Osteoporosis and Its Risk Factors among Menopausal Women

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Abstract

**Background:** The characteristic features of osteoporosis are low bone mass and bone degeneration. Female hormones protect them from osteoporosis but after menopausal, her age, BMI, duration of menopause, dietary or nutritional intakes and life style play a role in the occurrence and severity of osteoporosis.

**Objectives:** To determine the association of osteoporosis with age, BMI and other risk factors in post menopausal women.

**Study type, settings and duration:** Cross sectional study conducted in Obs. & Gyne ward of Lyari General Hospital Karachi from March 1, 2011 to September 30, 2011.

**Subjects and Methods:** A total of 122 postmenopausal women having natural menopause, aged over 45 years and who agreed to get a Dual-Energy X-ray Absorptiometry (DEXA) scan were included in the study. A questionnaire was filled for all.

**Results:** On scan, 52.5% women had osteoporosis, 29.5% osteopenia and 18% were normal. Most (64.3%) osteoporotic women were > 55 years (p < 0.03). Osteoporosis was more (55.7%) in obese patients (insignificant). Risk factors reaching statistical significance (p < 0.05 and odds ratio > 1) included age, history of trauma/ fracture, low intake of calcium & Vitamin-D, backache, low physical activity. Using arms to assist in standing was the commonest sign.

**Conclusion:** Many women have osteoporosis which remains undiagnosed. The significant risk factors associated with osteoporosis in these women were advancing age, lack of physical activity, low intake of calcium and history of trauma/ fracture.

**Key words:** Post menopausal, osteoporosis, BMI, DXA scan.

Introduction

Osteoporosis is characterized by low bone mass with microarchitectural disruption and skeletal fragility, resulting in an increased risk of fracture. Osteoporosis and related fractures are major public health problem and become more important with an ageing population¹. Almost 30-50% women and 15-30% men suffer from osteoporosis-related fractures in their lifetime².

Osteoporosis is common in post menopausal women. During the perimenopause, both the quantity and quality of bone declines rapidly, resulting in a dramatic increase in the risk of fracture in postmenopausal women³. Women with osteoporosis are more likely to experience fractures. Demographic trends for hip fracture parallel those for osteoporosis. Hip-fracture incidence in women rises from 50 per 100,000 at age 50 years to 237 per 100,000 at age 65 years⁴. An Indian study reported 48% prevalence of osteoporosis at the lumbar spine, 16.7% at the femoral neck, and 50% at any site⁵. In a study conducted in Quetta among adult females using ultrasonography to calculate BMD, 12.9% had osteoporosis⁶. Another study from Peshawar on postmenopausal women assessed BMD of heel using ultrasonography reported osteoporosis in 24.5%⁷, while in a study from Lahore reported osteoporosis in 41% females aged > 45⁸.

Several risk factors of osteoporosis have been identified of which many can be changed i.e. low calcium intake, tobacco use, eating disorders, sedentary life style. Factors like advance age, family history osteoporosis (FHO), female gender, menopause before age 45 years, low BMI, prolong amenorrhea, multiparity, hyperparathyroidism, prolong treatment with thyroid hormones cannot be changed⁹,10.

In Pakistan¹¹ the proportion of elderly and postmenopausal women is on the rise. In the future, more Pakistani women will suffer from osteoporosis related fractures that lead to a poor quality of life. Studies indicate a high prevalence of risk factors associated with osteoporosis in the community¹². According to a survey, 72% of people lead a sedentary lifestyle, and vitamin D deficiency among Pakistani women is as high as 83%¹². Moreover, Pakistani diet is deficient in calcium¹³. The prevalence of smoking ranges between 22-40% in a recent population-based study¹⁴. A high percentage of

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Pakistani population has deficiency of calcium and vitamin D. A hospital-based study from Karachi reported that 92% of the out-patients had vitamin D deficiency.

There is no consensus for mass screening of osteoporosis however it is strongly recommended that all postmenopausal women should be evaluated for signs and symptoms of osteoporosis during routine physical examination. Though (dual-energy X-ray absorptometry) DXA Scan is the gold standard for diagnosing osteoporosis, but the test is expensive and not available everywhere making its use limited.

The purpose of this study was to find out the association of osteoporosis with age, BMI and in selected sample of postmenopausal women.

### Subjects and Methods

This cross sectional study was conducted at Obs. & Gyne ward of Lyari General Hospital Karachi from March 1, 2011 to September 30, 2011. A total of 122 postmenopausal women were selected through random systematic sampling from OPD (either coming as patients or attendant) were included. Sample size was calculated using formula where, \( p = 48\% \) (Proportion of osteoporosis at the lumbar spine), \( d = 9\% \) & \( \alpha = 5\% \). Inclusion criteria were women with natural menopause of age greater than 45 years, capable of active communication and who were willing to get a DXA scan. Women with surgical menopause and those already diagnosed as osteoporosis were excluded. After taking informed consent all women were interviewed for risk factors and then referred for DXA scan and results were recorded in structured proforma. The proforma included the basic demographic data and associated risk factors. The presence of osteoporosis was confirmed from BMD value expressed as T-score which compare BMD to mean bone density of young adults.

Data was analyzed by using SPSS 18. Frequencies and percentages were calculated for age groups, obesity, risk factors and osteoporosis. Mean±SD was computed for age, height, weight and BMI. Chi-square test was used to compare the osteoporosis with age, BMI and risk factors at 5% level of significance. By using multivariate analysis Odds ratios were calculated for normal and abnormal results.

### Results

A total of 122 postmenopausal women from OPD were included. The mean age was 57.8±10 years with the range from 50 to 81 years. The mean weight, height and BMI were 64.5±11.4 kg, 149.9±4.8 cm and 28.8±4.7 kg/m² respectively.

On DEXA scan 64(52.5%) women had osteoporotic changes followed by osteopenia in 36(29.5%) while 22(18%) were normal. Mean age of osteoporotic women was 59.2±9.8 years and that for osteopenic was 5.9±8.9 years.

### Table 1: Distribution of osteopenia and osteoporosis by BMD site in postmenopausal women. n=122

<table>
<thead>
<tr>
<th>Sites</th>
<th>Normal</th>
<th>Osteoporotic</th>
<th>Osteopenic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lumbar spine</td>
<td>5 (4.1%)</td>
<td>85 (69.7%)</td>
<td>32 (26.2%)</td>
</tr>
<tr>
<td>Hip</td>
<td>20 (16.4%)</td>
<td>55 (45.1%)</td>
<td>47 (38.5%)</td>
</tr>
</tbody>
</table>

### Table 2: Proportion of osteoporosis with respect to age and BMI. n=122

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Total</th>
<th>Osteoporosis</th>
<th>p-values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean ±SD</td>
<td>p-values</td>
<td>95% CI</td>
</tr>
<tr>
<td>45-54</td>
<td>66</td>
<td>28 (42.4%)</td>
<td>0.03</td>
</tr>
<tr>
<td>&gt;54</td>
<td>56</td>
<td>36 (64.3%)</td>
<td>7 to 53</td>
</tr>
</tbody>
</table>

### Table 3: Sensitivity and specificity of possible risk factors in patients with osteoporosis. n = 122

<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>DXA Scan</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Back pain</td>
<td>93</td>
<td>93</td>
<td>9.1</td>
</tr>
<tr>
<td>Low intake of calcium &amp; vitamin D</td>
<td>93</td>
<td>15</td>
<td>93</td>
</tr>
<tr>
<td>Use of arms to assist in standing</td>
<td>78</td>
<td>16</td>
<td>78</td>
</tr>
<tr>
<td>Low physical activity</td>
<td>81</td>
<td>13</td>
<td>81</td>
</tr>
<tr>
<td>Family history</td>
<td>52</td>
<td>4</td>
<td>52</td>
</tr>
<tr>
<td>Loss of height</td>
<td>46</td>
<td>10</td>
<td>46</td>
</tr>
<tr>
<td>Smoker</td>
<td>23</td>
<td>0</td>
<td>23</td>
</tr>
<tr>
<td>History of low trauma fracture</td>
<td>14</td>
<td>0</td>
<td>14</td>
</tr>
</tbody>
</table>
The majority 36(64.3%) of osteoporotic patients were in the age group > 55 years with a mean of 57.2±9.3 years ($p=0.03$, 95% CI=7.5–53). Proportion of osteoporosis was high (55.7%) in obese patients but this was statistically insignificant. Almost 53% osteoporotic patients were overweighted and 45.5% had normal weight. Proportion of osteoporosis was high in grandmulti-parity 44(57.1%) and those with history of breast feeding 59(54.6%) (Table-2).

Sensitivity and specificity of risk factors by taking DXA scan as gold standard is shown in Table-3. The multivariate comparison of various risk factors among normal, osteopenic and osteoporotic individuals is shown in Table-4. Factors reaching statistical significance ($p < 0.05$ and odds ratios > 1) included age, history of low trauma fracture, low intake of calcium and vitamin D, backache, low physical activity. Use of arms to assist in standing was the commonest sign.

None of the patients had received estrogen therapy or corticosteroids for prolong duration.

### Discussion

In this study, the prevalence of osteoporosis using T scores (WHO criteria) in postmenopausal women was 52.5% with mean age of 59.2±9.8 years while another 29.5% women were osteopenic. Majority (64.3%) of osteoporotic women were > 55 years of age. Proportion of osteoporosis was high (55.7%) in obese patients but this was not significant. Similar results were reported by an Indian study where prevalence of osteoporosis was 48% at the lumbar spine, 16.7% at the femoral neck, and 50% at any site. A study from Korea reported the prevalence of osteoporosis was 30.6% in the 45-64 years old women, 52.5% in the elderly women aged 65-74, and 68.7% in the women aged 75 years or over. However, differing results were encountered from other international studies. A study from Jakarta reported the prevalence of osteoporosis in postmenopausal women aged 47 to 60 years, was 20.2% in the lumbar vertebrae, and 30% in the distal radius. In Germany prevalence of osteoporosis was 23.3% in postmenopausal women aged 50 to 64 years. A Thai study reported 9.4% prevalence of osteoporosis in the lumbar spine of postmenopausal women aged 50 to 54 years and this increased to 22.6% in those between 55 to 59 years. In a study from Quetta among adult females using ultrasonography to calculate BMD, 12.9% had osteoporosis. Another study from Peshawar on post-menopausal women assessed BMD of heel using ultrasonography and reported that 24.5% women had osteoporosis, while a study from Lahore reported 41% females aged > 45 years had osteoporosis. In a cross sectional survey from Pakistan. It was found that 32.4% women had osteopenia and 6.7% had osteoporosis.

The reason of high percentage of osteoporosis in this community was the careless lifestyle. According to a survey, 72% people lead a sedentary lifestyle, and vitamin D deficiency among Pakistani women is as high as 83%. Moreover, the Pakistani diet is deficient in calcium. The prevalence of smoking varies between 22-40%.

Low intake of calcium & vitamin D and low physical activity were important risk factors in osteoporotic women. It was observed in a study that dietary calcium intake and level of physical activity have noticeable positive and independent association with bone mineral density. A high percentage of Pakistani population has deficiency of calcium and vitamin D. A hospital-based study from Karachi reported that 92% of the out-patients had vitamin D deficiency. Lack of calcium supplementation during pregnancy and lactation seems to be a factor, leading late in life to weak bones and osteoporosis related hip fractures. Also, 56.5% of osteoporotic women were smokers. This is alarming as smoking among women in Pakistani society is considered to be a taboo and previous studies have reported much lower rates. An increase in the prevalence of

<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>Total</th>
<th>Osteoporotic</th>
<th>Osteopenic</th>
<th>Normal</th>
<th>Odds Ratios</th>
<th>p-values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Back pain</td>
<td>113</td>
<td>63 (55.8%)</td>
<td>30 (26.5%)</td>
<td>20 (17.7%)</td>
<td>4.8</td>
<td>0.003</td>
</tr>
<tr>
<td>Low intake of &amp; vitamin D calcium</td>
<td>108</td>
<td>61 (56.5%)</td>
<td>32 (29.6%)</td>
<td>15 (13.9%)</td>
<td>5.3</td>
<td>0.04</td>
</tr>
<tr>
<td>Use of arms to assist in standing</td>
<td>94</td>
<td>60 (63.8%)</td>
<td>18 (19.2%)</td>
<td>16 (17%)</td>
<td>5.2</td>
<td>0.03</td>
</tr>
<tr>
<td>Low physical activity</td>
<td>94</td>
<td>61 (64.9%)</td>
<td>20 (21.3%)</td>
<td>13 (13.8%)</td>
<td>5.6</td>
<td>0.01</td>
</tr>
<tr>
<td>Family history</td>
<td>56</td>
<td>32 (57.2%)</td>
<td>20 (35.7%)</td>
<td>4 (7.1%)</td>
<td>5.44</td>
<td>0.4</td>
</tr>
<tr>
<td>Loss of height</td>
<td>56</td>
<td>28 (50%)</td>
<td>18 (32.1%)</td>
<td>10 (17.9%)</td>
<td>2.8</td>
<td>(-11) - 41</td>
</tr>
<tr>
<td>Smoker</td>
<td>23</td>
<td>13 (56.5%)</td>
<td>10 (43.5%)</td>
<td>0</td>
<td>NA</td>
<td>(-26) - 26</td>
</tr>
<tr>
<td>History of low trauma Fracture</td>
<td>14</td>
<td>12 (85.7%)</td>
<td>2 (14.3%)</td>
<td>0</td>
<td>NA</td>
<td>(-20) - 53</td>
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An increase in the prevalence of osteoporosis in postmenopausal women aged 47 to 60 years, was 20.2% in the lumbar vertebrae, and 30% in the distal radius. In Germany prevalence of osteoporosis was 23.3% in postmenopausal women aged 50 to 64 years. A Thai study reported 9.4% prevalence of osteoporosis in the lumbar spine of postmenopausal women aged 50 to 54 years and this increased to 22.6% in those between 55 to 59 years. In a study from Quetta among adult females using ultrasonography to calculate BMD, 12.9% had osteoporosis. Another study from Peshawar on post-menopausal women assessed BMD of heel using ultrasonography and reported that 24.5% women had osteoporosis, while a study from Lahore reported 41% females aged > 45 years had osteoporosis. In a cross sectional survey from Pakistan. It was found that 32.4% women had osteopenia and 6.7% had osteoporosis.

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female smokers is a serious risk factor not only for osteoporosis but also for lung cancer, coronary and cerebrovascular diseases\(^3\). In a study from Pakistan, smoking was identified as the most dominant risk factor in osteoporotic women. In some studies\(^2\,2,5\) both current and former smokers were at greater risk for low BMD compared with nonsmokers.

Several studies have found a relationship between small gestature and low weight with osteoporosis having a relative risk of low weight of 2.35. Additionally, in some studies weight < 57 kg or BMI < 25 were considered as risk factors\(^2\,6,27\).

In our study 57.2% osteoporotic women had family history of osteoporosis or hip fracture. Our figures are higher than 40% reported by others.\(^6\) It is possible that these women were not counseled by their physicians about the possibility that they were at an increased risk of developing this condition, unless they practiced appropriate preventive behavior, or it may be the case that osteoporosis has a strong genetic component which may not be corrected by life habits only.

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