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### A Study of Risk Factors Causes Bone Injury in Osteoporotic Individuals

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#### Abstract

Osteoporosis is characterized by low bone mass with micro architectural deterioration of bone tissue leading to enhance bone fragility, thus increasing the susceptibility to fracture. Osteoporotic fractures in India occur commonly in both sexes, and may occur at a younger age than in the West. Healthy lifestyle can have a major positive impact on the bone metabolism and bone health of Indians. Thus, osteoporosis is a major public health problem in Indian especially in women. Low calcium intakes with extensive prevalence of vitamin D deficiency, increasing longevity, sex inequality, early menopause, genetic predisposition, lack of diagnostic facilities, and poor knowledge of bone health have contributed toward the high prevalence of osteoporosis. Present study evaluate the factors of osteoporotic bone injury, all the subject were randomly selected from survey and their osteoporotic status and bones injury was observed with the help of specially designed questionnaire.

Keywords: osteoporosis, bone injury.

#### Introduction

Osteoporosis is characterized by reduced bone mass and the disruption of bone architecture that results in increased risks of fragility fractures, which are the main consequences of the disease.<sup>(1)</sup> Osteoporosis-related fractures are associated with substantial pain, suffering, disability, and possibly even death for the affected patients. Further, increasing longevity has resulted in an increasing number of senior citizens globally; life expectancy at present is ~67 years in India and is expected to increase to 71 years by 2025 and to 77 years by 2050.<sup>(2)</sup> Further, ~10% of the Indian population is older than 50 years at present; however, these figures are likely to go up to 34% by 2050.<sup>(1)</sup>

Thus, increasing longevity and a greater proportion of the Indian population over the age of 50 years are likely to result in an increased number of people affected by osteoporosis.<sup>(3)</sup>

Habitual low intakes of calcium have been reported in toddlers, adolescents, pregnant and lactating mothers, and postmenopausal Indian women.<sup>(4,5)</sup> Given the need to build up peak bone mass during pubertal years and the increased calcium requirements during pregnancy time, lactation, and peri- and postmenopausal years, the situation is critical for Indian women.<sup>(6,7)</sup> Milk and milk products are expensive commodities, and the amounts purchased by the lower socioeconomic classes are likely to be meager.<sup>(8,9)</sup> Further, the

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unequal distribution of milk and milk products, with boys and men being served larger portions, is another factor that worsens the situation.<sup>(10)</sup> The differences in calcium intakes between sexes are starker in the lower socioeconomic classes. Indian diets are predominantly vegetarian, and the contribution of dairy products to the overall calcium intake is minimal in the lower socioeconomic classes.<sup>(11)</sup> Phytates and oxalates in the fiber-rich Indian diet also retard the absorption of calcium.<sup>(12)</sup> Government supplementation programs provide pregnant and lactating mothers with 500 mg/d of calcium through a serving of 165 g of micronutrient fortified food per day; however, there are no national programs for supplementation for or promotion of bone health.<sup>(13)</sup>

A study also shows that there was a general lack of knowledge about osteoporosis and that there was a need for increased involvement of medical professionals in education about bone health.<sup>(15)</sup> Thus, low calcium intakes with extensive prevalence of vitamin D deficiency, poor knowledge about osteoporosis, and difficulties in the diagnosis of osteoporosis in Indian conditions are some of the reasons that have resulted in osteoporosis becoming a major public health problem in India, especially among the women.

#### **Material and Methods**

The study was carried out In F.C.I., University polytechnic, AMU, Aligarh. Fifty subject of either sex aged between 25 t0 66 years or above were randomly selected (by the permission of chairman, D/o orthopedic) from OPD of Orthopedic J.N.M.C., AMU, Aligarh. The Department osteoporotic status and bone injury which was observed with the help of questionnaire (appendix 1). Informed consent was taken from all the subject included in the study. This questionnaire comprises various questions which evaluate the osteoporosis and bone injury and questions also evaluating the nutritional status and physical activity of subjects included in the study . Obtained data were tabulated and analysis was done.

**Table-1** Distribution of Subject According to Age And Sex

s.no	Age in years	No.& % of female	No.& % of male	Total no. and %
1	Less than 50 yrs	14 (28%)	6 (12%)	20 (40%)
2	More than 50 yrs	20 (40%)	10 (20)	30 (60%)
	Total	34 (68%)	16 (32%)	50 (100%)

 Table -2 Distribution of subject according to Body weight

s.no	Weight per kg	No.& % of female	No.& % of male	Total no. and %
1	25-45	10 (20%)	9 (18%)	19 (38%)
2	46-65	20 (40%)	4 (8%)	24 (48%)
3	66-above	4 (8%)	3 (6%)	7(14%)
	Total	34 (68%)	16 (32%)	50 (100%)

 Table -3 Distrubtion of Subject According to Economical Conditions

s.no	Status	No. of subject	% of subject
1	High class group	5	10%
2	Middile class group	10	20%
3	Lower class group	35	70%
	Total	50	100%

**Table- 4** Distribution of Subject to Pain

s.no	Pain	No.& % of female	No.& % of male	Total no. and %		
1	Low back pain	29(58%)	8 (16%)	37 (74%)		
2	Small joint pain	10 (20%)	3 (6%)	13 (26%)		
	Total	39 (78%)	11 (22%)	50 (100%)		

### **Table- 5** Distribution of Subject According to Pre & Post Menopausal Women

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s.no Menopausal sta		No.of subject	% of subject
1	Pre-menopausal	14	42%
2 Post-menopausal		20	58%
	Total	34*	(100%)

\*Total no. of female was 34

### **Table-** 6 Distribution of Subject According to Intake of Dairy Products and Calcium Supplements

s.no	Dairy products/calcium supplements	No.& % of female	No.& % of male	Total no. and %
1	Dairy product	10 (20%)	6(12%)	16 (32%)
2	Calcium supplemtnt	9 (18%)	3 (6%)	12 (24%)
3	nil	15 (30%)	7 (14%)	22 (44%)
	Total	34 (68%)	16(32%)	50 (100%)

#### Table -7 Distribution of Subject According to Fracture of Bone with Minimal Trauma

s.no	Fracture	No.& % of female		No.& % of male		Total no. and %
		Less than 50	More than	Less than 50	More than	
		yrs	50yrs	yrs	50yrs	
1	Vertebra (back)	1 (2%)	8(16%)	0 (0%)	3 (6%)	12 (24%)
2	femure	6 (12%)	13(26%)	1(2%)	6(12%)	26 (52%)
3	Wrist	0(0%)	5(10%)	0(0%)	4 (8%)	9(18%)
4	humerus	1 (2%)	0(0%)	1(2%)	0(0%)	2 (4%)
5	ribs	0(0%)	0(0%)	1(2%)	0(0%)	1(2%)
	Total	8 (16%)	26(52%)	3 (6%)	13(26%)	50(100%)

#### Table- 8 Distribution of Subject According to Chronic Illness/Disease

	J	0		
s.no	Chronic illness/disease	No.& % of female	No.& % of male	Total no. and %
1	Chronic joint pain	26(52%)	6(12%)	32 (64%)
2	Liver disease	1 (2%)	4(8%)	5 (10%)
3	Kidney disease	6 (12%)	4 (8%)	10(20%)
4	T.B/Asthma	1 (2%)	2(4%)	3(6%)
	Total	34 (68%)	16(32%)	50(%)

#### **Table- 9** Distribution of Subject According to Body Built

s.no	Body Built	No.& % of female	No.& % of male	Total no. and %
1	Thin	2(4%)	0(0%)	2(4%)
2	Over weight	8(16%)	4(8%)	12 (24%)
3	Average	24 (48%)	12(24%)	36(72%)
	Total	34 (68%)	16(32%)	50 (100%)

Table- 10 Distribution of Subject According to type of Daily Exercise

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s.no	Type of exercise	No.of subject	% of shown
1	walking	28	56%
2	cycling	4	8%
3	yoga	8	16%
4	sports	3	6%
5	Weight lifting exercise	0	0%
6	jogging	7	14%
	Total	50	100%

#### **Result and Discussion**

Osteoporosis is the most common of all bones disease in adults especially in old age. In women a very modest decline in bone mineral mass during the age of 30 and menopause is followed by sharp, exponential decline for the next decade, with a further more modest, apparently liner decline thereafter the rapid loss of bone mineral mass that occur in women in the decade after menopause account for same 13% of total bone a density at menopause and largely affected trabecular bone. In men on the other hand, bone mineral mass

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decline linearly with a rate of approximately 0.2% per year from a peak mass reached in the third decade of life.(20) In our study the sex ratio was observed to be 1:2 in other words ,for every 1male there were 2 female subject. It was observed that 68% were female and 32% were male. The study also indicate that female percentage 40% were of into double of male percentage i.e. 21% on group of more than 50 years while in less than 50 years female were superior to male group . Thus our finding are consistent with the fact that female subject either more than 50 years or less than 50 years are more prone to osteoporosis. (table 1)

Weight is one of most powerful determinants of peak bone mass. This is only partly a matter of big people having big bones. Heavy women carry more weight and have greater lean body mass, as well as greater fat mass and lean mass contribute to the influence on bone density of weight in women, while lean mass seems the more important in men. Furthermore, overweight women have been shown to absorbed calcium with greater efficiency and to have a bone remolding apparatus that is less sensitive to PTH, thus conserving bone mass and inducing better utilization of environmental calcium.<sup>(19)</sup> In present study, therefore indicate that 40% females were 46-65 kg. weight ,which is consistent with this fact that female an average weight are prone to develop osteoporosis comparable to overweight women. (table 2).

Socioeconomic conditions have long been pronoun to influence human. The economic status determines the stand and of living quality of life, family size and the pattern of disease and deviant behavior in the community.<sup>(16)</sup> in our study 70% of subjects were from lower class group . The lower socioeconomic status may be one of the several factors responsible for such a high prevalence of osteoporosis and bone injury.(table 3)

The vertebral bone loss has been reported among women than men due to unvolatory menstrual cycle leutal phase defects. The most frequent symptom from vertebral fracture is pain in back to deformity in the spine usually the result from collapse of the dorsal end lumber region.<sup>(19)</sup> Present study shows that 74% subjects develop lower back pain although 58% were females. Thus our findings are consistent with these fact that females are more prone to osteoporosis due to estrogen deficiency which cause resorption of bone and leads to fracture which is the predominantly cause of osteoporosis.(table-4) Sex hormone exert a very pronounced effect on skeleton about 15% decline in bone density accompanies the onset of estrogen deficiencies, either from natural menopause or oophorectomy. The exponential character of relationship means that most of the loss will occur within about 5 years of cessation estrogen production. In the presence of estrogen that reference lever of bone mass density is about 17% higher than its absence estrogen have a positive effect on bone mass gain after poverty.<sup>(19)</sup> In our study we observed that post menopausal women were greatly effected 58%, which shows that post menopausal women almost always present with osteoporosis.(table-5) Milk and dairy product are the most important food sources of calcium. In our body calcium absorption is carried out by in the presence of vitamin D although vitamin D is associated with hyperparathyroidism and increased bone turnover supplementation of calcium, contributes to increase BMD or reduction in fractions. A research indicates that one quart of whole milk, or six ounce of whole natural cheese supply the optimum 1200mg calcium.<sup>(22,23)</sup> A Studies also show that low dietary calcium has consequences on the calcium reserves in bones by mobilizing

on the calcium reserves in bones by mobilizing specific quantities in order to maintain constant blood calcium levels. In case of an average calcium intake of 700-800 mg/day, the generation of bone material shall be limited by this insufficient supply <sup>(14, 15, 16)</sup>. Important are not only an appropriate intake of dietary calcium, but also its efficient absorption and retention, and a series of interactions inside the body, which influence the availability and use of dietary calcium<sup>(17)</sup>. it was observed in our study that 32% subjects were

dairy product like, milk, butter and cheese, while 24% were took calcium supplement. Therefore, the study indicates that individuals who did not take adequate amounts of dairy products an calcium supplements, therefore, worry about osteoprosis.(table-6)

Fracture also evaluated in the study, it was observed that maximum fracture were femur fracture which is 52% while vertebral, wrist, humerus and ribs were 24%.18%,4% and 2% respectively. The study indicated that fracture of femur bone was occurred in both sex, while female subject were more prone than more than 50 yrs group than in same age group males subject. (table-7)

Chronic joint pain could appear to be a risk factor for osteoporosis through its association with other factors more directly responsible for the observed effects, such as corticosteroid user or immobilezation. In glucocorticoid induced oesteoprosis glucocorticoid effects on oesteoblast resulting in inhibition of collagen synthesis and a reduction in change of precursor cell in to functioning oesteoblast.<sup>(19)</sup> our study demonstrated that 52% female was suffered from chronic joint pain . which consistent with the fact that steroid therapy in chronic pain inhabit bone formation which is responsible for osteoporosis.(table-8)

During the study the body built of the entire subject was also noted down. It was observed that maximum subject got average built i.e.72% .The result also demonstrated that female subjects attained 48% of average weight when compared with same group of male subject i.e. 24% (table-9) Exercise is a major determent of bone mass (or density) which increase on increased mechnical loading bone density seems to be regulated by classical negative feedback loop that control balance bone formation and bone resorption the amount of bending that occurs on loading (strain) is somehow sensed by bone cells probly the oestocytes. The result is that more bone is deposited that removed when strain are excessive and vice versa when strains are low.<sup>(19)</sup> our study demonstrated the all that subject were done

exercise in various forms like walking, cycling, yoga etc. therefore, it was observed that in all forms of exercise walking counts maximum percentage 56% than other exercise. While weight lifting exercise accounts 0%, which consistent with facts that those people perform less exercise are more prone to developed osteoporosis. (table-10)

### Conclusion

Osteoporosis is a disease in which bones becomes weak and brittle. This is the most common disease in old age. After the age of 50 yrs, people develop this disease more frequently. The risk factors, such as low calcium intakes, vitamin D deficiency, sex inequality, early menopause, predisposition, lack of diagnostic genetic facilities, and poor knowledge of bone health, have contributed toward the high prevalence of osteoporosis and fractures. Our study concluded that osteoporosis is common in premenopausal and postmenopausal women. Beside this after the age 50yrs men and women of bearing weight and built affected approximately in same ratio. Other factors also involved like, less intake of dairy products and calcium supplement, low socioeconomic conditions, less weight bearing exercises, use of some medicines e.g. steroid therapy in asthma and in chronic Joint pain which change endocrine functions resulting bone loss. Low bone mass leading to micro architectural determination of bone tissue leading to enhanced bone fragility and consequently increasing the fracture risk. These can affect virtually any bone, but the most common sites are forearm (colles' fracture). spine (vertebral) fracture, colles' and vertebral fracture typically occur in women aged 55 and above, where as femur fracture mainly occur individuals aged 60 and above. Since low bone density alone does not cause symptoms until a fracture occur.

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### Appendix -1 Questionnaires

General information: Name: sex: (male/female) Weight: socioeconomic status: Address: 1. Have you any pain in the body? Yes() No() 2. What is your age? > than 50 yrs ( ) < then 50 yrs ( ) 3. Have you ever suffered from fracture with minimal trauma of any following bone or region? ribs () Bach () hip() humerus () wrist() 4. If female: are you post-menopausal of pre-menopausal? Yes () No() 5. Have you ever had prolonged plaster of arms / legs after fracture? Yes () No()6. Have you ever gone for prolonged bed rest of inactivity due to prolong illness /fracture or any other illness? Yes () No()7. Your diet contains enough calcium/milk of dairy products. Yes () No() 8. Do you take alcohol? Yes () No() No() 9. Are you suffering loss of appetite (anorexia)? Yes () 10. Are you taking any drug? Yes () No() 11. Which type of drugs used: name 12. Are you suffering of any chronic disease. Chronic joint pain (), liver disease (), kidney disease (), TB () 13. Are you have any hormonal disorder? Yes () No()14. Have you any deformity in your spine? Yes () No() 15. Have you any bone and joint problem? Yes () No() 16. Built : Thin (), Over weight (), Average () 17. Age : younger (), elderly () 18. Bach ache: ves () No() 19. Do have exercise regularly : yes( ) No() 20. Food habits: Intake of calcium (), vitamin D () 21. How much milk do you take daily? Nil()1 glass(), 2 glass() 22. Do you like fast food? Yes(), No()23. At what time get up early in the morning? 24. What kinds of exercise do you did? Walking (), cycling (), yoga (), sports (), weight (), lifting (), none () 25. How many times do you take meal? Early morning(), breakfast(), mid morning(), lunch( ). evening tea(),dinner() 26. What types of food do you take? Fast food ( ), boiled ( ), fried food ( ) routine meal prepared at

home ()