Burden of Osteoporosis and The Factors Associated with it among the Patients Attending an Outreach Camp in a Rural Area of District Baramulla, Kashmir: A Cross-Sectional Study

Mohamad Azhar Gilani[1], Tarseem Lal Motten[2], Shahid Shabir Khan[3]

[1]Postgraduate resident, [2]Assistant Professor, [3]Senior resident, Department of Orthopaedics, SKIMS Medical College and Hospital, Srinagar, Jammu and Kashmir, India

Correspondence : Dr. Shahid Shabir Khan, Email:faceshahid123@gmail.com

Abstract:

Introduction: Osteoporosis is the most common bone disease affecting a number of people of both genders. Since bone loss a start occurring in young age soon after the peak bone mass is achieved, the problem needs to be evaluated in young people as well. **Objectives:** 1. To find out the burden of osteoporosis among the patients attending an outreach camp in a rural area of district Baramulla 2. To determine the factors associated with Osteoporosis among study population. **Method:** This was a cross-sectional study conducted in March 2022. An out-reach camp was conducted in a rural area of district Baramulla by researchers from a tertiary care hospital at Srinagar. Bone mineral density (BMD) test was performed free of cost on all the participants. All the participants coming on the day were selected as study participants. The t score corresponding to the BMD was obtained and the frequency of osteoporosis was determined. **Results:** About 45.1% of the participants belonged to the age-group of 41-60 years. There was a female preponderance (63%). The prevalence of osteoporosis in this study was found out to be 20.9% and that of osteopenia was 47.3%. There was an inverse relationship between BMD and age, with BMD being lower in older age groups. The relationship between menopause and osteoporosis was statistically significant with 48% postmenopausal women having osteoporosis compared to 9.1% women premenopausal women with osteoporosis. **Conclusion:** The frequency of osteoporosis and osteopenia among the attendants of the camp was substantial. The bone mineral density was lower in the older age groups probably because of the age related bone loss. Consequently, the prevalence of osteoporosis was higher in older age groups. Frequency of osteoporosis was more among postmenopausal women than among the premenopausal women.

Key words : Bone Mineral Density, Menopause, Osteopenia, Osteoporosis

Introduction:

Osteoporosis is the most common bone disease affecting a number of people of both genders. The prevalence of osteoporosis increases with age compromising the bone strength in elderly people. It increases the bone fragility and risk of fractures.[1] Osteoporosis is characterized by low bone density and deterioration of bone tissue. It can be a silent problem until a fracture occurs which can cause a number of secondary problems including death. Osteoporosis affects more women after the menopause due to estrogen deficiency then premenopausal women.[2] Men are also afflicted by the problem, hence it's not a women's disease only.[3] There are a number of secondary causes of osteoporosis including lifestyle changes like vitamin D deficiency, high salt intake, smoking, alcohol intake,

immobilization, physical inactivity, low calcium intake; genetic disorders like cystic fibrosis, glycogen storage diseases, Riley day syndrome, osteogenesis imperfecta, Marfan's syndrome; endocrine disorders like Cushing's syndrome, thyrotoxicosis, hyperparathyroidism, diabetes mellitus etc.[4] Osteoporosis is a public health problem in India as well. India is the second most populated country in the world with more than 100 million people over 50 years of age.[5] It was estimated that in 2013, 50 million people in India are either osteoporotic or have low bone mass.[6]

Most of the current studies have focused on finding the prevalence in menopausal women or elderly population. Since bone loss a start occurring in young age soon after the peak bone mass is achieved, therefore the problem needs to be evaluated in young people as well. Therefore the present study was conducted with the objective to find out the burden of osteoporosis among the patients attending an outreach camp in a rural area of district Baramulla and to determine the factors associated.

Method:

This was a cross-sectional study conducted in March 2022. An out-reach camp was conducted in the rural area of Sheeri Baramulla. The doctors from a tertiary care hospital at Srinagar provided free treatment to the patients with any orthopaedic complaint. Besides, bone mineral density test was performed free of cost on all the participants to find out the prevalence of osteoporosis in general population in the area. All the participants (91) coming on the day were selected as study participants. Informed consent was taken from all the participants.

Bone mineral density assessment:

Calcaneal quantitative ultrasound was performed by using heel ultrasound of left foot of the participant. A trained assistant helped with the assessment of BMD. The assessment was performed automatically by the machine within 20 seconds and was noted in a file. Based on T-score of BMD obtained,

participants were labeled as normal (T-score above -1 SD), osteopenia (T-score -1 to -2.5 SD) and osteoporosis (T-score <-2.5 SD).[7]

Statistical analysis

Data was entered in the Microsoft excel 2010 software and analysed using SPSS version 23. Data was summarized as frequency and percentages for qualitative variables and as mean and standard deviation for quantitative variables. Chi-square test or Fisher's Exact test was employed to determine the relationship between two qualitative variables. p value<0.05 was considered statistically significant.

Results:

A total of 91 participants who attended the camp were taken into the study. Table 1 depicts the general characteristics of the study participants. About 45.1% of the participants belonged to the age-group of 41-60 years and 21% were elderly aged ≥61 years. There was a female preponderance with about 63% of the study participants being females. About 29% of the participants were overweight and another 21% were obese. For 81% of the participants income per month was up to Rs.20000. About 20% of the study participants were smoking currently.

A total of 6.6% of the participants were diabetic and 33% were hypertensives where as about 10% were hypothyroid. About 43% of the females were postmenopausal. About 64% were taking calcium supplements regularly. (Table 1)

The prevalence of osteoporosis in our study was found out to be 20.9% and that of osteopenia was 47.3%. (Table 2)

The relationship between BMD and age was found out to be inverse with BMD decreasing in higher age groups. (Table 3,Figure 1). In the post-hoc Tukey HSD test, the significant difference lied between <40 and 41-60 age-group with the <40 year age group having a higher BMD, a mean difference of 0.12 BMD (p=0.023). The difference also lies between between<40 and >/=61 age-groups with the former having a higher BMD and a mean difference of 0.201 was found out (p=0.001).

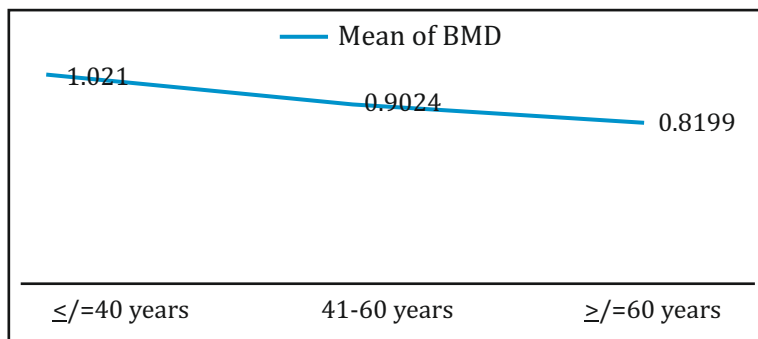**Table 1: Socio-demographic characteristics of the study participants**

Characteristic	Group	Frequency (N=91)	Percentage
Age-group (years)	≤40	31	34.1
	41-60	41	45.0
	≥61	19	20.9
Gender	Male	34	37.4
	Female	57	62.6
Marital status	Not married	5	5.5
	Married	86	94.5
BMI	18.5-24.9	46	50.5
	25-29.9	26	28.6
	≥30	19	20.9
Individual Income per month (in Rupees)	≤20000	74	81.3
	20001-40000	10	11.0
	40001-60000	5	5.5
	60001-80000	2	2.2
Smoking status	Current smoker	18	19.8
	Non-Smoker	71	78.0
	Past smoker	2	2.2
Diabetes	Yes	6	6.6
	No	85	93.4
Hypertension	Yes	30	33.0
	No	61	67.0
Hypothyroidism	Yes	9	9.9
	No	82	90.1
Menopause (n=57)	Yes	25	43.9
	No	32	56.1
Calcium supplement intake	Yes	58	63.7
	No	33	36.3

Table 2: Distribution of the participants based on the presence of osteoporosis and osteopenia

T-score categories	N (%)	Mean BMD	Standard deviation
Normal	29(31.9)	1.139	0.183
Osteopenia	43(47.2)	0.883	0.064
Osteoporosis	19(20.9)	0.697	0.054
Total	100.0	0.926	0.199

Table 3: Relationship of bone mineral density with age of the study participants

BMD	N	Mean(SD)	df	F	p value
≤40	31	1.02(0.156)	2	7.5	0.001
41-60	41	0.90(0.182)			
≥61	19	0.82(0.233)			

Figure 1: Relationship of Bone Mineral Density with age

Mean of BMD

1.021 — 0.9024 — 0.8199

≤/=40 years   41-60 years   ≥/=60 years

Table 4: Relationship of Osteoporosis with General Characteristics

Variables		T_score_category			χ² value (p value)*
		Normal	Osteopenia	Osteoporosis	
Age group (Years)	≤40	18(58.1%)	12(38.7%)	1(3.2%)	23.24(<0.001)*
	41-60	8(19.5%)	24(58.5%)	9(22.0%)	
	≥61	3(15.8%)	7(36.8%)	9(47.4%)	
Marital status	Married	28(32.6%)	40(46.5%)	18(20.9%)	0.52(0.850)
	Unmarried	1(20.0%)	3(60.0%)	1(20.0%)	
BMI	18.5-24.9	15(32.6%)	17(37.0%)	14(30.4%)	6.18(0.186)
	25-29.9	8(30.8%)	15(57.7%)	3(11.5%)	
	≥30	6(31.6%)	11(57.9%)	2(10.5%)	
Gender	Female	17(29.8%)	25(43.9%)	15(26.3%)	2.73(0.255)
	Male	12(35.3%)	18(52.9%)	4(11.8%)	
Monthly Income of Patient (INR)	≤20000	26(35.1%)	31(41.9%)	17(23.0%)	5.82(0.396)
	20001-40000	1(10.0%)	8(80.0%)	1(10.0%)	
	40001-60000	1(20.0%)	3(60.0%)	1(20.0%)	
	60001-80000	1(50.0%)	1(50.0%)	0(0.0%)	
Smoking status	Smoker	7(38.9%)	10(55.6%)	1(5.6%)	3.19(0.202)
	Non-smoker	22(30.1%)	33(45.2%)	18(24.7%)	
Diabetes	Yes	1(16.7%)	3(50.0%)	2(33.3%)	1.11(0.567)
	No	28(32.9%)	40(47.1%)	17(20.0%)	
Hypertension	Yes	7(23.3%)	13(43.3%)	10(33.3%)	4.49(0.106)
	No	22(36.1%)	30(49.2%)	9(14.8%)	
Hypothyroidism	Yes	2(22.2%)	4(44.4%)	3(33.3%)	1.16(0.596)
	No	27(32.9%)	39(47.6%)	16(19.5%)	
Calcium supplements	Yes	20(34.5%)	24(41.4%)	14(24.1%)	2.32(0.313)
	No	9(27.3%)	19(57.6%)	5(15.2%)	
Menopause	Yes	3(12.0%)	10(40.0%)	12(48.0%)	13.05(0.001)*
	No	14(43.8%)	15(46.9%)	3(9.3%)	

*Statistically Significant

Table 4 shows the relationship of osteoporosis with general characteristics. Osteoporosis was found to be most prevalent in elderly age-group of more than 60 years with a prevalence of 47.4% and least prevalent in the age-group of up to 40 years with a prevalence of 3.2%. The relationship of age with osteoporosis was statistically significant (p<0.001). No relationship was found with gender (although the prevalence in females was higher 26.3% vs 11.5% in males). No relationship was found between the occurrence of osteoporosis and marital status, BMI, income, comorbidities (like diabetes, hypertension and hypothyroidism), calcium supplement intake, and smoking status.

The relationship between menopause and osteoporosis was statistically significant with 48% postmenopausal women having osteoporosis compared to 9.1% women premenopausal women with osteoporosis.

Discussion:

It is of utmost importance to know the prevalence of osteoporosis and osteopenia because a person may himself not be aware of such bone problems and at the same time these problems put the individual at increased risk of fractures. These fractures may sometimes be silent and pose a problem later in life.[8] Therefore the present study was conducted to know the status of osteoporosis and osteopenia in general population and factors associated with it. In our study the prevalence of osteoporosis was found out to be 20.9% and that of osteopenia was 47.3%. In a recent study by Madhuchhanda Patnaik et al, 37.9% of the individuals were osteopenic and 22.45% were osteoporotic.[9] Similar findings were noted by Ramalingaiah et al with the prevalence of osteoporosis and osteopenia as 21.46% and 39.73% respectively.[10] Another study by Sushrut Babhulkar the prevalence of osteopenia and osteoporosis was 49.9 and 18.3% respectively.[11] Another retrospective record based study by Neelam Kaushal et al found out the prevalence of osteopenia and osteoporosis to be 34% and 6.9% respectively.[12]

In our study we found that as the age increases, the prevalence of osteoporosis increases and the prevalence was higher in females although the relationship with gender was not statistically significant. Similar findings were noted in the study conducted by Madhuchhandha Patnaik et al.[9] It has been observed that peak bone mass is attained at around the age of 25 years and there after the bone mass begins to decrease.[13]

The other factor associated with the occurrence of osteoporosis in our study was menopause. After menopause the prevalence was higher with 48% postmenopausal women having osteoporosis compared to 9.1% women premenopausal women. Research suggests that after menopause there is accelerated loss of bone mass each year.[14,15] We did not find a statistically significant relationship between the occurrence of osteoporosis and other general characteristics like marital status, BMI, income, diabetes, hypertension, hypothyroidism, calcium supplement intake, and smoking status. Smoking, low calcium intake and diabetes have been found to be the secondary causes of osteoporosis.[16,17]

Conclusion and recommendations:

The frequency of osteoporosis and osteopenia among the attendants of the camp was substantial. The bone mineral density was lower in the higher age groups probably because of the age related bone loss. Consequently, the prevalence of osteoporosis was higher in older age groups. Frequency of osteoporosis was more among postmenopausal women than among the premenopausal women. Awareness should be generated among common people regarding osteoporosis, more so among the groups who are at higher risk including older people and postmenopausal women. Preventive measures should be applied at an earlier stage and healthy lifestyle should be adopted so as to decrease the prevalence of osteoporosis.

Limitation of the study :

The limitation of the study was smaller sample and a camp based approach. The prevalence in the community cannot be ascertained by this study.

Declaration:

Funding: Nil

Conflict of Interest: Nil

References:

1. NIH Consensus Development Panel on Osteoporosis Prevention, Diagnosis, and Therapy. Osteoporosis prevention, diagnosis, and therapy. JAMA. 2001 Feb 14;285(6):785-95. doi: 10.1001/jama.285.6.785. PMID: 11176917.

2. Cosman F, de Beur SJ, LeBoff MS, Lewiecki EM, Tanner B, Randall S, Lindsay R; National Osteoporosis Foundation. Clinician's Guide to Prevention and Treatment of Osteoporosis. Osteoporos Int. 2014 Oct;25(10):2359-81. doi: 10.1007/s00198-014-2794-2. Epub 20.

3. Sozen T, Ozisik L, Calik Basaran N. An overview and management of osteoporosis. Eur J Rheumatol. 2017;4(1):46–56.

4. Watts NB, Bilezikian JP, Camacho PM, Greenspan SL, Harris ST, Hodgson SF, Kleerekoper M, Luckey MM, McClung MR, Pollack RP, Petak SM; AACE Osteoporosis Task Force. American Association of Clinical Endocrinologists Medical Guidelines for Clinical Practice for the diagnosis and treatment of postmenopausal osteoporosis. Endocr Pract. 2010 Nov-Dec;16 Suppl 3(Suppl 3):1-37. doi: 10.4158/ep.16.s3.1. PMID: 21224201; PMCID: PMC4876714.

5. Mithal A, Bansal B, Kyer CS, Ebeling P. The Asia-Pacific Regional Audit-Epidemiology, Costs, and Burden of Osteoporosis in India 2013: A report of International Osteoporosis Foundation. Indian J Endocrinol Metab. 2014 Jul;18(4):449-54. doi: 10.4103/2230-8.

6. Mithal A, Kaur P. Osteoporosis in Asia: A call to action. Curr Osteoporos Rep. 2012;10:245–7.

7. World Health Organisation. Assessment of fracture risk and its application to screening for postmenopausal osteoporosis. World Health Organisation Technical Report Series. Geneva: WHO, 1994.

8. Orstavik R, Haugeberg G, Kvien TK, Lilleås F. Vertebrale frakturer ved osteoporose--skjulte brudd med stor betydning [Vertebral fractures in osteoporosis--silent fractures of clinical importance]. Tidsskr Nor Laegeforen. 2000 Oct 10;120(24): 2891-4. Norweg.

9. Pattnaik M, Mohanty T, Jena S. Prevalence of osteoporosis in Eastern Odisha - A cross-sectional study of bone mineral density. J Orthop Traumatol Rehabil. 2022;14(1):1.

10. Qureshi A, Ullas M, Ramalingaiah A. Burden of Osteoporosis in the Urban Indian Population. EC Orthopaedics. 2017;7:74-81.

11. Babhulkar S, Seth S. Prevalence of osteoporosis in India: an observation of 31238 adults. Int J Res Orthop. 2021;7(2):362.

12. Kaushal N, Vohora D, Jalali RK, Jha S. Prevalence of osteoporosis and osteopenia in an apparently healthy Indian population - a cross-sectional retrospective study. Osteoporos Sarcopenia [Internet]. 2018;4(2):53–60. Available from: https://doi.org/10.1016/j.afos.2018.04.002

13. Lu J, Shin Y, Yen MS, Sun SS. Peak Bone Mass and Patterns of Change in Total Bone Mineral Density and Bone Mineral Contents From Childhood Into Young Adulthood. J Clin Densitom. 2016 Apr-Jun;19(2):180-91. doi: 10.1016/ j.jocd. 2014.08.001. Epub 2014 Oct 18.

14. Gupta A. Osteoporosis in India--the nutritional hypothesis. Natl Med J India. 1996 Nov-Dec;9(6):268-74. PMID: 9111786.

15. Finkelstein JS, Brockwell SE, Mehta V, Greendale GA, Sowers MR, Ettinger B, Lo JC, Johnston JM, Cauley JA, Danielson ME, Neer RM. Bone mineral density changes during the menopause transition in a multiethnic cohort of women. J Clin Endocrinol Metab. 2008 .

16. Ward KD, Klesges RC. A meta-analysis of the effects of cigarette smoking on bone mineral density. Calcif Tissue Int. 2001 May;68(5):259-70. doi: 10.1007/BF02390832. PMID: 11683532; PMCID: PMC5352985.

17. Wongdee K, Charoenphandhu N. Osteoporosis in diabetes mellitus: Possible cellular and molecular mechanisms. World J Diabetes. 2011 Mar 15;2(3):41-8. doi: 10.4239/wjd.v2.i3.41. PMID: 21537459; PMCID: PMC3083906.