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ORIGINAL ARTICLE

Prevalence and Distribution of Osteoporosis Among Postmenopausal Women

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ABSTRACT

Background: *Osteoporosis is a major skeletal disorder after menopause, but contemporary data describing site-specific bone mineral density (BMD) patterns among Bangladeshi postmenopausal women remain limited.* ***Methods & Materials:*** *This hospital-based cross-sectional study included 117 postmenopausal women attending the Department of Obstetrics and Gynaecology, Dhaka Medical College Hospital, from January to December 2025. Lumbar spine and left femoral BMD were assessed by dual-energy X-ray absorptiometry (DXA), and skeletal status was classified from T-scores as normal, osteopenia, or osteoporosis.* ***Results:*** *The mean age was 59.1 ± 6.61 years. At the spine, 20.5% of participants had normal BMD, 30.8% had osteopenia, and 48.7% had osteoporosis. At the left femur, 23.9% had normal BMD, 46.2% had osteopenia, and 29.9% had osteoporosis. Osteoporosis was 18.8 percentage points more frequent at the spine, whereas osteopenia was 15.4 percentage points more frequent at the left femur.* ***Conclusion:*** *Low bone mass was common in this hospital-based sample and showed clear variation by skeletal site, with osteoporosis predominating at the spine and osteopenia at the femur. Assessment of both sites may provide a more complete description of skeletal status in postmenopausal women.*

Keywords: *Postmenopausal women; Osteoporosis; Osteopenia; Bone mineral density; DXA; Bangladesh*

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INTRODUCTION

Osteoporosis is a persistent systemic skeletal condition marked by diminished bone integrity and heightened vulnerability to fragility fractures. In postmenopausal females, the cessation of ovarian estrogen hastens bone remodeling, promotes osteoclast-driven resorption rather than production, and leads to a fast decline in bone mass, particularly during the initial postmenopausal years [1,2]. Due to the potential consequences of fragility fractures, such as pain, disability, loss of autonomy, increased mortality, and prolonged healthcare utilization, identifying diminished bone mineral density (BMD) prior to fracture is crucial for promoting healthy aging in women. Dual-energy X-ray absorptiometry (DXA) is the conventional clinical technique for measuring bone mineral density (BMD) at significant skeletal locations, including the lumbar spine and proximal femur.

Osteoporosis is prevalent worldwide, however its occurrence significantly differs among various people and skeletal locations. A comprehensive review and meta-analysis employing World Health Organization diagnostic standards projected an overall osteoporosis prevalence of 19.7% and an osteopenia prevalence of 40.4%, noting a greater incidence of osteoporosis in emerging nations compared to industrialized ones [3,4]. Data from the Global Burden of Disease 2021 indicated that diminished bone mineral density in postmenopausal women correlated with 219,552 fatalities and 7.76 million disability-adjusted life years in 2021, with South Asia experiencing a notably elevated burden. In advanced Asia-Pacific regions, the majority of prevalence estimates for women aged 40 and over generally range from 10% to 30% and rise with advancing age [5]. A systematic analysis in India estimated the combined prevalence of osteoporosis in postmenopausal women to be 29% at both the lumbar spine and femoral neck, highlighting the necessity of site-specific evaluation [6].

Bangladesh is undergoing demographic aging, although current data regarding postmenopausal bone health is still very scarce. A tertiary-care investigation conducted in Dhaka found a significant prevalence of diminished bone mineral density in postmenopausal females [7]. In North Central Bangladesh, Kha et al. documented osteoporosis prevalence at 31.0% in the

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lumbar spine and 12.0% in the left femoral neck, with osteopenia occurring more commonly in the femoral neck compared to the spine [8]. A recent DXA study conducted in southern Bangladesh revealed diminished bone mineral density in older individuals at both the lumbar spine and femoral neck, with variations linked to demographic and clinical factors [9]. These results suggest that diminished bone mineral density is a significant local health issue, albeit its extent and distribution differ among study populations and skeletal locations.

Notwithstanding these findings, current research from Bangladesh explicitly detailing the prevalence of normal bone density, osteopenia, and osteoporosis at the lumbar spine and femur in postmenopausal women is scarce, especially within gynecology-focused tertiary-care groups. Site-specific prevalence estimates hold clinical significance as the ratio identified as osteopenic or osteoporotic in one skeletal area may vary from that in another. Consequently, the current investigation sought to ascertain the prevalence and distribution of osteoporosis and osteopenia in the lumbar spine and left femur of postmenopausal women visiting Dhaka Medical College Hospital.

METHODS & MATERIALS

Study Design: This was a hospital-based cross-sectional study conducted in the Department of Obstetrics and Gynaecology, Dhaka Medical College Hospital (DMCH), Dhaka, Bangladesh, over a 12-month period from June 2025 to July 2026. The study was designed to determine the prevalence and site-specific distribution of osteoporosis and osteopenia among postmenopausal women.

Study Population: The study included 117 postmenopausal women with a history of natural menopause who attended the Gynaecology outpatient department of DMCH during the study period. The age of participants ranged from 50 to 75 years.

Sample Size and Sampling Technique: A total of 117 eligible participants were included using a purposive sampling technique according to the predefined inclusion and exclusion criteria.

Selection Criteria: Postmenopausal women aged 50–75 years with natural menopause who were willing to participate were eligible. Women with surgical menopause, chronic renal disease, hypo- or hyperthyroidism, or current use of medications known to affect bone metabolism, including anticoagulants, anticonvulsants, corticosteroids, or hormone replacement therapy, were excluded. Women unwilling to participate were also excluded.

Data Collection Procedure: After obtaining informed consent, sociodemographic and clinical information, including age and parity, was collected using a structured questionnaire. Height and weight were measured using standard procedures. BMD of the lumbar spine and left femur was assessed by dual-energy X-ray absorptiometry (DXA), and T-scores were recorded. Skeletal status was classified according to standard T-score thresholds: normal BMD (T-score ≥ −1.0), osteopenia (−2.5 < T-score < −1.0), and osteoporosis (T-score ≤ −2.5). Data were checked for completeness and consistency before analysis.

Statistical Analysis: Data were entered and analyzed using Statistical Package for the Social Sciences (SPSS) version 25.0. Continuous variables were summarized as mean ± standard deviation (SD) and range, while categorical variables were presented as frequencies and percentages. The prevalence of normal BMD, osteopenia, and osteoporosis was described separately for the spine and left femur. Differences between the two skeletal sites were expressed as percentage-point differences. The denominator for site-specific percentages was the total sample (n=117).

Ethical Approval: Prior to commencement of the study, the research protocol was approved by the Research Review Committee and the Ethical Committee of Dhaka Medical College Hospital. All participants were informed about the nature, risks, and benefits of the study, and informed consent was obtained before enrollment. Permission was also obtained from the concerned department and institution.

RESULTS

A total of 117 postmenopausal women were included in the study. The results describe the participants' age, anthropometric characteristics, parity, and bone mineral density status at the lumbar spine and left femur. The distribution of normal BMD, osteopenia, and osteoporosis was compared between the two skeletal sites to identify site-specific patterns of bone loss.

Table I shows the age and anthropometric characteristics of the study participants. Among the 117 postmenopausal women, the largest proportion was aged 50–59 years, followed by those aged 60–69 years and those aged 70 years or above. The mean age was 59.1 ± 6.61 years, with an age range of 50–75 years. The mean height was 1.47 ± 0.06 m, while the mean body weight was 58.92 ± 11.45 kg.

Table I: Age and anthropometric characteristics of study participants

Variable	Category	n (%)	Mean ± SD	Range
Age (years)	50–59	54 (46.2)		
	60–69	49 (41.8)		
	≥70	14 (12.0)		
	Overall	117 (100.0)	59.1 ± 6.61	50–75
Height (m)	Overall	117	1.47 ± 0.06	1.31–1.61
Weight (kg)	Overall	117	58.92 ± 11.45	40–88

SD: standard deviation. Values are presented as n (%) or mean ± SD.

Table II presents the distribution of participants according to parity. Parity of four was the most common, followed by parity of five and three. Relatively fewer participants had parity of six or more. The mean parity was 4.4 ± 1.29, indicating that most participants had experienced multiple pregnancies.

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Table II: Distribution of participants according to parity

Parity	Number (n)	Percentage (%)
3	29	24.8
4	40	34.2
5	30	25.6
6	8	6.8
7	6	5.2
8	4	3.4
Total	117	100.0

Mean parity: 4.4 ± 1.29; range: 2–8.

Table III demonstrates the distribution of bone mineral density status at the lumbar spine and left femur. At the lumbar spine, osteoporosis was the most common BMD category, followed by osteopenia and normal BMD. In contrast, osteopenia was the most frequent finding at the left femur, followed by osteoporosis and normal BMD. These findings indicate a clear difference in the distribution of bone mineral density status between the two skeletal sites.

Table III: Distribution of bone mineral density status according to skeletal site

Skeletal site	Normal T-score, n (%)	Osteopenia, n (%)	Osteoporosis, n (%)	Total, n (%)
Spine	24 (20.5)	36 (30.8)	57 (48.7)	117 (100.0)
Left femur	28 (23.9)	54 (46.2)	35 (29.9)	117 (100.0)

Values are presented as n (%). Percentages were calculated using the total number of participants (n=117) as the denominator.

Table IV compares bone mineral density categories between the lumbar spine and left femur. Osteoporosis was more frequent at the spine than at the left femur, whereas osteopenia was more common at the left femur. Normal BMD showed only a small difference between the two skeletal sites. Overall, the findings demonstrate a distinct site-specific pattern, with greater osteoporotic involvement at the spine and a higher occurrence of osteopenia at the femur.

Table IV: Distribution of bone mineral density status according to skeletal site

BMD status	Spine, n (%)	Left femur, n (%)	Difference, percentage points
Normal	24 (20.5)	28 (23.9)	−3.4
Osteopenia	36 (30.8)	54 (46.2)	−15.4
Osteoporosis	57 (48.7)	35 (29.9)	+18.8
Total	117 (100.0)	117 (100.0)	

Values are presented as n (%). Percentages were calculated using the total number of participants (n=117) as the denominator.

DISCUSSION

Current study findings revealed a significant prevalence of diminished bone mass in 117 postmenopausal women, highlighting a notable variation in bone mineral density among the assessed skeletal locations. Osteoporosis was more prevalent in the lumbar spine, while osteopenia was more commonly detected in the left femur. Typical bone mineral density was hardly observed in both locations. These results suggest that skeletal degradation frequently occurs post-menopause and that its manifestation can differ significantly between the spine and femur.

The location-specific trend identified in this study aligns closely with recent findings from Bangladesh. Kha et al. indicated that osteoporosis was more prevalent in the lumbar spine, whereas osteopenia was more frequently observed in the femoral neck of postmenopausal women [8]. These results thus corroborate the consistent trend of increased osteoporotic impact on the spine and a prevalence of osteopenia at the femoral location. Variations in the extent of bone loss between studies may be attributed to disparities in referral settings, participant demographics, age distribution, selection criteria, and other unquantified risk factors.

Research conducted in India has also revealed a significant prevalence of decreased bone mineral density in postmenopausal women. Khinda et al. showed a significant prevalence of osteoporosis and osteopenia in postmenopausal women evaluated with DXA [10]. Similarly, Imran et al. reported significant bone degradation in a hospital-based cohort from Northern India [11]. Their location-specific results additionally indicated increased osteoporotic engagement of the lumbar spine and a heightened prevalence of osteopenia at the femoral neck [11]. This pattern aligns with the current research and underscores the necessity of assessing many skeletal locations in postmenopausal women.

Similar site-specific variance has been documented in additional groups. Abu Khurmah et al. noted that osteoporosis predominantly impacted the lumbar spine, while osteopenia was more prevalent at the femoral neck in postmenopausal women in Jordan [12]. This distribution closely mirrors the trend observed in the current investigation. Conversely, Hemmati et al. indicated a relatively diminished prevalence of site-specific osteoporosis within an Iranian demographic, despite the continued occurrence of reduced bone mass [13]. These disparities indicate that the overall prevalence of osteoporosis may range significantly among communities, even when employing comparable DXA-based diagnostic standards.

A prevalence of lumbar osteoporosis compared to hip osteoporosis has also been reported in Saudi Arabia. Al Zaid and colleagues illustrated a more pronounced osteoporotic impact on the lumbar spine compared to the hip, while also emphasizing the presence of diagnostic discrepancies among skeletal locations [14]. Evidence derived from population studies in China has similarly indicated that osteoporosis prevalence escalates with age among females [15]. Recent multicenter research from Saudi Arabia has revealed a significant prevalence of osteopenia and osteoporosis in postmenopausal women [16]. The relatively increased load noted in hospital research might indicate variations in referral practices,

inherent skeletal vulnerabilities, and participant criteria when contrasted with community-based or healthier cohorts.

This study was mostly descriptive and did not aim to identify independent predictors of osteoporosis. The majority of individuals fell among the earlier and mid postmenopausal age brackets, and there was typically a high level of parity. Prior research concerning the association between parity and bone mineral density has yielded contradictory findings. Imran et al. indicated a correlation between higher parity and increased osteoporosis risk [11], but Hakim and Hussein presented another trend in their multicenter research [16]. These divergent findings indicate that reproductive history must be considered alongside other critical factors influencing bone health, such as age, time elapsed since menopause, nutritional condition, body mass index, physical activity levels, vitamin D levels, medication history, and related clinical variables.

A significant advantage of the current research was the evaluation of bone mineral density at both the lumbar spine and left femur within the identical clinical cohort. This facilitated the comparison of site-specific skeletal patterns and illustrated that the extent of bone loss may vary among different anatomical locations. Nonetheless, some constraints must be recognized. The research was carried out at a singular tertiary medical facility, participants were chosen intentionally, and hence the results may not reflect the wider demographic of postmenopausal women in Bangladesh. Moreover, the descriptive framework failed to assess independent risk determinants, individual-level discrepancies between hip and spine diagnoses, or ensuing fracture results.

Notwithstanding these constraints, the research reveals a significant burden of diminished bone mineral density in postmenopausal women and underscores a notable disparity between lumbar spine and femoral engagement. The prevalence of osteoporosis in the spine and osteopenia in the femur suggests that depending on a solitary skeletal location may yield an inadequate evaluation of bone health. Assessment of both the lumbar spine and femur may thus yield a more thorough clinical evaluation of skeletal condition in postmenopausal females.

CONCLUSION

In postmenopausal women visiting Dhaka Medical College Hospital, diminished bone mass was prevalent and exhibited notable differences across skeletal locations. Osteoporosis impacted about fifty percent of subjects at the lumbar spine and approximately thirty percent at the left femur, while osteopenia was more prevalent at the femur. These results suggest that evaluating both axial skeletal locations offer a more comprehensive understanding of bone health than assessing either location independently. Considering the hospital-based, intentionally chosen sample, the figures should not be regarded as countrywide prevalence; rather, the significant percentage of reduced BMD highlights the necessity for enhanced clinical focus on osteoporosis evaluation and prevention among postmenopausal Bangladeshi women.

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