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Bone Mineral Density in an Urban Hospital in Dhaka City of Bangladesh

Quamrun Nahar[1]*, Tasnu Ara[2], Fariha Islam[3], Matiur Rahman[4], Shamim Momtaz Ferdousi Begum[5]

[1]Department of Cell Biology & Molecular Genetics, Bangladesh Institute of Research and Rehabilitation in Diabetes Endocrine and Metabolic Disorders (BIRDEM), Dhaka, Bangladesh.
Email: quamrunnaharr@gmail.com,
Orcid ID: 0000-0002-1467-9945
[2]Department of Food and Nutrition, College of Home Economics, Dhaka, Bangladesh. Email: tasnu610@gmail.com,
Orcid ID: 0000-0002-1105-7876
[3]Department of Nutrition and Food Technology, Jashore University of Science and Technology, Jessore, Bangladesh.
Email: ifariha35@gmail.com
Orcid ID: 0000-0003-2865-1086
[4]Assistant Director (Coordination), Directorate General of Family Planning, Dhaka, Bangladesh.
Email: matiurfpo@gmail.com,
Orcid ID: 0000-0001-5575-4860
[5]Director and Head of PET-CT Division, National Institute of Nuclear Medicine & Allied Science, Bangabandhu Sheikh Mujib Medical University Hospital, Dhaka, Bangladesh.
Email: pragyna06@yahoo.com,
Orcid ID: 0000-0002-5230-8109

*Corresponding author

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Abstract

Background: Osteoporosis behaves as a silent killer. Therefore, a high percentage of the affected people are not aware they have this chronic condition. In this way, the burden of osteoporosis is the burden of its clinical outcome: osteoporotic fractures, which are generally characterized by low-trauma fractures resulting from low bone mineral density (BMD). **Objectives:** The present study aimed to assess BMD distribution among urban and rural subjects and its relationship with key foods. **Material & Methods:** In this study, a total of 140 subjects were studied from the study BMD lab of the study hospital. Data were analyzed using Mean, SD, % and correlation by SPSS 24. **Results:** Mean±SD value of age (yr), BMI, WHR, Lumber-T score, Lumber-BMD, Right Femur -T score, Right Femur-BMD, Left Femur-T score, Left Femur-BMD, Supplementation of the study participants were 54±19, 25±5, 1.0±0.25, -1.0±1.0, 1.0±0.2, -1±1, 1±0.2, -1±1, 1±0.15.Age (yrs), BMI, waist (cm), hip (cm), WHR, Lumber T-score, Lumber Z-score, Lumber BMD (g/cm²), Rt. Fem Neck T-score,Rt. Fem Neck Z-score, Rt. Fem Neck BMD (g/cm²), Lt. Fem Neck T-score,Lt. Fem Neck Z-score, Lt. Fem Neck BMD (g/cm²) of the urban study participants were 51±13, 30±5, 88±16, 95±20, 1±20, -1.6±1.6, -1±1.6, 0.9±0.2, -0.9±1.3, -0.2±1.9, 0.9±0.2, -1±1.2, -0.3±1, 0.8±0.1 respectively and for rural participants the values were 54±14, 25±2.5, 86±9, 92±10, 1±0.2, -2.4±1.5, 0.8±0.2, -1.5±1.3, -0.6±1, 0.7±0.2, -1.6±1.2, -0.7±1 and 0.8±2 respectively. About 48.18% rural subjects had osteoporosis, 34.54% had osteopenia and 17.27% had normal bone health. Again, 28.57% of the urban subjects had osteoporosis, 41.40% had osteopenia and 30% had normal bone density. Fish, egg and meat were associated with BMD. Fish intake had a positive association with lumber T score (r=0.194, p=0.009), LumZ (r=0.016, p=0.031), Lumber BMD (r=0.183, p=0.014). Milk intake has positive association with Lumber t and Lumber BMD (p=0.027, 0.049). Similarly, egg intake has positive association with Lumber BMD, Rt BMD, Lt BMD (p= 0.035, 0.01, 0.019). **Conclusions:** Nearly 48.18% rural subjects have osteoporosis, 34.54% have osteopenia and 17.27% have normal bone health. Again, 28.57% urban subjects have osteoporosis, 41.40% have osteopenia and 30% have normal bone density. The prevalence of osteoporosis is higher in rural area than urban peopleand osteopenia is higher in urban area than rural area. Fish, milk and egg consumption positively associated with BMD.

Keywords:- Osteoporosis, Bone Mass Density, Osteopenia, Normal bone health.

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INTRODUCTION

Osteoporosis is a major public health problem. However, given the absence of solid regional recommendations, the screening, treatment, and follow-up of osteoporosis patients throughout the country lags. BMD is a good tool in predicting fracture risk.[1] Bone strength is proportional to bone mineral density (BMD), and a reduction in BMD is associated with an increased risk of fracture.[2] Changes in bone mineral content (BMC) and bone mineral density (BMD) are generally dependent on age and gender. BMC and BMD increase with increasing age, reaching a maximum at the 20s, and then slowly decline over time in both genders.[3] It is critical to obtain reliable data on the global prevalence of osteoporosis. With increasing life expectancy and longevity, the prevalence of osteoporosis and related fractures is increasing.[4] This is a serious challenge not only for health officials but also for individuals and their families and society in general.[4] Determining the prevalence and incidence of osteoporotic fractures is the first step in adopting the necessary strategies to reduce the burden of this challenge and concerns.[4] We decided to conduct a systematic review of all studies conducted in this field and examined the worldwide prevalence of osteoporosis using meta-analysis tools due to the dispersion of reports related to the prevalence of osteoporosis in the world, which was based on small and large samples, as well as a lack of estimates of the prevalence worldwide. The prevalence of osteoporosis in China was 6.46% and 29.13% respectively for men and women aged 50 years and older.[5] Norway is one of the countries with the highest number of osteoporosis diagnoses per capita. The highest prevalence of osteoporosis in the studies studied in Iran with 77.3% and the lowest prevalence in the Canadian study with 1.07%.[6] Obesity and osteoporosis are two major and rising public health issues globally, and osteoporotic fractures are one of the most common concerns among the senior population. Low bone mineral density (BMD) is a primary risk factor for osteoporosis and fractures associated with it. Many populations have documented a relationship between body mass index (BMI), weight, height, and BMD. Studies have found significant correlation between BMD and the gender and lifestyle of the patient.[7] The risk of osteoporotic fracture has been demonstrated to be inversely linked to body weight or BMI. BMD appears to be reduced in lean postmenopausal women in most but not all studies; in some studies, BMD was reduced, whereas in other studies BMD was increased.[8] Some studies have found that rural communities had superior bone health than urban populations, whereas others have found inconsistent results. After correcting for age and bodyweight, femoral neck BMD in rural men and women was considerably greater than in urban men and women in cross-sectional research of 411 urban and 436 rural Thai men and women, but the difference was not detected at the lumbar spine.[9] In contrast to Thailand, urban Chinese men and women had much greater spine bone mineral content (BMC), BMD, and bone area than their rural counterparts. After controlling for body size, the differences between urban and rural spine BMC and BMD remained inconclusive, but were no longer significant in men. Income, milk intake, vitamin D, and calcium consumption, total physical activity level, walking, and social activity were unable to

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explain the disparities observed in women. Previous research linked poor bone health in rural postmenopausal women to characteristics such as having more children, being shorter in height, having a lower educational level, and eating less dairy and eggs/milk. Furthermore, due to financial conflict, postmenopausal women were more likely to have had difficulty accessing calcium-rich diets in their early years. Other factors likely to be important in developing countries are parity and lactation.[10] The present study was undertaken to assess the prevalence of osteopenia and osteoporosis and its relationship with key foods.

MATERIAL AND METHODS

This cross-sectional descriptive study was conducted at the Scintigraphy Division at National Institute of Nuclear Medicine and Allied Sciences (NINMAS), Bangabandhu Sheikh Mujib Medical University, Dhaka from May 2016 to November 2016. The study was conducted with a total of 140 patients who had been referred for BMD test among the population of the study hospital.

BMD assessment

Bone density, unlike bone quality, iseasy to measure, and is used in the World Health Organization (WHO) operationaldefinition of osteoporosis, which is a bone mass density of 2.5 standard deviations (SD) or belowthe average for young adult. A bone mineral density (BMD) test can provide a snapshot of your bone health. The test can identify osteoporosis, determine your risk for fractures (broken bones), and measure your response to osteoporosis treatment. The most widely recognized BMD test is called a central dual-energy x-ray absorptiometry, or central DXA test. It is painless—a bit like having an x-ray. The test can measure bone density at your hip and spine.10A BMD test measures your bone mineral density and compares it to that of an established norm or standard to give you a score. Although no bone density test is 100-percent accurate, the test is an important predictor of whether a person will have a fracture in the future.[10]

The T-Scores

Most commonly, BMD test results are compared to the ideal or peak bone mineral density of a healthy 30-year-old adult, and a T-score is given based on that. A score of 0 means that the BMD is equal to the norm for a healthy young adult. Differences between the patient BMD and that of the healthy young adult norm are measured in units called standard deviations (SDs). The more standard deviations below 0, indicated as negative numbers, the lower the BMD and the higher the risk of fracture. As shown in the table on page 2, a T-score between +1 and −1 is considered normal or healthy. A T-score between −1 and −2.5 indicates that you have low bone mass, although not with osteoporosis. A T-score of −2.5 or lower indicates that you have osteoporosis. The greater the negative number, the more severe the osteoporosis.World Health Organization Definitions Based on Bone Density Levels recognize Normal Bone density as within 1 SD (+1 or −1) of the young adult mean. Low bone mass Bone density is between 1 and 2.5 SD below the young adult mean (−1 to −2.5 SD). Osteoporosis is recognized when the Bone density is 2.5 SD or more below the young

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adult mean (−2.5 SD or lower). Severe (established) osteoporosis is classified as Bone density more than 2.5 SD below the young adult mean, and there have been one or more osteoporotic fractures.[10]

RESULTS

M±SD value of age (yr), Height (cm), Weight (kg), BMI, WHR, Lumber-T score, Lumber-BMD, Right Femur -T score, Right Femur-BMD, Left Femur-T score, Left Femur-BMD, Supplementation of the study participants were 54±19, 160±5, 62±11, 25±5, 1±0.25, -1±1, 1±0.2, -1±1, 1±0.2, -1±1, 1±0.15.[Table 1]

[Table 2] showed that the mean value of age (years), height (cm), weight (cm), BMI, waist (cm), hip (cm), WHR, Lumber T-score, Lumber Z-score, Lumber BMD (g/cm²), Rt. Fem Neck T-score,Rt. Fem Neck Z-score, Rt. Fem Neck BMD (g/cm²), Lt. Fem Neck T-score,Lt. Fem Neck Z-score, Lt. Fem Neck BMD (g/cm²) of the urban study participants were 51±13, 151±8, 62±10, 30±5, 88±16, 95±20, 1±20, -1.6±1.6, -1±1.6, 0.9±0.2, -0.9±1.3, -0.2±1.9, 0.9±0.2, -1±1.2, -0.3±1, 0.8±0.1 respectively. The mean value of age (yrs), height (cm), weight (cm), BMI, waist (cm), hip (cm), WHR, Lumber T-score, Lumber Z-score, Lumber BMD (g/cm²), Rt. Fem Neck T-score, Rt. Fem Neck Z-score, Rt. Fem Neck BMD (g/cm²), Lt. Fem Neck T-score, Lt. Fem Neck Z-score, Lt. Fem Neck BMD (g/cm²) of the rural study participants were 54±14, 147±8, 54±12, 25±2.5, 86±9, 92±10, 1±0.2, -2.4±1.5, 0.8±0.2, -1.5±1.3, -0.6±1, 0.7±0.2, -1.6±1.2, -0.7±1 and 0.8±2 respectively.

This [Figure 1] shows that, 48.18% rural subjects had osteoporosis, 34.54% had osteopenia and 17.27% had normal bone health. Again, 28.57% urban subjects had osteoporosis, 41.40% had osteopenia and 30% had normal bone density. All the measurements showed that the prevalence of osteoporosis was higher in the rural area compared to people from the urban areas. Again, the prevalence of osteopenia was higher in urban area compared to rural area. Normal bone health is maintained in urban participants than rural.

Table 1: General characteristics of the study population (n=140)

Parameter	Mean± SD
Age (yrs)	54±19
Height (cm)	160±5
Weight (kg)	62±11
BMI	25±5
WHR	1±0.25
Lumber–T	-1±1
Lumber – BMD	1±0.2
Right – T	-1±1
Right – BMD	1±0.2
Left – T	-1±1
Left – BMD	1±0.15

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Table 2: Anthropometric and BMD Parameters (N=140)

Parameters	**Urban**	**Rural**
	Mean± SD	**Mean± SD**
Age (yrs)	51±13	54±14
Height (cm)	151±8	147±8
Weight (kg)	62±10	54±12
BMI	30±5	25±2.5
Waist (cm)	88±16	86±9
Hip (cm)	95±20	92±10
WHR	1±20	1±0.2
Lumber T-score	-1.6±1.6	-2.4±1.5
Lumber Z-Score	-1±1.6	-1.4±1.2
Lumber BMD (g/cm²)	0.9±0.2	0.8±0.2
Rt. Fem Neck T-score	-0.9±1.3	-1.5±1.3
Rt. Fem Neck Z-score	-0.2±1.9	-0.6±1
Rt. Fem Neck BMD (g/cm²)	0.9±0.2	0.7±0.2
Lt. Fem Neck T-score	-1±1.2	-1.6±1.2
Lt. Fem Neck Z-score	-0.3±1	-0.7±1
Lt. Fem Neck BMD (g/cm²)	0.8±0.1	0.8±2

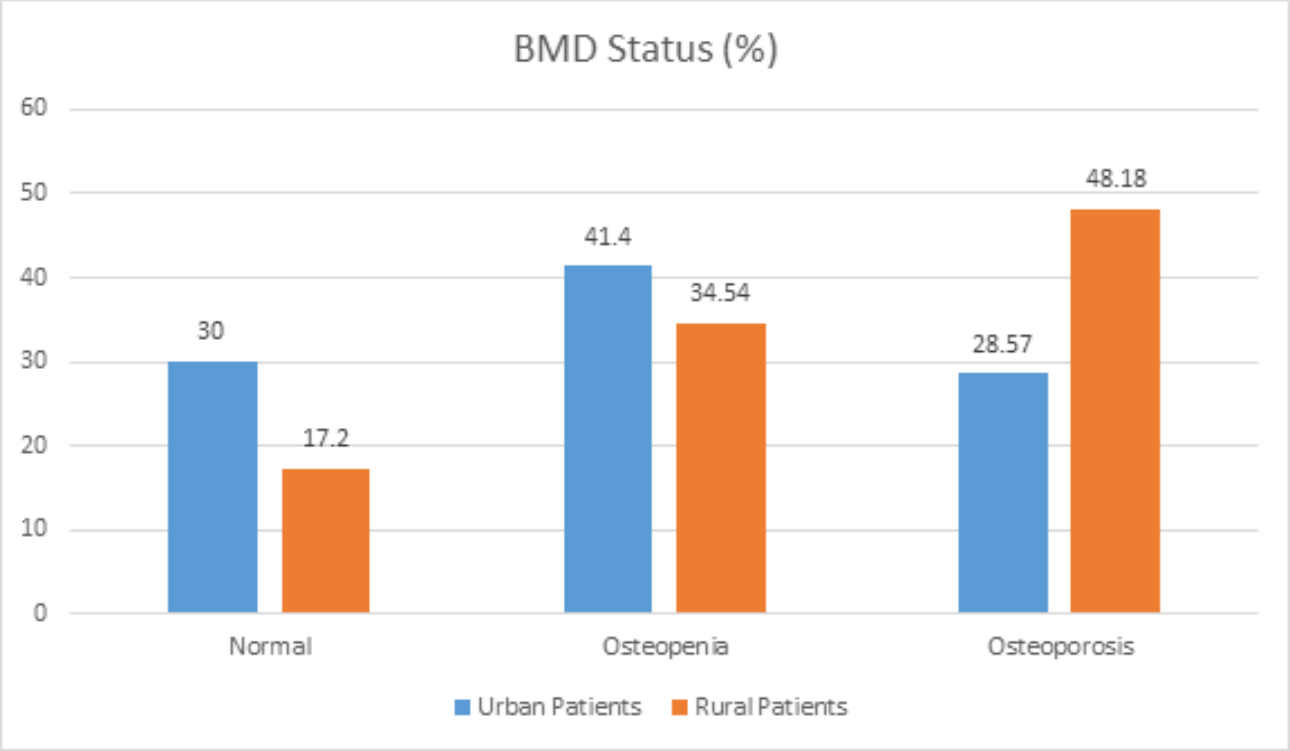

Figure 1: Bone Minerals Density status (%) among urban and rural study participant (n=140)

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Table 3: Correlation between Bone Minerals density and Vitamin-D rich dietary food intake (n=140)

Variables	r	p
Lum_T Vs Fish	0.194	0.009
Lum_Z Vs Fish	0.161	0.031
Lum_BMD Vs Fish	0.183	0.014
Rt_BMD Vs Fish	0.177	0.018
Lt_T Vs Fish	0.199	0.008
Lt_Z Vs Fish	0.209	0.005
Lt_BMD Vs Fish	0.160	0.032
Milk Vs Fish	0.297	0.000
Egg Vs Fish	0.171	0.022
Lum_T Vs Milk	0.166	0.027
Lum_BMD Vs Milk	0.147	0.049
Sup_C Vs Milk	-0.185	0.013
Egg Vs Milk	0.426	0.000
Lum_T Vs Egg	0.197	0.008
Lum_BMD Vs Egg	0.158	0.035
Rt_BMD Vs Egg	0.192	0.010
Lt_BMD Vs Egg	0.176	0.019

Here having some significance between indicators of BMD and vitamin D based dietary intake. Correlation is significant at the 0.05 level (2-tailed). In [Table 3], it has been shown that fish intake has been positive association with Lumber T score (r=0.194, p=0.009), LumZ (r=0.016, p=0.031), Lumber BMD (r=0.183, p=0.014). By increasing fish intake, BMD at these sites will be increasing. Milk intake has a positive association with Lumber T and Lumber BMD (p=0.027, 0.049). Similarly, egg intake has positive association with Lumber BMD, Rt BMD, Lt BMD (p= 0.035, 0.01, 0.019). So, it can be said that by increasing of milk and egg intake BMD can also increase.

DISCUSSION

Most people reach their peak bone mass around age 30. After that, bone remodeling continues, but one loses slightly more bone mass than he gained. Bone health presents a huge challenge in developing countries due to demographic evolution and aging of the population coupled with limited resources. The exact disease burden is difficult to enumerate because of the lack of data. Civilization affects bone density as well as osteoporosis risk. The prevalence of osteoporosis in less developed and developing countries is not clear because of the scarcity of studies in these populations. However, racial differences in BMD are well recognized. In China, 7290 urban and rural subjects aged 50 years or older had prevalence of osteoporosis spine 28%, any femur site 15% and any spine or femur site 31%.[11] This study shows that urban subject had higher weight (kg) and BMI but lower height (cm) and WHR than rural subjects. The Mean ± SD value of Lumber-T Score, Lumber-Z Score and Lumber-BMD

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scores were respectively 0.08±1.2, 0.4±1.9 and 1.1±0.2 in urban participants and the values in rural were -1.7±0.3, -1.2±3.7 and 0.9±0.4 respectively. The result shows that urban subjects had a higher Lumber-T Score, Lumber-Z Score and Lumber BMD than rural subjects. The Mean ± SD value of Right Femur T Score and Right Femur BMD scores were respectively -0.64±0.7 and 0.9±0.1 in urban participants and the values in rural were -1.16±0.9 and 0.7±0.2 respectively. The result shows that urban participants had a higher Right Femur T Score and Right Femur BMD than rural subjects. Right Femur Z Scores are quite same for both groups. The Mean ± SD value of Left Femur T Score, Left Femur Z Score and Left Femur BMD scores were respectively -0.46±0.7, 0.1±0.9 and 0.94±0.11 urban participants and the values in rural participants were -1.3±0.74, -0.72±0.7 and 0.82±0.14 respectively. The result shows that urban subjects had higher Left Femur T Score, Left Femur Z Score and Left Femur BMD than rural subjects in our country.In India, 289 low-income group women aged 30 to 40 years had osteoporosis at the femoral neck with a prevalence of 29%.[12] In Pakistan, 608 women aged 40 years from two teaching hospital of Peshawar had prevalence of osteoporosis at 12.01%.[13] In Malaysia, 514 urban women aged 45 years had prevalence of osteoporosis at 24.1%.[14] In Iran, among 553 subjects (34%men, 66% women) aged 20 to 69 years randomly selected from 50 blocks in Tehran, the prevalence of osteoporosis was 7.4% in the lumbar spine 7.4%, hip 2.4%.[15] This research shows that in our country, 48.18% rural subjects had osteoporosis, 34.54% had osteopenia and 17.27% had normal bone health. Again, 28.57% urban subjects had osteoporosis, 41.40% had osteopenia and 30% had normal bone density. All the measurements show that the prevalence of osteoporosis was higher in the rural population compared to the urban people. Again, the prevalence of osteopenia was higher in the urban area than rural area. Normal bone health is maintained in urban participants compared to the rural population.From above discussion it can be concluded that the prevalence of osteoporosis was higher among the rural population (48.18%) compared to the urban population (28.57%). The prevalence of normal bone density was higher among the urban population, compared to the rural population of our study (30% vs 17.27%). Normal bone health is better maintained amongthe urban participants than rural. Fish, milk and egg consumption was associated with BMD.

CONCLUSIONS

Nearly 48.18% rural subjects have osteoporosis, 34.54% have osteopenia and 17.27% have normal bone health. Again, 28.57% urban subjects have osteoporosis, 41.40% have osteopenia and 30% have normal bone density. The prevalence of osteoporosis is higher in rural area than urban peopleand osteopenia is higher in urban area than rural area. Fish, milk and egg consumption associated with BMD.

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