

## Quality of Life in Postmenopausal Women and Its Correlation with Bone Mineral Density

Minggam Pertin<sup>1</sup>, Romi Singh Nongmaithem<sup>2</sup>, C Zonunsanga<sup>3</sup>, Hmingthanmawii<sup>4</sup>, Chongreilen Chiru<sup>5</sup>, Yengkhom Jotin Singh<sup>6</sup>

### ABSTRACT

**Aim:** To evaluate the quality of life in postmenopausal women and its correlation with bone mineral density.

**Study design:** Cross-sectional study.

**Duration of the study:** October 2012 to September 2014.

**Settings:** Physical Medicine and Rehabilitation Department, Regional Institute of Medical Sciences, Imphal.

**Study population:** Postmenopausal women who attended the department during the study period.

**Materials and Methods:** Quality of life was assessed using WHOQOL-BREF questionnaire, a validated brief version of the WHOQOL-100. Bone mineral density (BMD) in the lumbar spine, femoral neck and trochanter were measured using dual energy x-ray absorptiometry (DEXA) scan – GE Lunar model.

**Results:** A total of 125 patients were studied. The mean t-scores in lumbar spine, femoral neck and trochanter were  $-2.550 \pm 1.209$ ,  $-1.831 \pm 0.921$  and  $-1.621 \pm 1.064$  respectively. The mean BMD (g/cm<sup>2</sup>) in lumbar spine, femoral neck and trochanter were  $0.867 \pm 0.144$ ,  $0.789 \pm 0.131$  and  $0.682 \pm 0.139$  respectively. The mean overall WHOQOL score was  $57.68 \pm 10.07$ . There were statistically significant positive association of WHOQOL score with the BMDs in lumbar spine, femoral neck and trochanter ( $p < 0.05$ ). Multivariate regression showed significant relation of overall WHOQOL score with BMD lumbar spine ( $b=0.229$ ;  $R^2=0.119$ ), BMD femoral neck ( $b=0.285$ ;  $R^2=0.129$ ), and BMD trochanter ( $b=0.245$ ;  $R^2=0.119$ ).

**Conclusion:** BMDs in the lumbar spine, femoral neck and trochanter had a positive correlation with quality of life scores. BMD also had a good predictive value in determining the quality of life in postmenopausal women.

**Key words:** Quality of life, postmenopausal women, osteoporosis, WHOQOL-BREF, bone mineral density.

### Introduction:

Osteoporosis is a disease of impaired mineralisation of bone leading to a decreased bone mineral density (BMD), low bone mass and deterioration in

the bone micro-architecture particularly trabecular bone thereby making the bone more fragile and prone to fractures<sup>1</sup>. Due to peri-menopausal decreased level of oestrogen, osteoclastic activity is increased due to increase level of tumour necrosis factor (TNF-alpha) and interleukins (IL-1 and IL-6) and thereby causing increased bone resorption. Low BMD along with many other risk factors such as poor nutrition, reduced lean and fat tissue, reduced physical activity, general frailty, poor balance and slowed gait speed have been known to increase the risk of fractures<sup>2</sup>.

Quality of life is defined as individual's perceptions of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns<sup>3</sup>. It refers to a subjective evaluation which is embedded in a cultural, social and environmental context and focuses on the respondent's perceived quality of life.

#### Authors' affiliation:

<sup>1</sup> MBBS, Post graduate trainee, PMR.

<sup>2</sup> MBBS, Diplomate NB(PM&R), MNAMS; Professor.

<sup>3</sup> MBBS, Post graduate trainee, PMR.

<sup>4</sup> MBBS, Post graduate trainee, PMR.

<sup>5</sup> MBBS, Post graduate trainee, PMR.

<sup>6</sup> MBBS, Post graduate trainee, PMR.

Department of Physical Medicine and Rehabilitation, Regional Institute of Medical Sciences, Imphal-795004

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#### Correspondence:

Dr Romi Singh Nongmaithem, Professor, Department of Physical Medicine and Rehabilitation, Regional Institute of Medical Sciences, Imphal, Manipur (India)-795004, Email: dr.romi.singh@gmail.com

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Low BMD has been correlated with the degree of skeletal pain pertaining to the daily activities of living. Postmenopausal women experience back pain both of lumbar and thoracic vertebral origin and experience sleep disturbance, frailty, weakness, difficulty with balance and difficulty in activities of daily living. These factors thus have a great impact on the overall quality of life<sup>4</sup>. Primary osteoporosis is a health issue with multi-dimensional involvement in the daily life activities due to pain, fatigue, depression or self image. These factors affect self dependence, and limit the walking ability and the activities of daily living and thereby largely affecting the quality of life<sup>5</sup>. Osteoporosis constitutes a problem not only for patients with osteoporosis but also for their families and the society as a whole. The approach to a patient suffering from osteoporosis has always been targeting symptomatic treatment of complaints and fracture prevention. Identifying and understanding the right factors which contribute to the disabilities will enable us make a management plan that would target not only on symptomatic management but on improvement of the overall quality of life of a person.

Studies on quality of life measures in postmenopausal women have been conducted elsewhere. Only few studies are available on the correlation between bone mineral density and quality of life in postmenopausal women. The present study was an attempt to find out the quality of life in postmenopausal women and its correlation with bone mineral density.

### **Materials And Methods:**

The study was a cross-sectional study and subjects were recruited from consenting postmenopausal women coming with various complaints of pain, attending the Department of Physical Medicine and Rehabilitation, Regional Institute of Medical Sciences, Imphal between October 2012 and September 2014. All the patients recruited for the study were subjected to clinical, laboratory, radiological examinations and questionnaires on quality of life. Approval of the Institutional Ethics Committee was taken before starting the study.

### **Exclusion criteria:**

Patients with history of secondary causes of osteoporosis like hyperthyroidism, hyperparathyroidism, mal-absorption, malnutrition and chronic liver diseases, patients currently on medications for osteoporosis and on corticosteroids, premenopausal hysterectomy, arthritic conditions like rheumatoid arthritis, patients

with cognitive impairment, unwilling patients and with chronic comorbid conditions such as metabolic bone diseases, heart disease, metastasis, stroke and vascular disease were excluded from the present study.

### **Quality of life (QOL):**

Besides clinical examination, quality of life of the patients was assessed using the WHOQOL-BREF, a brief version of World Health Organisation Quality of Life-100 questionnaire<sup>6</sup>. The WHOQOL-BREF is a set of 26 questions covering 24 facets of quality of life questions and the other 2 questions are of overall quality of life and general health. These 24 facets are incorporated into 4 domains – physical health, psychological health, social health and environmental health. A time frame of two weeks is indicated in the assessment. The domain scores are scaled in a positive direction from 0 to 100 and higher the score represents higher the quality of life of the individual.

### **Bone mineral density measurement:**

Bone mineral density measurements at lumbar spines (L1-L4 AP view), femoral neck and trochanter (in g/cm<sup>2</sup>) were assessed using DEXA scan (dual energy x-ray absorptiometry) – GE Lunar model. Evidence of osteoporosis and its severity according to WHO guidelines<sup>7</sup> were evaluated from the t-score values in the DEXA scan report in the following manner:

- Normal:  $\geq -1$
- Osteopenia:  $-1$  to  $-2.5$
- Osteoporosis:  $\leq -2.5$

### **Statistical analysis:**

Data collected from the clinical examination, DEXA scan, laboratory investigations and WHOQOL-BREF scores were entered in microsoft excel and analysed using SPSS version 16. Independent sample t test was applied to compare the means of overall WHOQOL scores in relation to the t-scores in the lumbar spine, femoral neck and the trochanter. Pearson's correlation was applied to determine the correlation between the WHOQOL scores in each domain and BMD. Regression analysis of the WHOQOL scores and the BMD were done to find out the R<sup>2</sup> value. A p-value of  $<0.05$  was taken as statistically significant for all statistical tests.

### **Results And Observations:**

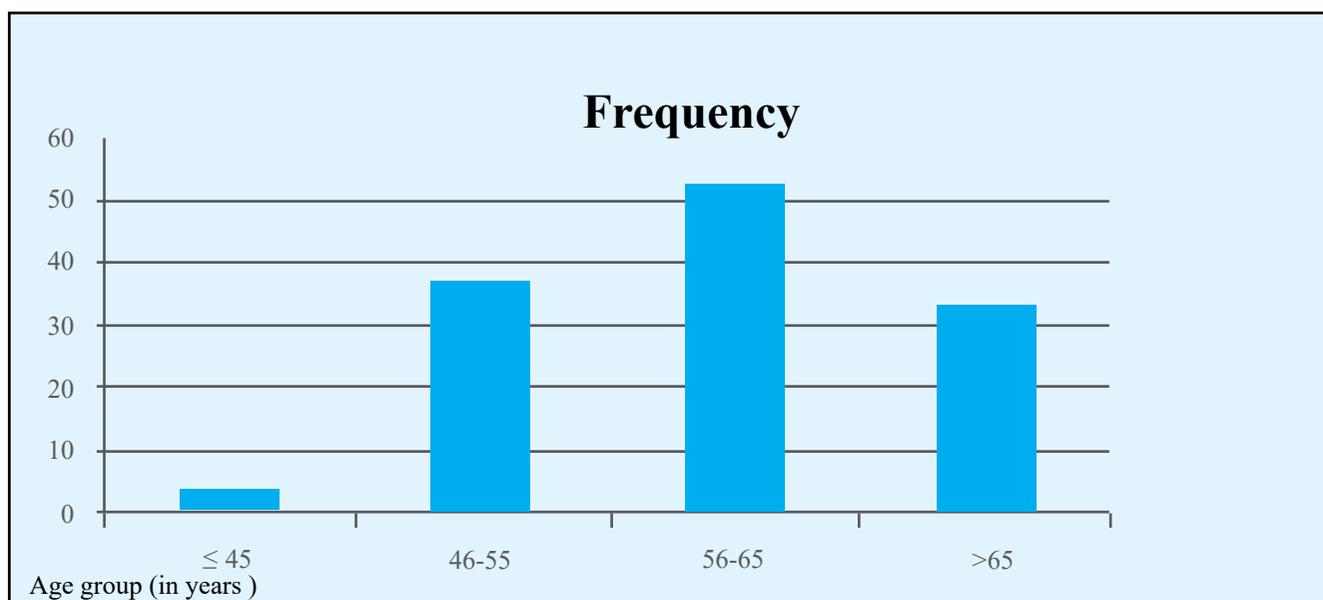
There were a total of 125 postmenopausal women included in the study. Table 1 shows the demographic profile of the study population. The mean age of the

patients was  $60.02 \pm 9.223$  years. Seventy-four (59.2 %) patients had reported with the complaints of low back pain followed by 22 patients (17.6 %) with knee pain. Back pain and knee pain comprised a total of 96 patients (76.8%). The mean duration of illness was  $16.98 \pm 14.61$  months (range 1-60 months). Fig1 shows the age group distribution; 53 women (42.4%) were in

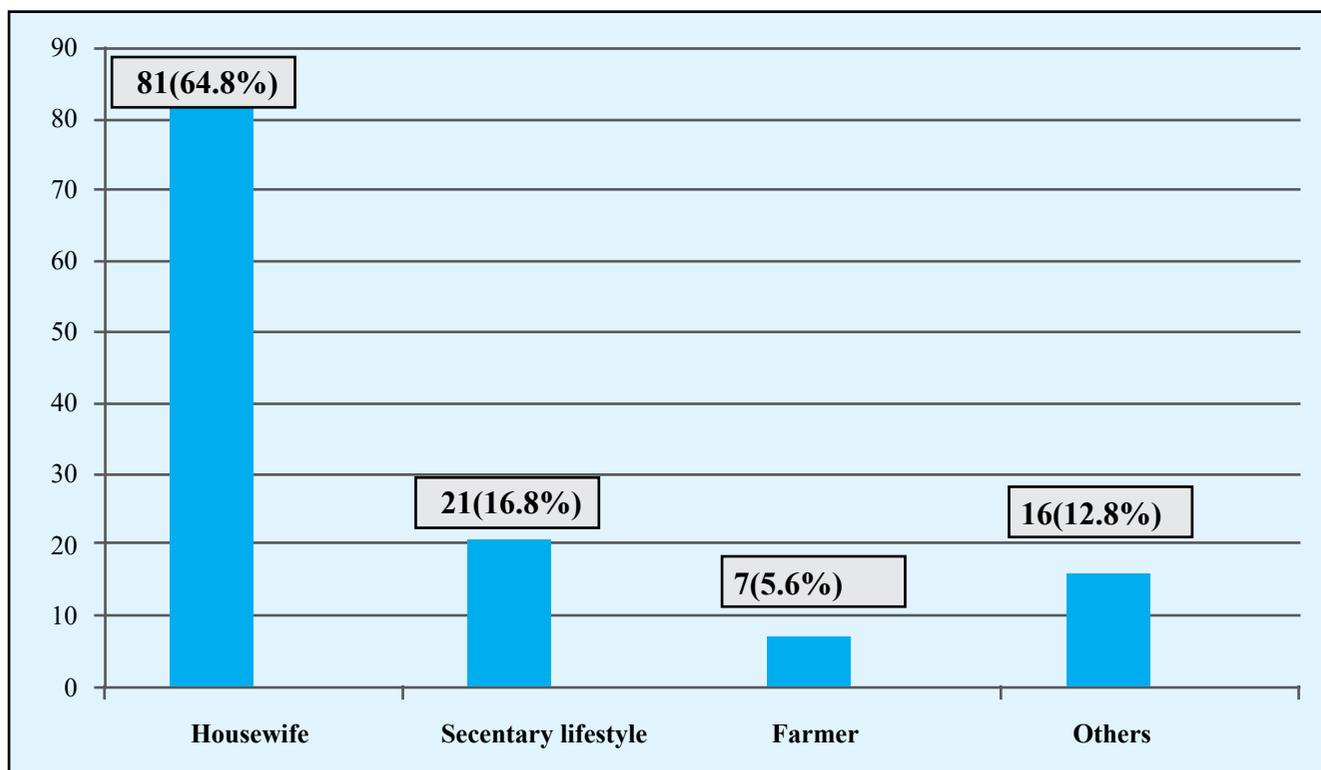
the 56-65 years age group, 36 (28.8%) women were in the 46-55 years and 32 (25.6%) women were in the age group more than 65 years. Fig 2 shows the occupation-wise distribution among the study population; 81 women (64.8%) were housewives, 21 (16.8%) had a sedentary lifestyle. Twenty-nine patients (23.2%) among the study population reported previous history of fracture.

**Table 1-** Demographic Profile of the Study Subjects (n=125)

Variables	Rank (mean $\pm$ SD)	No. of cases	Percentage
Age ( in years)	60.02 $\pm$ 9.223		
Agewise distributions (in years)	$\leq 45$	4	3.2
	46-55	36	28.8
	56-65	53	42.4
	>65	32	25.6
Complaints	Back pain	74	59.2
	Knee pain	22	17.6
	Neck pain	17	13.6
	Others	12	9.6
Duration of complaints ( in months)	1-60 (16.98 $\pm$ 14.61)		



**Fig 1 :** Agewise Distribution of Cases



**Fig 2:** Occupationwise Distribution of the Cases

**Table 2 -** Showing the Mean t-scores and Mean BMD at Lumbar Spine (LS), Femoral Neck (FN) and Trochanter (TR)

Site	Mean t-score	Mean BMD (g/cm <sup>2</sup> )
LS	-2.550 ± 1.209	0.867 ± 0.144
FN	-1.831 ± 0.921	0.789 ± 0.131
TR	-1.621 ± 1.064	0.682 ± 0.139

Table 2 shows the mean t-scores and the mean BMDs (in g/cm<sup>2</sup>). The mean t-scores in the lumbar spine, femoral neck and trochanter were -2.550 ± 1.209, -1.831 ± 0.921 and -1.621 ± 1.064 respectively. Similarly, the mean BMD in the lumbar spine, femoral neck and trochanter were 0.867 ± 0.144, 0.789 ± 0.131 and 0.682 ± 0.139 in (gms/cm<sup>2</sup>) respectively.

Overall WHOQOL score and WHOQOL scores in different domains:

Table 3 shows the WHOQOL scores of the study group. The WHOQOL score was grouped into 2 sub-groups viz, those with score of < 50 and score of ≥ 50. All 4 domains were scored from 0 to 100. Domain 1, i.e. the physical domain had a mean score of 48.04 ± 13.53 within a score range of 19 to 81. Out of the 125 women, 63 women (50.4%) scored < 50. Domain 2, i.e. the

psychological domain had a mean score of 58.50 ± 10.02 within a score range of 38 to 88, 107 women (85.6%) had a score of ≥ 50. Domain 3, i.e. the social domain had a mean score of 59.38 ± 9.59 within a score range of 31 to 75 and 119 (95.2%) women had a score of ≥ 50. Domain 4, i.e. the environmental domain had a mean score of 68.88 ± 9.10 within a score range of 38 to 81 and 121 women (96.8%) had a score of ≥ 50. The overall WHOQOL score was computed by taking an average of scores of all the domains and overall WHOQOL mean score was found to be 57.68 ± 10.07. Overall, 28 women (22.4%) had an overall WHOQOL score < 50 and 97 women (77.6%) had a score ≥ 50.

Relationship between mean overall WHOQOL score and t-scores in lumbar spine, femoral neck and trochanter:

Table 4 shows that the mean overall WHOQOL score was higher in the osteopenic group in comparison to the osteoporotic group in the lumbar spine, femoral neck and trochanter. In the osteopenic group, the mean WHOQOL score was 60.22 ± 9.08, 58.61 ± 8.64 and 58.93 ± 8.72 in the LS, FN and TR respectively. In the osteoporotic group, the mean WHOQOL score was 54.64 ± 10.43, 54.63 ± 13.54 and 52.68 ± 13.34 in the LS, FN and TR respectively. The associations were statistically significant in the lumbar spine and the trochanter only (p < 0.05).

**Table 3 - Overall WHOQOL Score and Domainwise WHOQOL Scores**

Variables		WHOQOL score			
		< 50		≥ 50	
	Mean	Frequency	Percentage	Frequency	Percentage
Overall WHOQOL	57.68±10.07	28	22.4	97	77.6
WHOQOL Domain 1	48.04±13.53	63	50.4	62	49.6
WHOQOL Domain 2	58.50±10.02	18	14.4	107	85.6
WHOQOL Domain 3	59.38±9.59	6	4.8	119	95.2
WHOQOL Domain 4	68.88±9.10	4	3.2	121	96.8

**Table 4 - Showing the Relationship of the Mean WHOQOL Score to the Mean t-scores in Lumbar Spine, Femoral Neck and Trochanter**

t-score	LS		FN		TR	
	Mean WHOQOL	p	Mean WHOQOL	p	Mean WHOQOL	p
≥ -2.5	60.22±9.08	0.02	58.61±8.64	0.06	58.93±8.72	0.005
< -2.5	54.64±10.43		54.63±13.54		52.68±13.34	

**Table 5 - Association between BMD in Lumbar Spine (LS), Femoral Neck (FN) and Trochanter (TR) with WHOQOL Scores in the Domain 1,2,3,4 and overall WHOQOL**

BMD	LS		FN		TR	
	r	p	r	p	r	p
WHOQOL Domain1	0.261	0.003	0.209	0.020	0.157	0.081
WHOQOL Domain 2	0.227	0.011	0.229	0.010	0.248	0.005
WHOQOL Domain 3	0.230	0.010	0.228	0.010	0.220	0.014
WHOQOL Domain 4	0.260	0.003	0.274	0.002	0.276	0.002
Overall WHOQOL	0.272	0.002	0.307	0.000	0.275	0.002

**Table 6 - Multivariate Regression Analysis of BMD Lumbar Spine, Femoral Neck and Trochanter with the Overall WHOQOL after Adjusting for BMI, Age and Fracture History**

Variable	B	p value	R2 (df); F
BMD LS	0.229	0.033	0.119 (4,120); 4.068
BMD FN	0.285	0.015	0.129 (4,120); 4.447
BMD TR	0.245	0.035	0.119 (4,120); 4.036

Relationship between BMD (g/cm<sup>2</sup>) in lumbar spine, femoral neck and trochanter with overall WHOQOL score and WHOQOL scores in different domains:

Table 5 shows the correlation between BMD in lumbar spine, femoral neck and trochanter with overall WHOQOL and WHOQOL scores in the domain 1, 2, 3 and 4 as depicted by the Pearson's correlation coefficient (r) and p-values. It clearly shows that there was a positive correlation of BMD in the lumbar spine, femoral neck and trochanter with overall WHOQOL and WHOQOL scores in all the 4 domains. The correlations

were statistically significant (p-value < 0.05) except for the correlation between BMD in trochanter and the physical health domain.

As shown in Table 6, multivariate regression analysis of the overall WHOQOL score with the BMDs, after adjusting confounding factors like age, BMI and fracture history, showed statistically significant regression coefficients (p < 0.05). BMD lumbar spine had a predictive value of 11.9% in contributing to the quality of life. Similarly, BMD femoral neck and trochanter had predictive values of 12.9% and 11.9% respectively.

## Discussion:

In the study, WHOQOL (0-100) score of the WHOQOL-BREF questionnaire was taken as the score for reference. As per the scores, participants were grouped into poor score (< 50) and good score ( $\geq 50$ ).

It was observed that most of the patients i.e. 97 patients (77.6%) had a score of  $\geq 50$  with a mean score of  $57.68 \pm 10.07$  in the overall WHOQOL score. Physical health domain was the most affected domain with a mean score of  $48.04 \pm 13.53$ . Psychological health, social health and environmental health domains were less affected in the study population with mean scores of  $58.50 \pm 10.02$ ,  $59.38 \pm 9.59$  and  $68.88 \pm 9.10$  respectively. This finding was similar to the study done by Kotz *et al*<sup>8</sup>, which was a longitudinal follow up study on a cohort of 1,171 aged women in an attempt to analyse the quality of life outcomes of osteoporosis. They observed that measures of physical health like greater risk for frailty (OR= 1.96), difficulty with frailty (OR= 2.77) and problems with ADL (OR= 3.37) were most affected.

Lai *et al*<sup>9</sup> studied the quality of life of 46 postmenopausal women with back pain and 42 postmenopausal women without back pain, using quality of life questionnaire of the European foundation for osteoporosis (QUALEFO). They observed that quality of life was significantly correlated with back pain (r range 0.50-0.90;  $p < 0.0001$ ). In our study also, it was found that the physical health was the most affected domain. Overall WHOQOL score was found to be better than the physical health score. It might be because of the effect of the other domains especially the social and environmental health domains, in contributing to the overall general well being of the individual.

On comparing the means of the WHOQOL scores in relation to the t-scores, it was observed that the mean WHOQOL score in all the domains as well as the overall WHOQOL score were higher in the osteopenic group in comparison to the osteoporotic group at all sites. This finding was similar to the study by Bruyere *et al*<sup>10</sup> in which they observed a better HRQOL (health related quality of life) scores in osteopenic group compared to the osteoporotic group. In the study by Berkemeyer *et al*<sup>11</sup> on 440 participants, they found that t-scores had a significant association with functional measures like activities of daily living (95.3 CI, 94.5 - 96.2;  $p < 0.05$ ), instrumental activities of daily living (7.3 CI, 7.2 - 7.5;  $p < 0.05$ ) and Timed Up and Go test (10.7 CI, 10.0 - 11.3;  $p < 0.05$ ). The present study also found a significant association between overall WHOQOL score and t-scores in the lumbar spine and trochanter

( $p < 0.05$ ) though we did not find significant association of WHOQOL score with the t-score in femoral neck.

The study observed a significant association of the BMDs at lumbar spine, femoral neck and trochanter with the WHOQOL scores in all domains (r range 0.227 to 0.274;  $p < 0.05$ ) but we did not find any significant association between BMD trochanter and the WHOQOL score in the physical health domain (r = 0.157;  $p < 0.081$ ). We also observed a significant association of the BMDs at lumbar spine, femoral neck and trochanter with the overall WHOQOL score (r range 0.272 to 0.307;  $p < 0.05$ ). This finding was also in agreement with the study of Bruyere *et al*<sup>10</sup>. In a 3 years follow up study on a population of 1838 postmenopausal osteoporotic women to study the relationship of BMD and HRQOL, they observed a weak but significant positive association between lumbar BMD and HRQOL scores measured with QUALIOST.

Lindsey *et al*<sup>12</sup>, also conducted a cross-sectional study on 116 healthy postmenopausal women who were not under any medication known to affect the bone including hormone replacement therapy. They observed that measures of physical performance like normal step length, brisk step length, normal gait speed, brisk gait speed, etc, were significantly correlated with BMDs at lumbar spine, femoral neck and trochanter (r range 0.19 to 0.38;  $p < 0.05$ ). In our study, we also observed that WHOQOL score in the physical health was significantly correlated with BMD at lumbar spine (r = 0.261;  $p < 0.05$ ) and femoral neck (r = 0.209;  $p < 0.05$ ).

The predictive value of BMDs at lumbar spine, femoral neck and trochanter in influencing or contributing to the quality of life were analysed using a multivariate regression after adjusting confounding factors like age, BMI and fracture history. The regressions were found to be statistically significant ( $R^2$  range 0.119 to 0.129;  $p < 0.05$ ). BMD lumbar spine had a 11.9% predictive value in contributing to the quality of life. Similarly, BMD femoral neck and trochanter had predictive values of 12.9% and 11.9% respectively. This was in contrast to the study by Bruyere *et al*<sup>10</sup>, in which the multivariate regression after adjusting for age, BMI and prevalent fractures, showed no significant relationship of quality of life scores with the BMDs at both lumbar spine and femoral neck. This could probably be due to the reason that their study had excluded subjects with a history of fracture within three years and moreover all participants were prescribed a good calcium diet. In the present study, we had neither taken into consideration fracture duration nor the dietary calcium intake records.

The present study also showed similar observations with the study by Lindsey *et al*<sup>12</sup>. Multiple regression model

analysis, after adjusting for BMI, hours of total activity, total calcium intake and age of menarche, showed significant association of the physical performance measures and BMD at lumbar spine, femoral neck and trochanter (R<sup>2</sup> range 0.11 to 0.24;  $p < 0.05$ ). The findings were in agreement with the present study findings (R<sup>2</sup> range 0.119 to 0.129;  $p < 0.05$ ). The study indicates that the BMDs, with their positive associations with the WHOQOL scores, in fact have a part in predicting the quality of life of postmenopausal women.

There are some limitations which may be inherent to this study. One limitation was that this study had a small sample size ( $n=125$ ). Another limitation of this study was of it being a cross-sectional study which was conducted on patients who had consulted a tertiary health institute and it might not have included the rural population at large and the results cannot be generalised to the whole ethnic population. There was also a problem regarding answering on certain questions especially on the social health issues viz, on personal relationships and sexual activity. As all the participants were postmenopausal women and most of them had some degree of reluctance in answering questions pertaining to personal / sexual relationship which may be due to personal or social reasons.

### Conclusions:

From the present study it was observed that quality of life in postmenopausal women had a positive association with bone mineral density. The predictive values of the bone mineral density measured at the lumbar spine, femoral neck and trochanter in determining the quality of life were found to be significant. Management of osteoporosis mainly targets on symptomatic treatment, fracture risk prevention, minimisation of functional disabilities and improvement of the quality of life. Addressing the measures to improve the bone mineral density would improve the physical health in postmenopausal women and thereby may improve the quality of life in such population.

Properly designed population based studies which will represent the whole ethnic community would be desirable to confirm our findings. Further studies are required in this regard but nevertheless, this study has been successful in observing that though osteoporosis is a disease of low bone mineral density, there are also other important factors that might have influence on the quality of life of an individual.

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