Original Article

Prevalence and Correlation of Osteoporosis with different Risk Factors

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ABSTRACT

Objectives: To determine **t**he prevalence and severity of low bone density and its correlation with different risk factors for osteoporosis in Quetta.

Study Design: Descriptive cross sectional study.

Place and Duration of Study: This study was conducted in the suburbs and urban setup of Quetta from February, 2009 to March, 2009.

Materials and Methods: A total of 212 females ranging from 18-72 years of age were selected**.** The subjects were interviewed regarding dietary calcium, socio-economic conditions and the associated diseases, and risk factors for osteoporosis. The calcaneal bone density of the subjects was measured using Bone Sonometer. Data was employed to differentiate between osteopenic and osteoporotic women and to analyze the results statistically.

Results: Risk factors for osteoporosis were highly prevalent. Many rural area subjects were current or former smokers (45%), and were negatively correlated (-.234) with low bone density. Total dietary calcium intake from both the localities was much lower than recommended. Subject with normal bone mineral density (57%) were prevalent, with 56 % in rural area residents and 58 % in urban area. Amongst all the subjects, 24 % were osteopenic, (18% in rural area and 30 % in urban area; 19 % had osteoporosis with 26 % in rural area and 12 % in urban area. T-score of all the subjects was positively correlated with physical acitivities and total calcium intake, ($p<0.01$) and negatively correlated to smoking ($r= -0.234$, $p<0.01$), bone fracture history ($r=-0.311$ $p<0.01$), junk food especially in the young women of urban locality and old age. The mean t-score of Killi natives was -1.3 compared to an average t-score of -0.9 for urban natives.

Conclusion: The risk factors for low bone density and osteoporosis are prevalent in both urban and rural women and are likely to increase during the next decade due to the aging of this population. A comprehensive prevention program to reduce the prevalence of amendable risk factors in this population is necessary.

Key Words: Calcium, Bone Mineral Density, Osteopenia, Osteoporosis, Rosl factors.

INTRODUCTION

Functions, such as blood-clotting and regulating our heart beat. That's why when we don't eat enough calcium-rich food to meet the body's needs, the mineral is drawn from bones to maintain Calcium is an essential building material for our bones. It is also involved in other essential a relatively constant supply in the bloodstream. This, in turn, speeds up the loss of bone mass. Old bone is constantly being broken down and removed, and new bone tissue is built to replace it. In a healthy adult, the bone cells osteoblasts synthesize the organic components of the bone matrix, which later mineralizes. Whereas, osteoclasts, break down or resorb bone. However, rate of bone-building changes as we age[1]. Up to about age 35, new bone is added to the skeleton more rapidly than old bone is removed. After that, bone is lost more quickly than it is built and, as a result, the skeleton becomes less dense[2]. In Osteoporosis the normal architecture of bone is disrupted and the matrix of bone is demineralized. The balance is disturbed and osteoclasts resorb bone faster than osteoblasts can replace it, reducing the bone strength[3].

Women are at highest risk for osteoporosis because they have lighter frames than men do. Moreover, decreasing levels of the hormone estrogen at menopause accelerate bone loss and make women more susceptible to fractures. In old age especially after 50 years of age bone becomes incredibly fragile[4.] Lack of physical activity or weight bearing exercises is an important risk factor for osteoporosis[5]. But osteoporosis isn't a normal part of aging. It is preventable, and new insights into the disease are making it more detectable and treatable than ever before**.**

In this study the prevalence and severity of low bone density an d associated risk factors for Osteoporosis were accessed in females ranging from 18-72 years of age from suburb villages of Quetta and compared it with the women of higher income of same ethnic group in urban localities of Quetta city. The results of the study can be used to formulate and design health education programs which will address different risk factors in urban and rural population of Quetta.

MATERIALS AND METHODS

A descriptive cross sectional study was conducted from February, 2009 to March, 2009, to find the bone mineral density of the local females living in the suburbs (village or killi) of Quetta and was compared with the urban population of Quetta. A total of 228 healthy females, 116 from killi and 112 from urban

population (in a college) ranging from 18-72 years of age were selected by inclusion criteria**.** Persons with fractures due to major trauma, with metabolic bone-related diseases or any treatment (bisphosphonate, calcium, and vitamin D3) known to influence calcium metabolism and women taking Hormone Replacement Therapy (HRT) were excluded from the study.

All subjects were interviewed after obtaining consent, by using a closed ended questionnaire[6]. These questionnaires were entered into the database software (Epi Info 6.04b, CDC, Atlanta, GA) personal computer. Questionnaire data was used to estimate dietary calcium, socio-economic conditions, physical activities, smoking habits, associated diseases, and risk factors for osteoporosis. During the interview, each subject was asked for how many servings per week in the last year on average they ate in a given food item. Estimating a serving size for each food the amount of calcium per serving from tables of nutrient values was determined. These values were used to calculate calcium intake. Junk food consumption was calculated by estimating the serving size of the specific food. The right calcaneus bone density was measured using a Clinical Bone Sonometer (Hologic, Inc., Waltham, MA). Measurement was repeated three times. Mean of the multiple measurements was used as that subject's bone density for the statistical analysis. The record included the subject's t-score, estimated bone density, and appropriate notations to aid the interpretation of the results[7].

Calculations were performed using the method described by Fleiss (1981) using Epi Info.

SPSS 13 was used to for data entry and statistical analysis[8]. Groups were compared by using Student's t test in parametric values which is significant at *=significant (P< 0.05) and **=highly significant (P<0.01). Any correlations between parameters were evaluated by using Spearman's Correlation Test. Correlation Statistics is significant at the 0.01 and 0.05 level (2-tailed). The p-value for these tests was calculated to show relationship with osteoporosis. These potential variables are shown in Table 2.

RESULTS

A total of 228 potential subjects interviewed and measured, of those 212 (93%) met all inclusion criteria and provided complete data for the purposes of statistical analysis. Sixteen persons were excluded from the study, because of some family restrictions faced by ten subjects, while the other three were taking some unknown traditional medicine. Three subjects were taking steroid hormones.

The primary study analysis considered risk factors for low bone mass in the natives. The results for the natives are shown in Table 1.

Table No.1: Selected Characteristics of Study Participants

Characteristic	Correlation with normal BMD	All Subjects N=212	Killi females N=108	Hali females N=104	P-value
Income rupees/month/family	.040	18,500	6 ,000	34,000	0.05*
Current and Former Smokers	-.234**	26 %	45 %	11 %	0.01**
History of fracture	-.287**	11 %	15 %	9 %	0.029*
Hormone Replacement Therapy	0.00	0 %	0 %	0 %	0-00
Physical activity 5x/week>=40min	.286**	32 %	48 %	16.0 %	0.015*
Diabetic/Cardiac problem	.018	11 %	16 %	7 %	0.128
Calcium Use	.427**	53 %	42 %	74 %	0.01*
Junk Food Use	-.152**	42 %	16 %	73 %	0.01*

*=Significant (p<0.05), **= Highly significant (p<0.01)

All of the variables were tested for interactions with bone mineral density to find correlation by Pearson-Correlation (2_tailed) test. A composite variable created by combining, history of hip, ankle, or foot fracture, and history of osteoporosis diagnosis, was significantly associated with low bone density. Variables were screened to test a theoretical relationship between the variable and bone density. Analysis revealed that risk factors for osteoporosis were highly prevalent in the study population (Table 1). Nearly one in 10-12 (15 %) mostly elderly Killi subjects reported having fracture of foot or ankle at some time in their lives.

Smokers comprised 45 % of killi, 11% of urban and 26 % of all subjects. The median tobacco consumption history was 13 years. Most of the smokers were from the suburb area and were elderly women. In the analysis of natives, both current smokers and former smokers were more likely to have low bone density compared to never smokers (Table 1). Smoking significantly (P<0.01) effected the bone mineral density with the subjects having an average T-score of <-1.0.

Post menopausal women (21), all from the suburb area had low bone mineral density, amongst them 13 were osteopenic, 5 osteoporotic and 3 woman had normal BMD (Fig 1). Osteoporosis was not observed amongst

any of the premenopausal women. None of them were taking hormone replacement therapy.

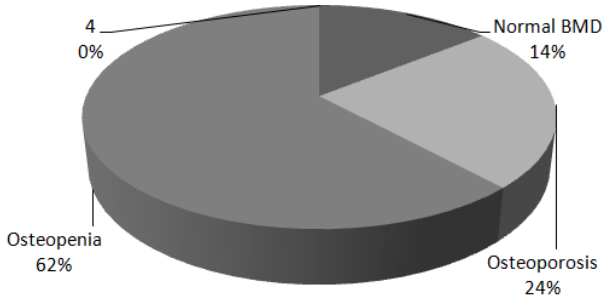

Figure No.1: Bone mineral density of post menopausal women.

Diabetes and cardiac problem were strongly associated with the subject having started menopause, otherwise no association was found between bone mass and diabetes or cardiac problems. The use of hormone replacement therapy was not observed in any subject. No other variables were strongly related with one another.

Some protective factors were also prevalent in the study population. However, 48% of Killi natives and only 16% urban natives exercised (physical activity) at least five times a week for 40 minutes or more per day. Moreover, the Killi diet consisted mainly of vegetables with almost no calcium robbers in their diet. The median total calcium intake of natives was 230 mg/day, and none of the Killi natives reported to take some type of dietary supplement containing calcium. The calcium density of bones of the subjects in high income urban natives was higher (Table 2) than that of Killi natives. This was due to much higher dietary calcium consumption by College native study participants. Low bone density was highly prevalent in the study population, as 40% of Killi natives and 36% of urban natives had a t-score less than -1.0. The mean t-score of Killi natives was -1.3 compared to an average t-score of -0.9 for urban natives (Table 2).

Table No.2: Dietary Calcium Measures (mg/day) for All Subjects and for Killi Natives.

Calcium Measure	Killli subjects Mean n=108	urban subjects Mean n104	p-value
Dairy Calcium	105	234	<0.01**
Calcium from other sources/Supplements	241	248	<0.21 NS
Total Dietary Calcium	346	482	<0.08 NS

NS= non-significant (P>0.05); *= Significant (P<0.05); **= Highly significant (P<0.01)
n = Number of subjects

Junk food consumption was calculated by estimating the serving size as done for assessment of dietary calcium. About 76 (73%) mostly young urban women consumed soft drinks, chocolates and other junk food and was negatively correlated with BMD (r=-1.52), whereas only 18 (16%) females from killi used carbonated soft drinks and junk food (Table 1). Ninety subjects (86%) from killi consumed simple diet with almost no junk food/soft drinks, mostly belonged to low income groups. Since only a small number of the subjects from killi consumed cola/carbonated drinks, with average consumption of 1-2 glass/week. Thus, it co-relation with T-score was not significant (P>0.05). However, college subjects consuming junk food and chocolates were found to be osteopenic having T-score values between -1.24 and-1.96.

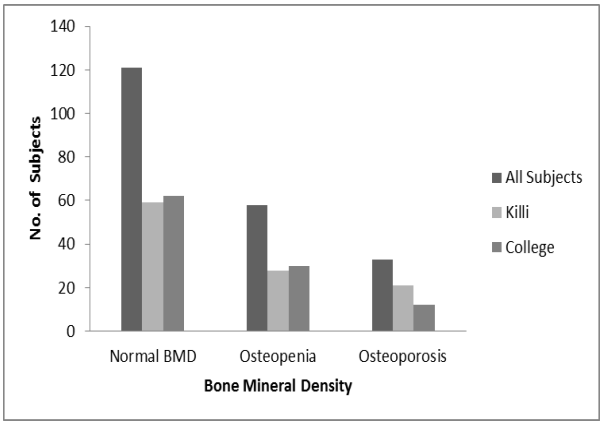

Figure No.2: Bone Mineral density of the studied subjects.

Most of the studied subjects had normal BMD *i.e.* 114 women (57%). However, 69 (34.5%) women had a low BMD and were osteopenic (i.e. T-score ranges from –l to -2.5) and only 17(8.50%) had severely low BMD and were suffering with osteoporosis (T-score less than -2.5). The mean t-score of Killi natives was -1.3 compared to an average t-score of -0.9 for urban natives. Killi natives were almost twice as likely to have osteoporosis as College natives (Fig 1).

DISCUSSION

The study suggests that osteoporosis were more prevalent in low income elderly women who had lower calcium intake (346 mg/d) and mostly used simple diet. A similar low calcium intake of 300 mg/d by Indian women was observed, which is almost 700 mg less than the RDA in the West[9]. Low calcium intake may also be a risk factor in the development of osteoporosis[10,11]

Decrease in bone mineral density (or bone loss) with increasing age and negatively correlation with T-score and age has been observed earlier[12]. Our study showed that the killi women were involved in home chores and had more physical activities then urban women, thus

had significant positive effect on BMD. It has been observed earlier that lack of physical activity is an important risk factor for osteoporosis[13]. Although calcium intake is often cited as the most important factor for healthy bones, our study suggests that physical activity in the killi women is really the predominant lifestyle determinant of bone strength in young women. There was a small positive relationship between calcium intake and bone variables, but a significant association between physical activities or exercises score and bone mass.

The age-smoking and history of fracture interactions with low bone mass also approached significance ($r= -.234$; $p<0.01$), as suggested earlier that smoking accelerates bone loss[14]

Consumption of junk food by killi women was very low, but quite significant by college women natives ($p<0.01$), who belonged to a high income group and had a comfortable life style with all sorts of rich food. The daily use of calcium robbers in their diet has lead to a low bone density in the general population. Although there was no significantly statistical difference in bone density in the average subjects between the two groups of natives, but the T-score of women having junk food was slightly reduced as observed earlier[15].

Many of the risk factors were significantly associated with low bone density of all the studied subjects. Fracture history, menopause, current smoking, former smoking, junk food and age were all negatively associated with bone density for the killi natives, whereas, exercising and calcium intake were positively associated with bone mineral density.

CONCLUSION

The risk factors for low bone density and osteoporosis are prevalent in both urban and rural women and are likely to increase during the next decade due to the aging of this population. A comprehensive prevention program to reduce the prevalence of amendable risk factors in this population is necessary

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