficial when levels of 25-hydroxyvitamin D is <30 nmol/L [21].

Other evidence-based results show that supplementation with calcium, vitamin D, or their combination does not prevent fractures in community-dwelling adults [21]. Low-dose vitamin D is safe. Addition of calcium with bisphosphonates is beneficial for treatment of low BMD?

Comparative results between combination of calcium with zoledronates and dronates alone, it was revealed that combination therapy was not superior to another group.

However, persons at risk of developing osteomalacia and those with 25-hydroxyvitamin D <25 nmol/L, should receive vitamin D supplement. Also, it is recommended that frail elderly, those who veiled and dark skin individual should receive vitamin D replacement [22]. Bisphosphonates appear to be a recommended first-line drug for osteoporosis therapy in patients with diabetes. In the elderly and patients with impaired renal function, denosumab is the preferred medication [23].

For postmenopausal women, the United States Preventive Services Task Force (USPSTF) recommends that having calcium through food during childbearing age life, can decrease the risk of developing low BMD in menopausal life. According to position statement there is not enough evidence to weigh the benefits and harms of taking >400 IU of vitamin D and >1000 mg of calcium daily. But there is some evidence that taking daily intake of less above mentioned of both, has no net benefit for preventing fragile fractures [24]. Recommendation is daily intake of 800 to 1000 units of vitamin D for adults aged 50 years and older. Calcium supplements should be 1200 mg/day for women 51 years and above while men 71 years and older [24].

Hormone replacement therapy (HRT). Hope or Hype

It is scientifically proved that reduced bone mineral density may be due to relative deficiency of anabolic sex hormones. Estrogen and other related hormones help osteoblastic and inhibit osteoclastic activity while its values are diminished with menopause. Crandall CJ concluded that there was difference in measurements of serum estradiol (E2), estrone (E1) and sex hormone-binding globulin (SHBG) concentration between women with and without menopausal symptom [25]. Is HRT beneficial for elderly menopausal subjects?

The landmark women health initiative (WHI) was a randomized longitudinal trial with more than 68,000 postmenopausal women enrolled and its results have useful worth. One subgroup of WHI with 27,347 women (age 50–79 years) had interventions of conjugated equine estrogens (CEE, 0.625 mg/day) with medroxyprogesterone acetate (MPA, 2.5 mg/day) compared with their placebos for 5.6 and 7.2 years, respectively. Results revealed that HRT did not prevent the prevalence of fragile fractures rather increased the risk of cardiovascular diseases (myocardial infarction, stroke), blood clots and some cancers [26].

So, HRT has some benefit and harm overlap.

Smoking harms bone health

Smoking is injurious for bone cells by multifactorial ways. Tobacco smoking has anoxic effect and compromise blood supply to osteoblasts or bone matrix. Nicotine and other toxic compound are competitive antagonist of calcium and phosphate leading to impaired mineralization [27]. Additionally, smokers are prone to develop emphysema and limited physical activity resulting in worsening of low BMD. There is little evidence to see impact of smoking on efficacy and side effects of HR. In WHI subgroup, it was observed that among smokers the estrogen therapy did not prevent hot flushes as compared to routine beneficial effect in nonsmokers. Also, it was observed that HRT was not able to prevent osteoporosis among smokers [26]. The USPSTF recommends that clinicians should ask all women about tobacco use and provide behavioral interventions for cessation of tobacco [24]. Evidence based smoking cessation plan has been made academically and health care professionals are required to strictly adhere to its step wise program [28].

Fall prevention strategies; Mind blowing update

One out of five falls does cause a serious injury such as a broken fragile bone or a head injury. As mentioned earlier, physical activity significantly reduces the incidence of sudden fall and fragile fractures in later life. In the WHI, there was an association between higher levels of physical activity and lower total fragile fracture risk particularly hip fracture [26]. It is important to note that even low-intensity activities such as walking or gardening reduced risk for hip fracture when compared to sedentary activities. A low-fat and increased fruits, vegetable, and grain diet intervention modestly reduced the risk of multiple falls and slightly improved hip BMD [26].

According to CDC statistics in 2018, more than 32,000 adults aged ≥ 65 years were killed by unintentional fall injuries [29]. CDC have reminded many risk factors that can be changed or modified to help prevent falls. They include lower body weakness, vitamin D /Ca deficiency, difficulties with walking and balance, use of tranquilizers, sedatives, or antidepressants, vision problems, poor footwear, broken uneven steps or stairs [29].

Healthcare providers can help cut down a person's risk for osteoporotic fracture by reducing the fall risk factors as falls can be prevented.

- The USPSTF recommends the clinicians that initial assessment should be multidisciplinary using a combination of various components, such as balance and gait, cognition, vision, medication, environment and postural blood pressure. Subsequent interventions should involve clinicians, nurses, exercise instructors, physical or occupational therapists or nutritionists [24]. There should be well planned group or individual exercise, cognitive behavioral therapy, nutrition therapy, education, medication, urinary incontinence management, social or community services and referral to specialists (e.g., ophthalmologist, neurologist, or cardiologist) [24]. Below are some simple recommendations by USPSTF for elderly to keep protected from falling Consult your doctor or healthcare provider to evaluate risk for falling and talk to pharmacist to review your medicines to see if any might make you dizzy or sleepy.
- Ask your doctor or healthcare provider about taking vitamin D/calcium supplements.
- Do exercises that make your legs stronger and improve your balance. Tai Chi is a good example of this kind of exercise.
- Elderly woman should get an eye exam and update eye-glasses at least annually
- Make your home safer, enough lights and get rid of things you could trip over.
- Add grab bars inside and outside tub or shower and next to the toilet.
- Put railings on both sides of stairs.
- Keep items of use often in cabinets you can reach easily without using a step stool.
- Use non-slip mats in the bathtub and on shower floors

Good-for-Your-Bones Foods

Several studies have concluded that dietary proteins are essential for bone matrix and build up BMD. The protein intake up

to 2 gm/kg /day is useful and more may not be beneficial. WHI subgroup results showed that higher protein and total energy intakes (calibrated) appear to be associated with a substantially increased diabetes risk [26]. A systemic review and meta-analysis had remarkable effects of fruit and vegetable intake among subjects aged over 50 years. 1192 studies were screened including 225,062 individuals and concluded that increase in one serving of fruits or vegetables resulted with increase in BMD and decrease in incidence of fragile fractures [30]. The level of evidence was moderate but significant.

Conclusion

Almost all evidence-based research support preventing risk factors of osteoporosis as its related mortality and morbidity is preventable. All health care personals are required to implement well-crafted multidisciplinary prevented programs for neglected seniors and facilitate because “ kindness is always rewarded”.

Acknowledgment

I hereby dedicate this paper to my late parents, Muhammad Aslam Khan and Kaneez Zineb, owing to their affectionate parenting, education and benevolence for me. God bless them ever.

References

- World population ageing 2019. Highlights. New York City (NY): United Nations, Department of Economic and Social Affairs; 2019 (ST/ESA/SER.A/430).
- United Nations, Department of Economic and Social Affairs, Population Division (2019). World Population Ageing 2019: Highlights (ST/ESA/SER.A/430). 2019.
- United Nations, Department of Economic and Social Affairs. (2021) World Prospects 2021.
- IOF, Epidemiology of osteoporosis and fragility fractures.
- Khan AH, Jafri L, Ahmed S, Noordin S. Osteoporosis and its perspective in Pakistan: A review of evidence and issues for addressing fragility fractures. *Annals of Medicine and Surgery*. 2018; 29: 19-25.
- Malluche HH, Davenport DL, Lima F, Monier-Faugere M-C. Prevalence of low bone formation in untreated patients with osteoporosis. *PLoS ONE*. 2022; 17: e0271555.
- Bone Health and Osteoporosis Foundation. Osteoporosis is Serious. 2022.
- Adami G, Fassio A, Gatti D, Viapiana O, Benini C, et al. Osteoporosis in 10 years' time: a glimpse into the future of osteoporosis. *Ther Adv Musculoskeletal Dis*. 2022; 14: 1759720X221083541.
- Black DM. Clinical Practice. Postmenopausal osteoporosis. *N Engl J Med*. 2016; 37: 254-262.
- Pinheiro MB, Oliveira J, Bauman A. Evidence on physical activity and osteoporosis prevention for people aged 65+ years: a systematic review to inform the WHO guidelines on physical activity and sedentary behavior. *Int J Behav Nutr Phys Act*. 2020; 17: 150.
- Chang C-F, Lee J-I, Huang S-P, Geng J-H and Chen S-C. Regular Exercise Decreases the Risk of Osteoporosis in Postmenopausal Women. *Front Public Health*. 2022; 10: 897363.
- Silva BBL da, Alves AKR, Pereira R de B, Rodrigues SLG, Santo Júnior JGE, et al. The influence of physical activity for the prevention and treatment of osteoporosis: integrative review. *RSD*. 2021; 10: e479101119968.
- Alamgir MA, Javid RA, Hameed A, Mustafa I. Gender difference in components of metabolic syndrome among patients of type 2 diabetes. *Pak J Med Sci*. 2015; 31: 886-890.
- Alamgir MA. Dynamics of Pre-Hypertension; What is Good, the Bad and the Ugly. *SunText Rev Med Clin Res*. 2022; 3: 168.
- Al-Dawood E, Zafar M. Association between metabolic syndrome and bone mineral density among menopausal Saudi women: Case-control study. *Med J Islam Repub Iran*. 2021; 35: 26.
- Renjithlal S, Magdi M, Mostafa M, Renjith K, Pillai P, et al. Bone Mineral Density as a Predictor of Cardiovascular Disease in Women: A Real-World Retrospective Study. *Journal Of Endocrinology and Metabolism*. 2022; 12: 125-133.
- Alamgir MA, Alamgir SI, Khan MA. Pandemic of Cardiovascular Diseases among Post-Menopausal Women; A Brain Storming Update. *J Qual Healthcare Eco*. 2020; 3: 000179.
- 2023 standard of care in diabetes. *Diabetes Care* December 2022; 46: S1-S4.
- Mizokami A, Kawakubo-Yasukochi T, Hirata M. Osteocalcin and Its Endocrine Functions. *Biochem Pharmacol*. 2017; 132: 1-8.
- Poiana C, Capatina C. Fracture Risk Assessment in Patients with Diabetes Mellitus. *J Clin Densitom*. 2017; 20: 432-443.
- Reid IR, Horne AM, Mihov B, Stewart A, Garratt E, et al. Fracture prevention with zoledronate in older women with osteopenia. *N Engl J Med*. 2018; 379: 2407-2416.
- Reid IR, Bolland MJ. Calcium and/or Vitamin D Supplementation for the Prevention of Fragility Fractures: Who Needs It? *Nutrients*. 2020; 12: 1011.
- Campos Pastor MM, Luna JD, Escobar-Jiménez F, Gómez Jiménez FJ, Serrano Pardo MD, P et al. Effects of Risedronate on Metabolic Bone Disease in Patients with Type 1 Diabetes and Osteoporosis. *Rev Esp Enferm Metabólicas Óseas*. 2008; 17: 66-70.
- US Preventive Services Task Force. Vitamin D, calcium, or combined supplementation for the primary prevention of fractures in community-dwelling adults. *JAMA*. 2018.
- Crandall CJ, Larson JC, Ensrud KE, LaCroix AZ, Guthrie KA, et al. Are serum estrogen concentrations associated with menopausal symptom bother among postmenopausal women? Baseline results from two MsFLASH clinical trials. *Maturitas*. 2022; 162: 23-30.
- Cauley JA, Crandall C. The Women's Health Initiative: A Landmark Resource for Skeletal Research Since 1992. *J Bone Miner Res*. 2020; 35: 845-860.
- Greenhalgh EM, Scollo MM, Winstanley MH. Tobacco in Australia: Facts and issues. Melbourne: Cancer Council Victoria. 2022.
- Muhammad AA, Javeria A, Amir R K A. Call in Calamity to Observe Impact of Smoking on COVID 19 Infection; Do Nicotine Has Hidden Link? *J B & Bio Engine*. 2022; 3: 1-5.
- Centers for Disease Control and Prevention, National Center for Injury Prevention and Control (2020) Web-based Injury Statistics Query and Reporting System (WISQARS). 2020.
- Brondani JE, Comim FV, Flores LM, Martini LA, Premeaor MO. Fruit and vegetable intake and bones: A systematic review and meta-analysis. *PLoS One*. 2019; 14: e0217223.