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A study on prevalence of osteoporosis in elderly women and its relation with nutrients

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Abstract

Osteoporosis is characterized by how bone mass micro architectural determination of bone tissue leads to enhanced bone fragility and consequently increasing the fracture risk among elderly people. However, osteoporosis is the sub-clinical or symptomless condition and becomes clinically evident only when a person suffers a fracture.

Women have a greater bone loss than men especially after the onset of menopause due to hormonal changes and reduced absorption efficiency of calcium. Added to the uncontrollable factors such as age, sex and menopause, several controllable factors also effect osteoporosis which can be classed under the different categories like lifestyle (menarche, early menopause, multiparity, inactivity and excessive exercise), nutritional status (prolonged low calcium intake, high animal protein), medical factors (degenerative disease as anorexia nervosa, diabetes, alterations in gastro-intestinal functions etc.) and drugs. The present investigation was undertaken on the factors of occurrence of the osteoporosis in selected Indian women who are at risk.

Keywords: Osteoporosis, elderly, Bone Marrow Cells (BMC), Bone Mass Density (BMD), Calcium, Vitamin D, hormones, pre-menopausal and post-menopausal women

Introduction

Osteoporosis is a common disease which includes reduced bone mass, microarchitectural deterioration of bone tissue and an increased risk fracture. The prevalence of osteoporosis and osteoporosis-related fractures both increase with age in women and men, reflecting age related decline in bone mass. Fractures related to osteoporosis are a major public health problem in all developed countries, and are estimated to affect up to 30% of women and 12% of men at some time in their life.

Post-menopausal osteoporosis occurs in women within a few years of menopause. Type I osteoporosis is characterized by fractures of the distal radius (Colle's fractures) and crush fractures of the lumbar vertebrae that are often painful and deforming. Acceleration of the process that occurs in women after menopause is directly related to the lack of estrogen. Risk factor for osteoporosis include age, race, sex, body weight, family history, premature menopause, nulliparity, number of lactations, dietary factors, limited exercise, use of cigarette, excessive alcohol consumption and prolonged use of medications.

Loss of menses at any age is a major determinant of osteoporosis risk in women. Acceleration of bones loss coincides with menopause either natural or surgical at the time when the ovaries stop producing estrogen. Any interruption of menstruation for an extended period results in bone loss.

Assessment of bone status based on the existence of one or more risk factors, such as age, height, weight, smoking status, alcohol consumption, calcium intake, exercise, frame size, and selected bone markers is not sufficiently accurate.

A number of medications contribute to osteoporosis either by interfering with calcium absorption or by actively promoting loss from bone. Steroids, for example, affect metabolism of vitamin D and can lead to bone loss. Because virtually all elderlies are affected by osteoporosis, the increasing longevity of the population emphasized the need for prevention of osteoporosis, especially after menopause and later in life. Secondly prevention is a form of treatment following the development of osteoporosis, either type I or type 2.

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At present, safe and effective treatment is not readily available to replace bone that is already lost. Nevertheless, it is important to identify women who are at risk of developing osteoporosis as early as possible, so that measure can be taken to prevent further bone loss. Because low BMD (Bone Mass Density) is a risk factor for osteoporosis, body weight is an important factor that affects BMC (Bone Marrow Cells) and BMD. Many nutrients and several non-nutrients have been implicated as etiologic risk factors for osteoporosis.

A striking but transient bone loss, especially from the femoral neck and lumbar spine, occurs in women who breast-feed for 6 months or longer. Sufficient calcium and vitamin D intake are essential during this time for the mother to replete her own serum and storage levels, but repletion typically does not occur until several months after peak lactation. Much lactation over a few years may contribute to significant bone loss by the end of the period of childbearing.

BMD measurement of an at-risk women entering menopause that is, prior to becoming estrogen deficient. The machines that make these measurements are now readily available. Fees for the measurement are reasonable, and the procedure is safe, providing very low radiation exposure.

It is very well known that calcium is the crucial nutrient for osteoporosis. Calcium intakes across global population differ to a great extent, so also there are differences in RDA of calcium which ranges from 400 gm per day for an Indian woman to 1200 mg per day for an American woman.

Causes of Osteoporosis

Osteoporosis is the commonest bone disorder and there are numerous conditions which can either cause osteoporosis or are associated with osteoporosis. Such conditions can generally be included in one of the following three broad groups:

1. Conditions associated with hormonal imbalance.
2. Deficiency of sex hormones
3. Conditions associated with nutritional deficiencies
 - Calcium deficiency
 - Protein deficiency and malnutrition
 - Vitamin C deficiency (scurvy)

Deficiency of the female sex hormones that occurs during menopause is generally responsible for postmenopausal osteoporosis in females. This type of osteoporosis may just be a part of the generalized ageing process or be due to lack of anabolic activity of the sex hormones. It may as well be due to lack of physical activity with consequent relative immobilization that occurs during old age. Excess secretion of adrenocortical hormone or excess availability of adrenocortical hormones may cause osteoporosis.

Nutritional deficiency and malnutrition may cause osteoporosis. Deficiencies of calcium and protein either dietary or as a result of malabsorption can cause osteoporosis. Deficiency of vitamin C results in poor matrix formation with consequent osteoporosis.

Women, BMD and Osteoporosis

Immobilization occurring during prolonged bed rest or during orthopaedic measures can cause generalized or localized osteoporosis. In such a patient, an increased excretion of calcium occurs in urine. The normal mobility of the skeleton provided stimulus for osteoblastic activity. This is lacking when a bone is immobilized. BMD, as measured by bone densitometry, is more clinically useful. The machines that

make the measurements are reasonable, and the procedure is safe, providing very low radiation exposure. In addition, the measurements are both precise and accurate; Low BMD itself is a risk factor for osteoporotic fractures.

BMD measurement of an at-risk women entering menopause, that is, prior to becoming estrogen deficient, serves as a baseline for subsequent measurements as the individual becomes increasingly estrogen deficient and develops low bone mass, especially osteoporosis according to the WHO.

Important Nutrients for Bone

Calcium, phosphate and vitamin D are essential for normal bone structure and function, but several other micronutrients also have essential roles in bone. Non-nutrients such as phytoestrogens may also improve the status of bone tissue.

Calcium

Calcium intake in the primary prevention of osteoporosis has received much attention. Recommendations for the intakes of calcium and several bone-related nutrients were made in 1998 by the Institute of Medicine (Food and Nutrition Board; 1998). Instead of recommended dietary allowances (RDAs).

The Board expressed its concern that maximizing bone mass during the adolescent growth period was extremely important, by increasing the AI from preadolescence (age 11 years) through adolescence (up to 19 years) to 1300 mg/day which exceeds the previous RDA of 1200 mg/day (Food and Nutrition Board, 1998).

Calcium intakes often do not meet the desired AI for age, especially for females. According to the US Department of Agriculture (USDA) Household Food Consumption Survey (USDA, 1994), teen and adult women consume considerably less than the current Ais; men are more likely to consume somewhat greater amounts than women, but they do not meet the recommended level either. These deficits translate, on average, into the need for an additional 500 mg/day for teenage girls and adult women.

Although it is recommended that calcium should be supplied by foods because of the congestion of other essential nutrients, many individuals, especially elderly women, may need to increase their intake of calcium by using supplements.

Calcium consumption during childhood and adolescence is beneficial for the acquisition of RBM. Low calcium bioavailability from selected foods may adversely affect calcium status. For example, spinach and a few other high oxalate containing vegetables that contain calcium have low calcium bioavailability. Dairy products have high amounts of calcium in a well absorbed form. Wheat bread may be a good source of calcium for those who consume a lot of bread. Green, leafy vegetables such as broccoli, kale, and Bok choy have good calcium bioavailability and calcium from soybeans is also very well absorbed. The amount of calcium in major food sources is listed in following table. An additional benefit of meeting calcium requirements from foods alone is that the foods containing calcium are also rich in several other nutrients needed for health in general, and for bone health in particular, and that the consumption of a calcium rich diet from foods is also a marker of a balanced intake with respect to particularly all micro nutrients. Calcium fortification of foods is another way to increase the consumption of calcium by women. Calcium is currently being added to some brands of orange juice at about 300 mg/cup of juice and some brands of soy milk at 200 to 300 mg/cup. It is also added to some bread and other food.

Recommendation intakes of bone related nutrients

Age (y)	Calcium (mg/day)	Phosphorus (mg/day)	Magnesium (mg/day)		Vitamin D (mg/day)	Fluoride (mg/day)	
	AI	RDA	M	F	AI	M	F
1-3	500	340	80		5	0.7	
4-8	800	500	130		5	1.1	
9-13	1300	1250	240	240	5	2.0	2.0
14-18	1300	1250	410	360	5	3.2	3.9
19-30	1000	700	400	310	5	3.8	3.1
31-50	1000	700	420	320	5	3.8	3.1
51-70	1200	700	420	320	10	3.8	3.1
>70	1200	700	420	320	15	3.8	3.1

Although increasing calcium intake for the first several years after menopause has little effect in slowing the high rate of BMD loss of 1% to 2% per year, it remains important to maintain an adequate calcium intake for even a potentially small benefit. Beyond these early postmenopausal years, however, BMD has been shown to be retained when calcium supplements are taken. One major benefit of the additional calcium from supplements is the suppression of PTH secretion and, hence the retention of bone. Men are thought to respond to adequate intakes of calcium in a similar way as women.

Recommendations to meet the current AIs seem reasonable at all ages, including the elderly years, to try match calcium losses as best as possible and to suppress PTH.

Phosphate

Phosphates are available in practically all foods, whereas calcium is not so much available in the food. The simple act of eating foods provides a rather constant amount of phosphate, roughly 1000 to 1200 mg/day for adult women and 1200 to 1400 mg/day for men. Proportionate amounts of calcium are not consumed unless a conscious effort is made to select enough servings of the few calcium rich foods, but both calcium and phosphate are in proportionate amounts are needed for the mineralization of bone. Excessive phosphorus intake as phosphate can greatly alter the calcium/phosphate ratio, especially if calcium intakes are low. Too much phosphate compared to calcium stimulates PTH, and, if this pattern of intake is chronic, bone loss follows.

Adequate vitamin D intake is important, but excess above the AI should be avoided. Use of excessive vitamin D supplementation may be toxic because high doses include hypocalcemia and raise the risk of soft tissue calcification, especially in the kidneys.

Sunlight exposure for skin biosynthesis of vitamin D may be useful source for persons who commonly obtain little vitamin D from their food intake. However, the skin of older individuals is less efficient in producing vitamin D following exposure to ultraviolet (UV) light. In addition, elderly subjects living in nursing homes and similar institutions typically have little exposure to sunlight. The elderly may benefit from supplementation in addition to sunlight.

Vitamin D deficiency is associated with secondary hyperparathyroidism and increased bone turnover. Low levels of 25-hydroxyvitamin D have been found in free-living elderly women as well as those living in nursing homes.

One report has shown that supplementation of calcium, contributes to increased BMD or reduction in fractures.

Calcium and vitamin D supplements are often given together to elderly people. The effects of supplements of both calcium and vitamin D on hip fractures were studied in 3270 healthy women aged 78 to 90 years over an 18-month period, using tricalcium phosphate (1200 mg elemental calcium) and 800

IU vitamin D. Half the group received the supplements and half received a placebo. Among the women who completed the study, significant reductions in the loss of BMD and in the rate of hip fractures were found in those who received the supplements. Both calcium (500 mg) and vitamin D (700 IU) supplementation to older women and men for 3 years result in significantly improved BMD and reduced fractures.

Presentation and Treatment

Because virtually all elderly is affected by osteoporosis, the increasing longevity of the population emphasizes the need of prevention of osteoporosis, especially after menopause and later life.

Estrogen Replacement Therapy

Estrogen Replacement Therapy (ERT) is one method for reducing bone resorption and arresting postmenopausal bone loss in women. It is most effective when used during the first 5 to 15 years after menopause, but even a smaller dose of estrogen may be as effective as the standard dose in women who are also consuming 1500 mg calcium daily.

Dietary Treatment

A novel approach to the dietary treatment of patients who are recovering from hip fractures, however, has been shown to be effective. Elderly patients with hip fractures were found to benefit from protein supplements coupled with adequate amounts of micronutrients.

In one study, clinical outcomes and BMD were improved in patients who were given 250 mL daily of a liquid supplement containing 20 g protein, 525 mg calcium, 750 IU vitamin A and 25 IU vitamin D for an average of 38 days.

Other Treatment

Several approaches to preventing fractures have been examined. These approaches include exercise, strength activities, fall prevention education, ultraviolet lamps, and special hip padding from girdles.

Exercise Physical activities, such as regular walking and swimming, appear to have little or no skeletal benefits for older individuals, but more active participation, such as weight-bearing exercise and intensive walking, have positive effects on BMD.

Material and Method

In this study 100 women of 40 years and above having premenopausal and post-menopausal stages were randomly selected from in OPD of JNMC Hospital, Aligarh Muslim University, Aligarh with the help of Senior Resident. Osteoporosis related symptoms were observed with the help of a set proforma given below. Data were tabulated and analysis were done.

Observations and Results

Table 1: Age wise distribution of Elderly women

Total Number of Subject = 100			
S. No.	Age in years	No. of Subjects	%
1.	50-60	24	24%
2.	61-70	50	50%
3.	71-80	22	22%
4.	81-90	4	4%
	Total	100	100%

Table-1 shows that the maximum number of subjects belong to age group 61-70 years that is 50 (50%). Rest is 24 (24%), 22 (22%), 4 (4%) cases fall in age group 50-60, 71-80, 81-90 years respectively.

Table 2: Distribution of weight of elderly women

Total Number of Subject = 100			
S. No.	Weight (kg)	No. of Subjects	%
1.	30-40	48	48%
2.	40-50	32	32%
3.	50-60	20	20%
	Total	100	100%

According to table-2 the maximum number of subjects were in between 30-40 kg i.e. 48 (48%).

Table 3: Distribution according to their Economical status

Total Number of Subject = 100			
S. No.	Status	No. of Subject	%
1.	High group	4	4%
2.	Middle group	44	44%
3.	Low group	52	52%
	Total	100	100%

Subjects were also divided on behalf of their economic condition that is 4 (%), 44 (44%), 52 (52%) belonging from High Group, Middle group and low group respectively

Table 4: Distribution of elderly women according to activity level

Total Number of Subject = 100			
S. No.	Activity level	No. of Subject	%
1.	Sedentary	88	88%
2.	Moderate	12	12%
	Total	100	100%

According to table-4, 88% people were sedentary life style and 12% people were moderate in their daily life.

Table 5: Distribution of elderly women according to physical activity

Total Number of Subject = 100			
S. No.	Physical Activity	No. of Subject	%
1.	Jogging/Morning walk	20	20%
2.	No exercise	80	80%
	Total	100	100%

Table-5 shows that 80 (80%) have no any specific exercise in their routine life style. While 20 (20%) peoples were doing jogging or morning walk daily.

Table 6: Distribution of elderly women according to their Food habits

Total Number of Subject = 100			
S. No.	Food Habit	No. of Subject	%
1.	Vegetarian	44	44%
2.	Non-Vegetarian	20	20%
3.	Eggetarian	36	36%
	Total	100	100%

Table-6 shows that 36 subjects were taking non-vegetarian diet in their daily life. While 44 (44%) were purely vegetarian.

Table 7: Intake of calcium and antioxidants

Total Number of Subject = 100			
S. No.	Intake of Calcium and antioxidant	No. of Subject	%
1.	Natural	24	24%
2.	Medication	76	76%
	Total	100	100%

According to Table-7, 76% people are taking calcium and antioxidant in the form of medication and 24% people were on Natural sources.

Table 8: Distribution of other diseases in elderly women

Total Number of Subject = 100			
S. No.	Disease	No. of Subject	%
1.	Diabetes mellitus	16	16%
2.	Hypertension	8	8%
3.	Coronary heart disease	8	8%
4.	No any system illness	68	68%
	Total	100%	100%

Table-8 showing presence of systemic illness 16 (16%) were suffering from Diabetes mellitus 8 (18%) where Hypertensive and coronary heart disease were also present in 8 (18%) and 8(8%) respectively, while no any history of systemic illness was present in 68 (68%) cases.

Table 9: Distribution of other relative problem

Total Number of Subject = 100			
S. No.	Relative problem	No. of Subject	%
1.	Fall	26	26%
2.	Fracture	26	26%
3.	Osteoarthritis	84	84%
4.	Immobility of Joint	76	76%

Table-9 showing that in 84 (84%) subjects were suffering from osteoarthritis while other age-related problems such as Fall, fracture, immobility were 24 (25%), 26 (26%), 76 (76%) respectively.

Table 10: Distribution of smoking, Tobacco, Alcohol and other addiction habit

Total Number of Subject=100			
S. No.	Addiction Habit	No. of Subject	%
1.	Smoking	90	90%
2.	Tobacco chewing.	82	82%
3.	Alcohol	10	10%
4.	Any other addiction	16	16%

Observations in table-10 shows that all the 90 cases were smokers, tobacco chewing ratio were also very high in 82 (82%) case and 10 (10%) cases were alcoholic, while 16 (16%) cases were having various type of addictions.

Discussion

Study reviewed that the females in this group are least exposed to the knowledge of nutrition and lifestyle. Stress, anxiety, depression and palpitation are the common problems in pre-menopausal females while in post-menopausal females, the joints related problems such as osteoarthritis, cervical spondylitis, fractures and fall immobility are the dominating problems.

Those females who are taking any type of hormones after menopause on less risk and those who have no any history of hormones are most exposed because oestrogens are reported to alleviate menopausal symptoms and lower risk of heart disease and osteoporosis. The older senior is at high risk for osteoporosis. Thus, age is an independent risk factor for the development of osteoporosis. The risk for vitamin D insufficiency and deficiency is high and should be treated appropriately. Vitamin D also plays an important role in bone strength and falls, with detrimental effects found in patients with vitamin D insufficiency and deficiency. All elderly women should be educated on a bone-health lifestyle including age-appropriate weight-bearing exercise.

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