# Bone mineral densities in normal Bangladeshi women

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*Background:* Low bone mass may increase risk of fracture. Several chronic medical conditions, medications, and life style factors affect bone mineral accrual. This study aims to evaluate the bone mineral densities and hip axis lengths in the local population. *Materials and Methods:* 336 normal Bangladeshi women age ranges 20 to 70 years had evaluation of their bone mineral densities (BMDs) by means of dual X-ray absorptiometry (DXA). *Results:* The trend of BMD at the left femoral neck and the lumber spine remains fairly constant with increasing age until the 45-49 years age range, beyond which there is a consistent decline. The mean hip axis length is 10.27 cm. *Conclusion:* Bone mineral densities in femoral neck and lumber spine as measured by DXA and the hip axis length of the local population is lower than corresponding figures reported in the western population. **Iran. J. Radiat. Res., 2008; 6 (3): 157-160**

***Keywords:*** *Osteoporosis, fracture, bone mass, dual-X-ray, hip axis.*

## INTRODUCTION

Osteoporosis is a condition characterized by low bone densities and disordered bone microarchitecture. Complications of osteoporosis are a major health problem. The high costs related to morbidity and morality from vertebral compression fractures and hip fractures have been well documented [1, 2]. Worldwide, these fractures constitute a major medical burden for the elderly and a public health burden for the community. Several studies have shown that the estimation of bone mineral density can predict future fracture risk among women [3, 4]. Our study involved 336 normal Bangladeshi females with the aim of the determining the trend of the local population's bone mineral densities at the lumber spine and the femoral necks, as well as hip axis length.

## MATERIALS AND METHODS

Female subjects were recruited from among hospital staff, their relatives and friends. Exclusion criteria were endocrine diseases (including use of exogenous thyroxine) renal, hepatic or rheumatic diseases (including metabolic bone disease), use of hormone replacement or steroids, hysterectomy or oophorectomy and presence of malignancy and a history of hip or vertebral fractures.

Bone densities measurements were made using the latest dual-energy X-ray absorptiometry (DXA) scanner (NORLAND XR-46). Calibration was performed at regular intervals. The regions scanned were the left femoral neck (generally the non-dominant leg), the lumber spine at the L1 to L4 region (in the anterior posterior view). The subject is scanned supine, according to recommended protocol, with the legs internally rotated and the first toes opposing each other during the hip scanning, with the hips flexed at 90 degrees when the spine is being scanned. The hip axis length was measured along a line through the centre of the femoral neck, with one end at the inner edge of the acetabulum and the other at the outer border of the greater trochanter (figure 1). Weight was measured on a standing scale in kilograms and height in centimeters by tape measure just before the commencement of the bone mineral

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densities measurements.

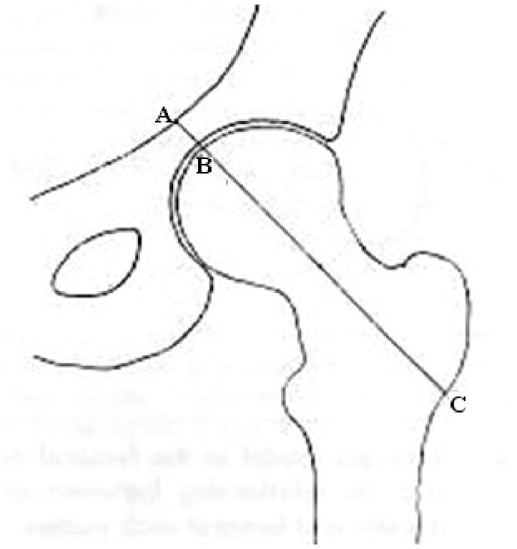


Figure 1. Diagram of the hip showing the geometric measurement of the hip axis length. (AC=hip axis length, BC=Femur axis length).

## RESULTS

A total of 350 female subjects between ages 20 to 80 were included in this study. Those outside the age range were excluded. Of the 350 selected 340 met the exclusion criteria. In view of the small numbers of subjects between 70 to 80 years of age, this age group was excluded as well. For the final analysis, a total of 336 female subjects were involved. The bone mineral densities were analyzed in 5 years age bands as shown in table 1 and graphically displayed in figure 2. There is a distinct decline in bone mineral densities of both the femoral necks and the lumber spine, beginning at 45 -49 years age band in normal female subjects. The mean hip axial length was 10.27 with a maximum of 11.25, a minimum of 8.25 cm.

Table 1. Bone mineral densities according to age – bands in 336 normal Bangladeshi Female.

| | | Bone Mineral Densities | |
|---|---|---|---|
| Age Band (Years) | Number | Femoral Neck ($g/cm^2$) | Lumber Spine ($g/cm^2$) |
| 20-24 | 11 | 0.80 | 0.99 |
| 25-29 | 18 | 0.79 | 0.98 |
| 30-34 | 25 | 0.77 | 1.00 |
| 35-39 | 33 | 0.78 | 0.99 |
| 40-44 | 49 | 0.77 | 0.97 |
| 45-49 | 74 | 0.76 | 0.95 |
| 50-54 | 36 | 0.67 | 0.78 |
| 55-59 | 37 | 0.65 | 0.95 |
| 60-64 | 30 | 0.63 | 0.72 |
| 65-69 | 23 | 0.56 | 0.60 |

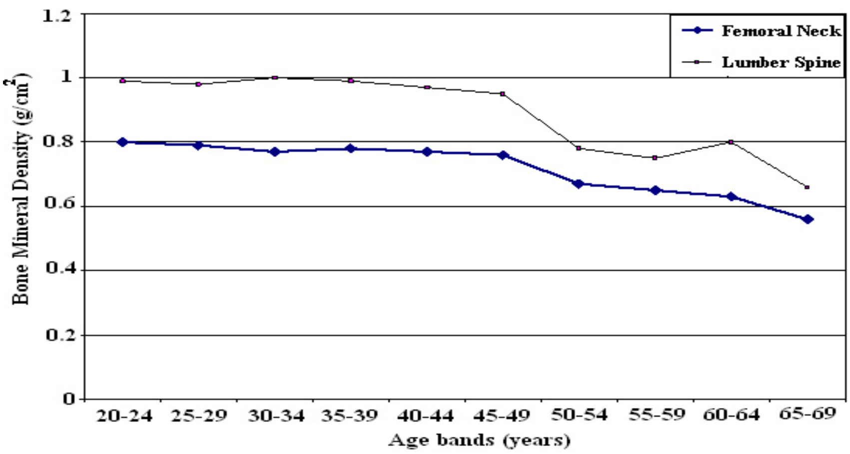


Figure 2.Trend of bone mineral densities in age bands.

## DISCUSSION

Our findings are similar to that of Leong and Feng [5] which showed a fairly constant bone mineral density at the femoral neck and lumber spine until 40 to 44 years and Asian population is in general 3-8% lower than American population. Nakamura *et al.* [6], who noted that a shorter femoral neck length and a lower a lower incidence of hip fractures than white Americans subjects despite a lower bone density. The comparatively low rates of fractures in Asians, in spite of a lower bone mineral density, has been explained in various ways, but two of the more plausible explanations are related to the nature of bone mineral density measurement using DXA and the shorter hip axial length in Asians.

Firstly, this low bone density and low fracture rate pattern may partly accounted for by the fact that bone mineral densities obtained by dual-energy, X-ray absorptiometry are area densities, rather than volume densities, which implies that, even when the bone density is unchanged, a generalized proportional increase or decrease in the size of the bone will cause a hidden and implicit change in the third, and unmeasured, dimension and this will influence the density value. In fact, a straightforward calculation, based on a simple model of a cylindrical femoral neck, suggests that even when the actual bone density is kept constant, the apparent bone mineral density will increase proportionally with the radius of the bone. Thus, it is possible that with the small dimensions of bones of Asians, the measured areal bone mineral densities appear lower than the western counterparts.

The second plausible explanation of the observation may be shorter hip axis length of Asians. The hip axis length of the female subjects in our study is 10.27 cm, which is relatively shorter than that reported by Peacock *et al.* [7], in Caucasian women (12.96 cm), and by Theobald *et al.* [8], in African-American women (12.72 cm) and Nigerian women (11.33 cm). It appears that taller women have an increased risk of hip fracture which may be related to a longer hip axial length and increased mechanical impact, as pointed out by Theobald *et al.* [9]. In the study by Peacock *et al.* [7], it was found that consideration of hip axis length together with bone mineral densities increased the discrimination of hip fractures, compared to that based on bone mineral densities alone. Thus, it may be that the shorter hip axis length of our local female population protects against a hip fracture.

## REFERENCES


1. Riggs BL and Melton LJ (1986) Involution osteoporosis. *NEJM, **314:** 1676-1686.*
2. Cummings SR, Kelsey JL, Nevitt MC, O'Dowd KJ (1985) Epidemiology of osteoporosis and osteoporosis fractures. *Epidemiology Rev, **7:** 178-208.*
3. Ross PD, Davis JW, Epstein R, Wasnich RD (1991) Preexisting fractures and bone mass predict vertebral fracture incidence in women. *Ann Intern Med, **114:** 919-23.*
4. Cummings SL, Black DMM, Nevitt MC (1990) The study of osteoporotic fractures research group: Appendicular bone density and age predict hip fracture in women. *JAMA, **263:** 665-8.*
5. Leong KH and Feng PH (1997) Bone mineral density measurements using the hologic QD2000 in 175 Singaporean women aged 20 to 80 years. *Sing Med J, **38:** 25-6.*
6. Nakamura T, Turner CH, Yoshikawa T, *et al.* (1994) Do various in hip geometry explain difference in hip fracture risk between Japanese and Americans? *J Bone Min Res, **9:** 1071.*
7. Peacock M, Turner CH, Liu G, Manatunga AK, Timmerman L, Johnston CC Jr. (1995) Better discrimination of hip fracture using bone density, geometry and architecture. *Osteoporos Int, **5:** 167-73.*
8. Theobald TM, Cauley JA, Gluer CC, Bunker CH, Ukoli FA, Genant HK (1998) Black-white difference in hip geometry. *Osteoporos Int, **8:** 61-7.*