Bone mineral densities in normal Bangladeshi women

S. Reza¹, M. Rahman¹, S. Hossain¹, S. Afroz ²

¹Center for Nuclear Medicine and Ultrasound, Dhaka Medical College Hospital Campus, Dhaka, Bangladesh
²Bio Science Division, Bangladesh Atomic Energy Commission, Dhaka, Bangladesh

Background: Low bone mass may increase risk of fracture. Several chronic medical conditions, medications, and lifestyle 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 mortality 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 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.

*Corresponding author:
Dr. Selim Reza, Center for Nuclear Medicine and Ultrasound, Dhaka Medical College Hospital, Dhaka, Bangladesh,
Fax: +88 2 8130102
E-mail: seliminm@yahoo.com.
densities measurements.

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.

<table>
<thead>
<tr>
<th>Age Band (Years)</th>
<th>Number</th>
<th>Femoral Neck (g/cm²)</th>
<th>Lumber Spine (g/cm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-24</td>
<td>11</td>
<td>0.80</td>
<td>0.99</td>
</tr>
<tr>
<td>25-29</td>
<td>18</td>
<td>0.79</td>
<td>0.98</td>
</tr>
<tr>
<td>30-34</td>
<td>25</td>
<td>0.77</td>
<td>1.00</td>
</tr>
<tr>
<td>35-39</td>
<td>33</td>
<td>0.78</td>
<td>0.99</td>
</tr>
<tr>
<td>40-44</td>
<td>49</td>
<td>0.77</td>
<td>0.97</td>
</tr>
<tr>
<td>45-49</td>
<td>74</td>
<td>0.76</td>
<td>0.95</td>
</tr>
<tr>
<td>50-54</td>
<td>36</td>
<td>0.67</td>
<td>0.78</td>
</tr>
<tr>
<td>55-59</td>
<td>37</td>
<td>0.65</td>
<td>0.95</td>
</tr>
<tr>
<td>60-64</td>
<td>30</td>
<td>0.63</td>
<td>0.72</td>
</tr>
<tr>
<td>65-69</td>
<td>23</td>
<td>0.56</td>
<td>0.60</td>
</tr>
</tbody>
</table>

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 lumbar 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
