



The Effect of Back Pain on Quality of Life, Sleep Quality and Depression in Patients with Postmenopausal Osteoporosis

Postmenopozal Osteoporozlu Hastalarda Sırt Ağrısının Yaşam Kalitesi, Uyku Kalitesi ve Depresyon Üzerine Etkisi

Sema Haliloğlu, Hülya Uzkeser*, Afıtap İçağasioğlu**

İstanbul Occupational Diseases Hospital, Department of Physical Medicine and Rehabilitation, İstanbul, Turkey

*Erzurum Regional Research and Training Hospital, Department of Physical Medicine and Rehabilitation, Erzurum, Turkey

**Medical Faculty, Medeniyet University, Department of Physical Medicine and Rehabilitation İstanbul, Turkey

Summary

Objective: This study aimed to assess the effects of back pain on the quality of sleep, quality of life and depression in patients with postmenopausal osteoporosis. We also evaluated the relationship between bone mineral density (BMD) and these parameters.

Materials and Methods: One hundred and five patients diagnosed with postmenopausal osteoporosis were included in this study. The patients were evaluated on the Quality of Life Questionnaire of the European Foundation for Osteoporosis (QUALEFFO-41), the Beck Depression Inventory (BDI) and the Pittsburgh Sleep Quality Index (PSQI). The intensity of back pain was evaluated using the visual analog scale (VAS).

Results: Patients ranged in age from 46 to 75, with a mean age of 61.16±7.59. As pain scores increased, depression scores increased and sleep quality and quality of life were impaired ($p<0.01$). There were strong positive correlations among depression, sleep quality and quality of life ($p<0.01$), but we did not find significant correlations among lumbar spine (L1-L4) T-scores, L1-L4 BMD values, VAS, PSQI total scores, QUALEFFO-41 total scores and BDI scores.

Conclusion: High pain scores in postmenopausal patients may be related to low quality of sleep and of life, and depression. Depression, sleep disorder and low quality of life may affect each other. Treating back pain, a frequent symptom in postmenopausal osteoporosis patients, may produce favorable effects on quality of sleep and life and on depression, as well as basic management. (Turkish Journal of Osteoporosis 2014;20: 6-9)

Key words: Pain, depression, postmenopausal osteoporosis, quality of sleep, quality of life

Özet

Amaç: Bu çalışma, postmenopozal osteoporozlu hastalarda sırt ağrısının uyku kalitesi, yaşam kalitesi ve depresyon üzerine etkilerini değerlendirmeyi amaçladı. Ayrıca biz kemik mineral yoğunluğunu (KMY) ile bu değişkenlerin ilişkilerini de değerlendirdik.

Gereç ve Yöntem: Araştırmaya postmenopozal osteoporoz tanısı alan 105 hasta dahil edildi. Hastalar Avrupa Osteoporoz Derneği Yaşam Kalitesi Anketi (QUALEFO-41), Beck Depresyon Ölçeği (BDÖ) ve Pittsburgh Uyku Kalite İndeksi (PUKİ) ile değerlendirildi. Sırt ağrısının şiddeti Görsel Analog Ölçek (VAS) kullanılarak değerlendirildi.

Bulgular: Hastaların yaş aralığı 46 ile 75 arasında olup ortalama 61,16±7,59 idi. Ağrı skorları arttıkça depresyon skorları da artmakta ve uyku kalitesi ve yaşam kalitesi kötüleşmekteydi ($p<0,01$). Depresyon, uyku kalitesi ve yaşam kalitesi arasında güçlü pozitif korelasyon vardı ($p<0,01$). Ancak Lomber vertebra (L1-L4) T-skorumları ve L1-L4 BMD değerleri ile VAS, toplam PUKİ skoru, QUALEFO-41 toplam skoru ve BDÖ skorları arasında korelasyon bulamadık.

Sonuç: Postmenopozal osteoporozlu hastalarda yüksek ağrı skorları düşük uyku ve yaşam kalitesi ve depresyon ile ilişkili olabilir. Depresyon, uyku bozukluğu ve düşük yaşam kalitesi birbirini etkileyebilir. Postmenopozal osteoporozlu hastalarda temel tedavinin yanında sık bir yakınma olan sırt ağrısının tedavi edilmesi, uyku ve yaşam kalitesi ve depresyon üzerinde olumlu sonuçlar sağlayabilir. (Türk Osteoporoz Dergisi 2014;20: 6-9)

Anahtar kelimeler: Ağrı, depresyon, postmenopozal osteoporoz, uyku kalitesi, yaşam kalitesi

Introduction

Osteoporosis is the most commonly observed metabolic bone disease in the world, and is a public health issue with an ever increasing incidence rate (1,2). It causes remarkable functional disabilities leading to severe clinical results such as pain, deformity, loss of function and risk of fracture, and also impairs quality of life (3,4). Psychological changes, especially depression, may be seen in patients with osteoporosis as in other chronic, painful, disabling diseases. Sleep, stress, and chronic pain perception are interactive factors (5).

Pain is an unpleasant feeling that originates from a certain part of the body and prevents the experience of pleasure in life. In osteoporosis, repetitive micro-fractures that develop as a result of the increase in bone resorption in the vertebrae may result in pain. Micro-fractures play a role in chronic pain by causing impairment in vertebral mechanics, improper posture, strain, contraction and compression in soft tissues, and facet joint dysfunction (6,7). Endogenous substances such as serotonin, histamine, and quinine that are secreted secondary to soft tissue injuries also contribute to the development of pain.

Various studies have reported conflicting results about the relationship between osteoporosis and pain or quality of life. However, to the authors' knowledge, this is the first study to investigate the relationship between bone mineral density (BMD) values and quality of sleep and pain in patients with postmenopausal osteoporosis.

Materials and Methods

We evaluated 115 patients for this study. Ten of them met our exclusion criteria and were dropped from the study. The remaining 105 patients were diagnosed with postmenopausal osteoporosis and had been admitted to the osteoporosis outpatient clinic of Medeniyet University. Informed consent was obtained from all patients before the study commenced. The local Ethics Committee approved the study, which was carried out in compliance with the principles of the Helsinki Declaration. Patients' demographic data were recorded. A diagnosis of postmenopausal osteoporosis was established according to clinical evaluation, anteroposterior and lateral spinal x-rays, BMD measurements of the lumbar vertebrae, and laboratory findings. Patients who were in menopause for at least a year, and those with BMD values 2.5 SD lower than that of young adult values (using the DXA (Hologic QDR 2000) technique), were included in the study. Spinal radiographs of patients who were included in the study, there was no compression fractured and advanced degenerative changes. Those with mental problems which prevented communication, and those with a history of malignancy or other disorders impairing bone metabolism (multiple myeloma, Paget's disease, osteomalacia, or renal osteodystrophy) were excluded from the study.

Severity of Back Pain

This was evaluated using the visual analogue scale (VAS; 0-100 mm). Patients were informed about this 10 cm line scale and what the numbers meant, and were asked to mark the intensity of back pain during daily activities. No pain was scored as 0, moderate pain as 5, and the most severe pain experienced in life as 10 points.

Quality of Life

The Quality of Life Questionnaire of the European Foundation for Osteoporosis (OUALEFFO), adapted for the Turkish population and tested for validity and reliability, was used for evaluation (8). This questionnaire is composed of a total of 41 questions with 5 subscales: pain (5 questions), physical functions (17 questions), social functions (7 questions), general health evaluation (3 questions), and mental functions (9 questions). Total scores and subscale scores of 0 indicate wellbeing, whereas scores of 100 indicate an unfavorable state of health.

Depression

This was evaluated using the Beck depression inventory (BDI) (9). The BDI is a questionnaire comprising 21 items; patients are asked to choose the sentence that best describes them. The highest score is 63. The scores are defined as: 0-16 points, normal; 17-27, mild depression; 28-34, moderate depression; and 35-63, severe depression.

Quality of Sleep

The Pittsburgh Sleep Quality Index (PSQI) has self-validity, is repeatable and reliable, and has been validated in Turkish (10). Eighteen questions from a total of 24 are included in the evaluation, and these determine sleep period, sleep latency, and the frequency and severity of special problems related to sleep. It has a total score between 0 and 21 points. PSQI scores of 5 and above indicate an unfavorable sleep quality.

These measurement methods were applied by the physician at an osteoporosis outpatient clinic. The NCSS (Number Cruncher Statistical System) 2007 & PASS 2008 Statistical Software (Utah, USA) were used for analyses. Descriptive statistics (mean, standard deviation) were used to evaluate the quantitative data. Spearman's rho correlation coefficients were used to analyze relationships between the parameters. The significance level was set at $p < 0.05$.

Results

Patients ranged in age from 46 to 75 with a mean of 61.1 ± 7.59 . Demographic and clinical characteristics of the patients are presented in Table 1.

There were no significant relationships between the Lumbar spine (L1-L4) T-scores and the L1-L4 BMD values with VAS, PSQI total score, QUALEFFO-41 total score, and BDI score (Table 2). However, there were significant positive correlations between the VAS scores and the PSQI total score, QUALEFFO-41 total score, and BDI (Table 3).

There was a significant positive correlation between PSQI total scores and BDI scores ($r=0.496$; $p<0.01$). There was also a significant positive correlation between PSQI total scores and QUALEFFO-41 total scores ($r=0.484$; $p<0.01$). In addition, a significant positive correlation was found between BDI scores and QUALEFFO-41 total scores ($r=0.699$; $p<0.01$).

Discussion

Although osteoporosis concerns the whole population, it is frequently observed in old age, particularly in postmenopausal women. It is a progressive bone disease with a multi-factorial etiology, and may affect quality of life (11,12). Age, body mass

index, level of education, menopausal periods, pain, disease condition, level of physical activity, and vertebral deformities evaluated by radiography were found to be related to quality of life (3,4,13). Pain in osteoporosis occurs mainly due to an increase in bone resorption and bone fragility, macro- or micro-fractures in vertebral bodies, and shortness in soft tissues consequent to bone deformities such as increased kyphosis. Lumbar and/or back pain was found to be the main complaint, according to an examination of the questionnaires on life quality and the cause of outpatient clinic admission (4,13).

The most prominent problems in osteoporosis patients are difficulty in daily routine activities, decreased functionality, and symptoms of depression such as feelings of hopelessness, worthlessness, and even social isolation (14). The relationship between pain and sleep is complex in people with chronic pain. Pain may decrease sleep quality, or low sleep quality may increase the intensity of pain. It is well established that the deficiency of non-rapid eye movement (NREM sleep; phase 4) causes musculoskeletal pain in most healthy people (14). The literature shows several studies on the relationship between painful syndromes and sleep (13-20). Marin et al. and Alsaadi et al. both found that sleep quality in patients with chronic lumbar pain was compromised (15,16). We also found a positive correlation between pain and sleep quality in this study. However, we have encountered only one study that investigated the relationship between osteoporosis and sleep quality in postmenopausal patients (17). In that study, 59 patients were evaluated using the PSQI. In the osteoporotic postmenopausal patient group, sleep latency and duration as a subcomponent of PSQI were significantly different from the control group. The study investigated the effects of osteoporosis on sleep compared with healthy controls. However, the relationship between level of osteoporosis in terms of BMD values and sleep was not evaluated. We investigated the correlation between BMD values and sleep quality and found no significant relationship. We hypothesized that a decrease in quality of sleep was not associated with osteoporosis itself, but that pain caused by various factors in osteoporosis can lead to decreased quality of sleep.

Another difference in our study was that it was carried out on a larger patient population and evaluated the correlation between DXA and PSQI. However, one limitation of our study was the absence of a control group.

Some studies have evaluated pain and sleep in osteoporosis patients (13,21). In one study, the group under subcutaneous calcitonin treatment, compared to the placebo group, showed a significant improvement in back pain scores measured by VAS, and also showed improvement in all subgroups of the Nottingham Health Profile (NHP) (13). In the present study, the relationship between pain and sleep quality was consistent with the literature.

Chronic pain causes unfavorable psychological homeostasis, decreased quality of life, increased loss of functionality, and difficulties in interpersonal relationships (22). In patients

Table 1. Demographic and clinical values in patients with osteoporosis

	Mean±SD
Age of menopause (year)	45.69±5.90
Duration of menopause (month)	15.30±8.85
L1-L4 T-score	-3.01±0.52
L1-L4 BMD score (gr/cm ²)	0.79±0.08
VAS	4.42±3.09
PSQI	6.98±4.42
BDI	13.89±8.82
QUALEFFO-41	32.40±15.50

SD: standard deviation, BMD: bone mineral density, VAS: visual analogue scale, PSQI: The Pittsburgh Sleep Quality Index, BDI: Beck Depression Inventory, QUALEFFO-41: The Quality of Life Questionnaire of the European Foundation for Osteoporosis

Table 2. Correlation of L1-L4 BMD score and score with PSQI, BDI, QUALEFFO-41 and VAS

	L1-L4 T-score		L1-L4 BMD score	
	r	p	r	p
PSQI	-0.054	0.603	-0.012	0.13
QUALEFFO-41	-0.143	0.164	-0.134	0.228
BDI	-0.135	0.190	0.099	0.373
VAS	-0.012	0.910	-0.033	0.768

PSQI: The Pittsburgh Sleep Quality Index, QUALEFFO-41: The Quality of Life Questionnaire of the European Foundation for Osteoporosis, BDI: Beck Depression Inventory, VAS: visual analogue scale

Table 3. Correlation of VAS with PSQI, BDI and QUALEFFO-41

VAS	r	p
PSQI	0.297	0.002**
QUALEFFO-41	0.450	0.001**
BDI	0.429	0.001**

Spearman's rho Correlation analysis ** $p<0.01$
VAS: visual analogue scale, PSQI: The Pittsburgh Sleep Quality Index, QUALEFFO-41: The Quality of Life Questionnaire of the European Foundation for Osteoporosis, BDI: Beck Depression Inventory

with chronic pain, the most frequent psychological condition is depression; the frequency of depression in the general population is 5-8%, while it is between 30% and 54% in patients with chronic pain (23). The present study found that the depression level of patients with severe pain was even higher. Pain, depression, and impaired sleep quality affect the individual's quality of life. Many studies have supported the hypothesis that quality of life in patients with osteoporosis is lower than in control groups (24,25). Even a diagnosis of osteoporosis can lead to negative feelings, such as fear of possible fractures and falls. In the present study, we found that as pain scores increased, quality of life deteriorated. Another finding from the present study was that when pain scores increased, depression scores also increased, and sleep and life quality deteriorated. Furthermore, strong positive correlations were found among depression, sleep quality, and quality of life. As sleep quality decreased, quality of life also deteriorated, and the level of depression increased. We observed that as the level of depression increased, patients' quality of life decreased. These findings were consistent with the literature. However, further controlled studies investigating the relationship between DXA values and quality of life in osteoporosis are needed.

Conflict of interest: None

References

1. Consensus Development Conference: Prophylaxis and treatment of osteoporosis. *Am J Med* 1991;90:107-10.
2. Ellerington MC, Hillard TC, Whitcroft SI, Marsh MS, Lees B, Banks LM, et al. Intranasal salmon calcitonin for the prevention and treatment of postmenopausal osteoporosis. *Calcif Tissue Int* 1996;59:6-11.
3. Lombardi I, Oliveria L, Monteiro CR, Confessor YQ, Barros TL, Natour J. Evaluation of physical capacity and quality of life in osteoporotic women. *Osteoporos Int* 2004;15:80-5.
4. Lips P, van Schoor NM. Quality of life in patients with osteoporosis. *Osteoporosis Int* 2005;16:447-55.
5. McCracken LM, Iverson GL. Disrupted sleep patterns and daily functioning in patients with chronic pain. *Pain Res Manage* 2002;7:75-9.
6. Silverman SL. The clinical consequences of vertebral compression fracture. *Bone* 1992;13 (Suppl 2): 27-31.
7. Ryan PJ, Evans P, Gibson T, Fogelman I. Osteoporosis and chronic pain: A study with single photon emission computed tomography bone scintigraphy. *Bone Miner Res* 1992;7:1455-60.
8. Koçyigit H, Gülseren S, Erol A, Hizli N, Memis A. The reliability and validity of Turkish version of quality of life questionnaire of the European Foundation for Osteoporosis (QUALEFFO). *Clin Rheumatol* 2003;22:18-23.
9. Beck AT, Ward CH, Mendelson M, Mock J, Erbaugh J. An inventory for measuring depression. *Arch Gen Psychiatry* 1961;4:561-571.
10. Agargun MY, Kara H, Anlar Ö. Validity and reliability of the Pittsburgh Sleep Quality Index in Turkish sample. *Turkish Journal of Psychiatry* 1996; 7:107-15. (Internet) Available from: http://www.psikiyatridizini.org/viewarticle.php?article_id=2668. Accessed: 26.6.2013.
11. Hamerman D. Considerations of osteoporosis prevention in an aging society. *Maturitas* 2000;37:69-73.
12. Esenyel M, Ozen A, Esenyel CZ, Rezvani A, Sariyildiz MA, Ergin O. Hip structural changes and fracture risk in osteopenia and osteoporosis. *Eurasian J Med* 2011; 43(2): 73-8 (Internet) Available from: <http://www.eajm.org/sayilar/179/buyuk/73-8.pdf>. Accessed: 26.6.2013.
13. Ofloğlu D, Akyüz G, Unay O, Kayhan O. The effect of calcitonin on beta-endorphin levels in postmenopausal osteoporotic patients with back pain. *Clin Rheumatol* 2007;26:44-9.
14. Davis GC. Improved sleep may reduce arthritis pain. *Holist Nurs Pract* 2003;17:128-135.
15. Marin R, Cyhan T, Miklos W. Sleep disturbance in patients with chronic low back pain. *Am J Phys Med Rehabil* 2006;85:430-35.
16. Alsaadi SM, McAuley JH, Hush JM, Maher CG. Prevalence of sleep disturbance in patients with low back pain. *Eur Spine J* 2011;20:737-43.
17. Yazici S, Canan F, Baki AE, Erkan ME, Ataoglu S, Ataoglu A. The effect of osteoporosis on self-report sleep quality in postmenopausal women. *Sleep and Biological Rhythms* 2011;9:130-132. (Internet) Available from: <http://onlinelibrary.wiley.com/doi/10.1111/j.1479-8425.2011.00497.x/pdf>. Accessed: 26.6.2013.
18. Wilcox S, Brenes GA, Levine D, Sevick MA, Shumaker SA, Craven T. Factors related to sleep disturbance in older adults experiencing knee pain or knee pain with radiographic evidence of knee osteoarthritis. *J Am Geriatr Soc* 2001;48:1241-51.
19. Andersen ML, Tufik S. Altered sleep and behavioral patterns of arthritic rats. *Sleep Research Online* 2000;3:161-7.
20. Landis CA, Levine JD, Robinson CR. Decreased slow-wave and paradoxical sleep in the rat chronic pain model. *Sleep* 1989;12:167-77.
21. Scharla S, Oertel H, Helsberg K, Kessler F, Langer F, Nickelsen T. Skeletal pain in postmenopausal women with osteoporosis: prevalence and course during raloxifene treatment in a prospective observational study of 6 months duration. *Curr Med Res Opin* 2006;22:2393-402.
22. Lame IE, Peters ML, Vlaeyen JWS, Kleef M, Patijn J. Quality of life in chronic pain is more associated with beliefs about pain, than with pain intensity. *Eur J Pain* 2005;9:15-24.
23. Haythornthwaite JA, Sieber WJ, Kerns RD. Depression and chronic pain experience. *Pain* 1991; 46:177-84.
24. Yoh K, Tanaka K, Ishikawa A, Ishibashi T, Uchino Y, Sato Y, et al. Health-related quality of life in Japanese osteoporotic patients and its improvement by elcatonin treatment. *J Bone Miner Res* 2005;23:167-73.
25. Martin AR, Sornay-Rendu E, Chandler JM, Duboeuf F, Girman CJ, Delmas PD. The impact of osteoporosis on quality of life: the OFELY cohort. *Bone* 2002;31:32-6.