QUALITY OF LIFE IN FEMALE PATIENTS WITH OSTEOPOROTIC VERTEBRAL FRACTURE

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The *aim* of this study was to estimate the quality of life in females with primary osteoporosis and vertebral fractures as a consequence of the disease, and to compare it to people without vertebral fractures. *Subjects and Methods:* Our cross-sectional study included 200 female patients with primary osteoporosis (100 with vertebral fractures and 100 without fractures), mean age 63.85±8.52 years, who received treatment at the Clinic for Medical Rehabilitation, Clinical Center of Vojvodina in Novi Sad. Data were based on history, questionnaire, and measurements of bone mineral density by DXA method using the Lunar Prodigy Primo device. Quality of life assessment was done by use of the Quality of Life Questionnaire of the European Foundation for Osteoporosis (QUALEFFO-41). Vertebral deformities were established by lateral radiography of the cervical, thoracic and lumbar regions by an experienced radiologist. Statistically significant differences were established between the two groups, in particular for pain (t=-2.72, p=0.01), daily activities (t=-3.67, p=0.01), performing housework (t=-4.84, p=0.01), mobility (t=-3.40, p=0.01), leisure activities (t=-2.66, p=0.01) and perception of health status (t=2.48, p=0.05). *Results:* The results indicated that the quality of life in patients with vertebral fractures did not differ according to the level of fracture compared to the control group. Patients with vertebral fractures had a number of limitations due to pain and poorer physical functioning compared to those without fractures, while the quality of life dependence on the level of fracture was not recorded.

Key words: quality of life; osteoporosis; vertebral fractures

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INTRODUCTION

Osteoporosis is a progressive systemic metabolic skeletal disease that occurs as a result of decreased bone density, damage to the microarchitecture of bone tissue, causing the bones become fragile and susceptible to fractures (1). Osteoporotic fractures are one of the major causes of morbidity and mortality in general, especially in developing countries (2). All types of fractures may lead to reduction in health related quality of life (HRQOL) (3, 4), and vertebral fractures and hip fractures are also associated with an increase in mortality (5). The rate of vertebral and hip joint fractures during the ten-year period increases exponentially with aging (6). According to the International Osteoporosis Foundation, more than 40% of middle-aged women will experience one or more osteoporotic fractures during their remaining life (7).

Vertebral fractures are the most common fracture related to osteoporosis (8). Vertebral fractures often need not be direct result of a fall, but may occur when the spine is flexed during activities of daily living (ADL) in individuals with hyperkyphosis and low bone mineral density (BMD) (9).

Once it occurs, vertebral fracture increases the likelihood of recurrence of fractures, both vertebral, and

non-vertebral. Reduction in BMD is considered to be the strongest predictor of vertebral fractures, unlike vertebral ones where the tendency to falls is considered equally important predictor for the occurrence of fractures (5, 10).

From the patient perspective, the quality of life (QOL) decreases after fracture because of reduced mobility and autonomy (11). Vertebral fractures cause pain in the spine and disability, but relatively little is known about their impact on QOL (12). Back pain remains almost the same five years after the fracture, while the key physical features of daily independent living mainly improve (13). The severity of osteoporosis has largely been and still is evaluated mainly in terms of the level of bone density and fracture incidence, but far fewer studies have been done to examine the impact of osteoporosis on QOL. Since osteoporotic fractures are very common and pose an increasing health problem, particularly among postmenopausal women, better knowledge about the long-term impact of osteoporotic fractures on daily life and HRQOL is needed. According to the literature, the Quality of Life Questionnaire of the European Foundation for Osteoporosis (QUALEFFO-41) is the most commonly used questionnaire to evaluate HRQOL in patients with osteoporosis and vertebral fractures (15-17). The questionnaire has satisfactory psychometric characteristics, is specific for the diagnosis, and has been shown to be able to distinguish between patients with and without vertebral fractures (18, 19).

The aim of this study was to examine and compare difference in QOL of patients with vertebral fractures and people from the control group, as well as to examine difference in QOL in the study group of patients with fractures according to the level at which the fracture occurred.

SUBJECTS AND METHODS

A total of 200 postmenopausal women with primary osteoporosis, i.e. 100 with osteoporotic vertebral fracture and 100 with osteoporosis but without fracture participated in this cross-sectional study. Exclusion criteria for participants were the presence of back pain caused by other disorders/illnesses; presence of inflammatory rheumatic diseases; presence of malignant or metabolic bone disease; and usage of glucocorticoid. The mean age of patients with osteoporosis and fractures was 65.33±7.39 (range, 42-76) years, while the mean age of patients with osteoporosis without fracture was 63.37±7.71 (range, 52-84) years) (Table 1).

Table 1
Demographic characteristics of patients with primary osteoporosis without fracture and with vertebral fracture

General characteristic		Osteoporosis without fracture	Osteoporosis with vertebral fracture
Number of patients		100	100
Age (yrs), χ±SD		63.37±7.54	66.33±7.39
BMI (±SD)		26.25±4.19	26.57±3.92
Mean age at menopause onset (yrs), χ±SD		48.24±4.98	49.33±4.09
DXA L1-4	T score, χ±SD	-2.483±0.523	-2.400±1.025
	BMD, χ ±SD	0.882±0.061	0.886±0.084
DXA femur total	T score, χ ±SD	-1.420±0.637*	-2.110±0.774*
	BMD, χ ±SD	0.823±0.079*	0.735±0.093*
DXA femur neck	T score, χ ±SD	-1.580±0.674*	-2.450±0.761*
	BMD, χ ±SD	0.786±0.084*	0.696±0.069*

*χ – mean value; SD – standard deviation; BMI – body mass index; BMD – body mineral density; DXA – dual energy x-ray absorptiometry; *statistically significant difference between the groups (p<0.001)*

The research was conducted between November 2015 and March 2016, at the Clinic for Medical Rehabilitation, Clinical Center of Vojvodina in Novi Sad. Measurements were performed dual energy x-ray absorptiometry (DXA)) of lumbar spine using the Lunar Prodigy Primo device. The study was approved by the independent Ethics Committee of the Faculty of Medicine and conformed to the legal standards.

Bone mineral density was measured through DXA examination (g/cm^2). Deviation of the obtained value from the average BMD of a young person of the same sex was expressed in percentage and standard deviation (T-score) and deviation from the expected value for sex and age (Z-score). T-score was used for diagnosing osteoporosis and osteopenia. Classification of patients according to DXA finding was performed according to the World Health Organization criteria (20). Fractures were defined according to Genant's classification (vertebral anterior, middle or posterior height reduction by more that 20%) (21). Vertebral deformity was established by lateral radiography of the cervical, thoracic and lumbar regions by an experienced radiologist.

In this study, we utilized Serbian version of the QUALEFFO-41 questionnaire (19) consisting of 41 questions divided into five domains: pain, physical functioning, social functioning (leisure time and activities), perception of health status, and mental functioning. In the context of physical functioning, the possibility of performing daily activities, housework and level of mobility are estimated. In Serbian version of QUALEFFO-41, Changes in items (No. 14, 18 and 26) were related to the living conditions in Serbia. Anglo-Saxon units in questions No. 14 and 18 were re-

placed by units of the international system applied in Serbia. These changes did not lead to changes in question marking and calculation of domain and questionnaire results. Values from 0 to 100 are obtained by scoring, where 100 points denotes the lowest level of QOL, while 0 points signifies the highest possible level of QOL. The lower the QUALEFFO-41 score, the higher is the QOL.

On statistical analyses, we used the statistical program International Business Machines (IBM) Statistical Package for the Social Sciences (SPSS) Statistics 22.0. Results were presented using standard statistical measures of mean and standard deviation (SD). The distribution and normality of the sample were estimated by Kolmogorov-Smirnov test (significance p=0.05). For establishing differences in results obtained on scales and subscales from which they were made of, t-test was used for independent samples. Results obtained were presented in tables and graphs.

RESULTS

By applying the QUALEFFO 41, we found statistically significant differences in QOL scores for domains A, B, C, D, E and F (pain, daily activities, housework, mobility, leisure time and social activities, and perception of the health status), as well as in the overall QOL (total score) between patients with vertebral fractures compared to patients without vertebral fractures. There was no statistically significant difference in QOL assessments terms of mental function between patients with osteoporosis and vertebral fractures and those with osteoporosis but without vertebral fractures (Table 2).

Table 2
Results of t-test in patients without fractures compared to patients with fracture

Domain	Group	N	$\bar{X}$	SD	T value	P
A) Pain	Without fracture	100	42.2	31.1	-2.72	0.009
	With VF	100	60.5	19.9		
B) Activities of daily living	Without fracture	100	17.2	16.2	-3.67	0.001
	With VF	100	40.1	30.1		
C) Jobs around the house	Without fracture	100	24.7	22.9	-4.84	0.000
	With VF	100	57.7	29.6		
D) Mobility	Without fracture	100	24.1	17.8	-3.40	0.001
	With VF	100	43.8	26.3		
E) Leisure and social activities	Without fracture	100	49.9	22.1	-2.66	0.010
	With VF	100	66.2	26.8		
F) General health perception	Without fracture	100	59.4	19.4	-2.48	0.016
	With VF	100	72.2	20.5		
G) Mental function	Without fracture	100	37.4	16.8	-1.56	0.125
	With VF	100	44.6	19.0		
Total score	Without fracture	100	35.2	14.2	-4.04	0.000
	With VF	100	53.3	19.9		

VF – vertebral fracture; p – level of statistical significance; N – number

In the group of patients with vertebral fractures, the highest incidence of fractures was recorded in lumbar spine (n=68, 67%), followed by thoracic spine (n=30, 30%), and lowest in the cervical part (n=2, 3%) (Fig. 1).

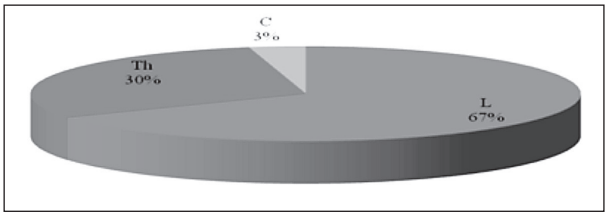

Fig. 1. *Incidence of fractures according to vertebral column level.*

In the group of patients with osteoporotic vertebral fractures, analysis of dependence between QOL assessment in each particular aspect and the level of spine involved by fracture was performed. There was no statistically significant dependence between QOL and level of fracture (Table 3).

Table 3
Dependence of the quality of life assessment on the level of fracture

Patients with vertebral fracture	Mean value	Standard error	T	p
A) Pain	72.77	9.629	7.56	0.000
	-8.978	6.542	-1.37	0.181
B) Activities of daily living	43.41	15.02	2.89	0.007
	-2.39	10.21	-0.23	0.816
C) Housework	41.56	14.42	2.88	0.007
	11.78	9.79	1.20	0.239
D) Mobility	39.29	13.14	2.99	0.006
	3.327	8.927	0.37	0.712
E) Leisure and social activities	44.65	12.70	3.52	0.002
	15.74	8.625	1.83	0.079
F) General health perception	72.54	10.24	7.09	0.000
	-0.245	6.955	-0.04	0.972
G) Mental functions	35.546	9.335	3.81	0.001
	6.625	6.342	1.04	0.305

DISCUSSION

Vertebral fractures can cause back pain, kyphosis, difficulty in performing everyday activities, depression and anxiety, all of which can reflect in physical, social and mental functioning and loss of personal independence (22, 23).

Our results of assessing QOL by applying QUALEFFO-41 questionnaire indicated statistically significant differences in QOL between the group of 100 patients without vertebral osteoporotic frac-

tures and the group of 100 patients with vertebral fractures. We compared the results for each domain of QUALEFFO-41 questionnaire separately and for all domains together, united in the total score of the questionnaire.

The biggest differences between these two groups of patients were recorded in the domains of pain, performing daily activities, doing housework and mobility; highly statistically significant differences were also established in the value of the total score. Patients with vertebral fractures referred to the existence of more frequent and longer-lasting pain, which often interfered with sleep and physical functioning. There are numerous restrictions for patients with fractures regarding performance of activities of daily living and mobility, and many of them indicate the existence of changes in the body caused by osteoporosis, which are expressed in the form of reductions in height, change of back shape, or development of deformities.

Significant differences were noticed when assessing the possibilities to using leisure time appropriately and be socially active, as well as in the domain of perception of health status. Patients with fractures often negatively responded to questions about the possibility of practicing sport, going to cinema or theater, the possibilities of going to visit friends or relatives, and expressed disappointment when it comes to their subjective perception of their own health and QOL.

In the context of mental functioning, there was no significant difference, and it was the only aspect of QOL in the survey that showed no statistically significant difference between the two patient groups. The results obtained were in accordance with the results of the study conducted by Oleksik *et al*., also stating that the difference between patients without fractures and patients with fractures was statistically significant in all domains and total score, with the exception of mental functioning (24). This is corroborated by the studies reporting that the QOL is compromised in people who have suffered vertebral or non-vertebral fracture (25, 26).

To test the hypothesis on the dependence of QOL assessment on fracture localization or the level of the spine involved by fracture, regression analysis was performed for the group of patients with vertebral fractures. Based on these results, we concluded that there was no statistically significant correlation of any of the QOL domains tested with the level of the fracture. In the group of patients with vertebral fractures, the highest incidence of fractures was found in lumbar spine (n=68, 67%), then thoracic spine (n=30, 30%), and lowest in the cervical part in (n=2, 3%). These results are consistent with the EPOS study, which also noted the largest number of fractures on lumbar spine (27).

Oleksik *et al*. state that differences in HRQOL between patients with thoracic spine fractures and those with lumbar spine fractures are significant in terms of physical functioning, general perception of health, pain, and total score (24). However, in their study from 2005, Fechtenbaum *et al*. report that there was no significant difference in the results of QOL testing according to thoracic or lumbar fracture localization (28).

CONCLUSIONS

Quality of life in patients with osteoporotic vertebral fractures was significantly reduced compared to patients without vertebral fractures due to pain and difficulty in physical function including everyday activities, housework and mobility. Significant difference was established in the domains of subjective perception of health, leisure and social activities between patients with osteoporotic vertebral fractures and patients without fractures, while dependence of QOL on the level of fracture was not found. It is necessary to undertake additional research in this field, which will include a larger number of subjects.

REFERENCES

1. The North American Menopause Society. NAMS Continuing medical education activity: management of osteoporosis in postmenopausal women. Menopause 2010; 17(1): 25-54. doi: 10.1097/gme.0b013e3181c617e6

2. Johnell O, Kanis JA. An estimate of the worldwide prevalence and disability associated with osteoporotic fractures. Osteoporos Int 2006; 17: 1726-33. [DOI: 10.1007/s00198-006-0172-4] [PMID: 16983459]

3. Jung HJ, Park YS, Seo HY *et al*. Quality of life in patients with osteoporotic vertebral compression fractures. J Bone Metab 2017; 24(3): 187-96. doi: 10.11005/jbm.2017.24.3.187. Epub 2017 Aug 31.

4. Palacios S, Neyro JL, Fernandez de Cabo S *et al.* Impact of osteoporosis and bone fracture on health-related quality of life in postmenopausal women. Climacteric 2014; 17: 60-70.

5. Caliri A, De Filippis L, Bagnato GL, Bagnato GF. Osteoporotic fractures: mortality and quality of life. Panminerva Med 2007; 49: 21-7. PMID: 17468730

6. Baum E, Peters KM. The diagnosis and treatment of primary osteoporosis according to current guidelines. Dtsch Arztebl Int 2008; 105(33): 573-U27.

7. Kanis JA, McCloskey EV, Johansson H *et al*. European guidance for the diagnosis and management of osteoporosis in postmenopausal women. Osteopor Int 2013; 24(1): 23-57. doi:10.1007/s00198-012-2074-y

8. Lee HM, Park SY, Lee SH *et al*. Comparative analysis of clinical outcomes in patients with osteoporotic vertebral compression fractures (OVCFs): conservative treatment *versus* balloon kyphoplasty. Spine J 2012; 12: 998-1005.

9. Briggs AM, Greig AM, Wark JD. The vertebral fracture cascade in osteoporosis: a review of etiopathogenesis. Osteoporos Int 2007; 18(5): 575-84. PubMed: 17206492

10. Reniu AC, Ong T, Ajmal S *et al*. Vertebral fracture assessment in patients presenting with a non-hip non-vertebral fragility fracture: experience of a UK Fracture Liaison Service. Arch Osteoporos 2017; 12: 23. https://doi.org/10.1007/s11657-017-0318-3

11. Rachner TD, Khosla S, Hofbauer LC. Osteoporosis: now and the future. Lancet 2011; 377(9773): 1276-87.

12. Bošković K, Protić-Gava B, Grajić M, Madić D, Obradović B, Tomašević-Todorović S. Adapted physical activity in the prevention and therapy of osteoporosis. Med Pregl 2013; 66(5-6): 221-4. PMID: 23888730

13. Vujasinović-Stupar N, Radunović G, Smailji M. Quality of life assessment in osteoporotic patients with and without vertebral fractures. Med Pregl 2005; 58(9-10): 453-8. PMID: 16526246

14. O'Neill TW, Cockerill W, Matthis C *et al*. Back pain, disability, and radiographic vertebral fracture in European women: a prospective study. Osteoporos Int 2004; 15(9): 760-5. doi: 10.1007/s00198-004-1615-4] [PMID: 15138664

15. Bergland A, Thorsen H, Kåresen R. Association between generic and disease-specific quality of life questionnaires and mobility and balance among women with osteoporosis and vertebral fractures. Aging Clin Exp Res 2011; 23(4): 268-72. PMID: 22067372

16. Van Schoor NM, Yu H, Bobula J, Lips P. Cross-geographic region differences in quality of life in women with and without vertebral fracture. Osteoporos Int 2009; 20(10): 1759-66. doi: 10.1007/s00198-009-0853-x] [PMID: 19238305

17. Rostom S, Allali F, Bennani L, Abouqal R, Hajjaj-Hassouni N. The prevalence of vertebral fractures and health-related quality of life in postmenopausal women. Rheumatol Int 2012; 32(4): 971-80. doi: 10.1007/s00296-010-1734-5; PMID: 21243498

18. Tosteson AN, Hammond CS. Quality-of-life assessment in osteoporosis – health status and preference-based measures. Pharmacoeconomics 2002; 20(5): 289-303. PMID: 11994039

19. Tadic I, Vujasinovic Stupar N *et al*. Validation of the osteoporosis quality of life questionnaire QUALEFFO-41 for the Serbian population. Health Qual Life Outcomes 2012; 10: 74. doi: 10.1186/1477-7525-10-74; PMID: 22709379

20. NIH Consensus Development Panel on Osteoporosis Prevention, Diagnosis, and Therapy: Osteoporosis prevention, diagnosis, and therapy. JAMA 2001; 285(6): 785-95.

21. Genant HK, Wu CY, van Kuijk C, Nevitt MC. Vertebral fracture assessment using a semiquantitative technique. J Bone Miner Res 1993; 8(9): 1137-48.

22. Cooper C, Harvey N, Dennison E. Worldwide epidemiology of osteoporotic fractures. In: Reginster JY, Rizzoli R, eds. Innovation in Skeletal Medicine, 1st edn. Elsevier; 2008, 95-112.

23. Lai PSM, Chua SS, Chan SP, Low WY. Validation of the English version of the quality of life questionnaire of the European Foundation for Osteoporosis (QUALEFFO) in Malaysia. Int J Rheum Dis 2008; 11(4): 421-9. doi: 10.1111/j.1756-185X.2008.00402.x

24. Oleksik A, Lips P, Dawson A *et al*. Health-related quality of life in postmenopausal women with low BMD with or without prevalent vertebral fractures. J Bone Miner Res 2000; 15: 1384-92. doi 10.1359/jbmr.2000.15.7.1384; PMID: 10893688

25. Adachi JD, Ioannidis G, Olszynski WP *et al*. The impact of incident vertebral and non-vertebral fractures on health related quality of life in postmenopausal women. BMC Musculoskelet Disord 2002; 3: 11. doi: 10.1186/1471-2474-3-11

26. Baczyk G, Chuchracki M, Opala T. Effect of selected socio-demographic, clinical and biochemical factors on self-reported quality of life among post-menopausal women with osteoporosis. Ann Agric Environ Med 2013; 20(4): 843-8. PMID: 24364466

27. Lunt M, O'Neill TW, Felsenberg D *et al*. Characteristics of a prevalent vertebral deformity predict subsequent vertebral fracture: results from the European Prospective Osteoporosis Study (EPOS). Bone 2003; 33(4): 505-13.

28. Fechtenbaum J, Cropet C, Kolta S, Horlait S, Orcel P, Roux C. The severity of vertebral fractures and health-related quality of life in osteoporotic postmenopausal women. Osteoporos Int 2005; 16(12): 2175-9. doi: 10.1007/s00198-005-2023-0; PMID: 16220230

S A Ž E T A K

KVALITETA ŽIVOTA PACIJENTICA S OSTEOPOROTIČNIM VERTEBRALNIM PRIJELOMIMA

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Cilj **istraživanja bio je procijeniti kvalitetu života žena s primarnom osteoporozom i prisutnim vertebralnim prijelomima kao posljedicom bolesti u odnosu na osobe bez vertebralnih prijeloma. U ispitivanju je sudjelovalo 200 bolesnica s primarnom osteoporozom (100 s vertebralnim prijelomima, 100 bez vertebralnih prijeloma) srednje dobi 63,85±8,52 godina, koje su provele terapiju u Klinici za medicinsku rehabilitaciju Kliničkog centra Vojvodine u Novom Sadu. Podatci su zasnovani na anamnezi, upitnicima, kao i mjerenjima mineralne koštane gustoće metodom DXA pomoću uređaja *Lunar Prodigy Primo.* Vertebralne frakture su potvrđene rendgenskim slikama cervikalne, torakalne i lumbalne kralježnice očitanim od iskusnog radiologa. Kvaliteta života procijenjena je primjenom upitnika QUALEFFO-41. Dobiveni rezultati ukazali su na statistički značajne razlike između ispitivanih skupina u intenzitetu boli (t=-2,72; p=0,01), svakodnevnim aktivnostima (t=-3,67; p=0,01), obavljanju kućanskih poslova (t=-4,84; p=0,01), pokretljivosti (t=-3,40; p=0,01), društvenim aktivnostima (t=-2,66; p=0,01), percepciji zdravstvenog stanja (t=2,48; p=0,05). *Rezultati* ukazuju na to da se kvaliteta života u bolesnica s vertebralnim prijelomima ne razlikuje prema razini prijeloma u odnosu na kontrolnu skupinu. Bolesnici s vertebralnim prijelomima imaju brojna ograničenja zbog boli i lošijeg fizičkog funkcioniranja u odnosu na osobe bez osteoporotičnih prijeloma, dok zavisnost kvalitete života o razini prijeloma nije utvrđena.**

Ključne riječi: **kvaliteta života, osteoporoza, vertebralni prijelomi**