SOCIAL AND MENTAL FUNCTIONING IN POSTMENOPAUSAL WOMEN WITH LOW BONE MINERAL DENSITY

Summary

Introduction. Osteoporosis is a systemic, metabolic, progressive bone disease characterized by reduced bone mineral density leading to bone fragility and reduced quality of life. The objective of this study was to examine the quality of social and mental functioning in postmenopausal women with reduced mineral bone density. Material and Methods. This prospective cross-sectional study included 210 postmenopausal women aged ≥ 50 years, who were referred for osteodensitometry to the Special Hospital for Rheumatic Diseases Novi Sad, Serbia. The study was conducted in the period from February 24 to April 3, 2017. All women completed the Serbian version of the Quality of Life Questionnaire of the European Foundation for Osteoporosis (41). They all underwent bone mineral density measurement in two regions of interest, and the results were interpreted according to the current definition of osteoporosis. The participants’ social and mental functioning was analyzed including the following variables: age, place of residence, educational attainment, employment, nutritional status, bone mineral density, and low-trauma fractures. Statistical processing and analyses were performed using Statistical Package for the Social Sciences, version 20. Results. A statistically significant negative correlation was noted between social functioning and the T-score for the femoral neck (r = -0.438), hip (r = -0.412) and spine (r = -0.226), as well as mental functioning with the T-score for the femoral neck (r = -0.424), hip (r = -0.454) and spine (r = -0.319). Patients with a history of fractures had a poorer quality of social functioning (t = 2.17, p < 0.05). Conclusion. The examinees of older age, with poor socio-demographic status, reduced bone mineral density, history of low-trauma fractures presented with lower quality of social and mental functioning.

Key words: Postmenopause; Osteoporosis; Postmenopausal; Bone Density; Social Participation; Mental Health; Surveys and Questionnaires; Quality of Life; Demography

Sažetak

Uvod. Osteoporoza je sustemska, metabolička, progresivno koštano oboljenje koja dovodi do fragilnosti kosti i smanjenja kvaliteta života. Cilj rada je ispitivanje kvaliteta socijalnog i mentalnog funkcionišanja kod žena u postmenopauzi koje imaju smanjenu mineralnu koštani gustinu. Materijal i metode. Prospektivna studija preseka obuhvatila je 210 ispitanica, starosti ≥50 godina, koje su suđene na osteodensitometrijsko snimanje u Specijalnu bolnicu za reumatske bolesti u Novom Sadu. Studija je sprovedena u periodu od 24. 2. do 3. 4. 2017. godine. Sve ispitanice su popunile upitnik koji je sastavio istraživač. Statistička obrada i analiza podataka je posredovanost korišćenjem softvera Statističkog paketa za društvene nauke, verzija 20. Rezultati. Postoje statistički značajna negativna korelacija socijalnog funkcionišanja sa T skorom vrata butne kosti (r = -0,438; p<0,001), T skorom kuka (r = -0,412; p<0,001) i T skorom kičme (r = -0,226; p<0,001), kao i mentalnog funkcionišanja sa: T skorom vrata butne kosti (r = -0,424; p<0,001), T skorom kuka (r = -0,454; p<0,001) i T skorom kičme (r = -0,319; p<0,001). Kada je u pitanju kvalitet socijalnog funkcionišanja postoji statistički značajna razlika između ispitanica sa i bez preloma kostiju (t = 2,17, p<0,05). Zaključak. Ispitanice su imale lošije kvalitet socijalnog i mentalnog funkcionisanja.
Osteoporosis is a systemic, metabolic, progressive bone disorder characterized by a reduction in bone mineral density (BMD) and changes in the bone tissue microarchitecture, which in turn results in bone fragility and an increased risk of fractures [1]. Given that osteoporosis is common in postmenopausal women, it has a significant impact on their quality of life (QoL). Evidence suggests that it is associated with significant morbidity and mortality [2].

In clinical practice, BMD is assessed using dual X-ray absorptiometry (DXA), which is a gold standard for the diagnosis of osteoporosis. DXA scanning involves BMD measurement in two regions of interest, the lumbar spine and the proximal femur, whereas the obtained values are expressed in g/cm². The diagnosis is based on the T-score expressed in standard deviations (SDs) [3, 4]. According to the World Health Organization (WHO) diagnostic classification, BMD at the hip or lumbar spine ≤ 2.5 SDs below the mean for young adult population is indicative of osteoporosis. In sum, lower T-scores are associated with more severe BMD deficiency. Consequently, osteoporosis is recognized as a risk factor for fractures, in the same vein as hypertension is linked to a greater risk of stroke [4, 5].

Due to the large number of osteoporotic patients and a high potential for complications, osteoporosis is a major social and financial problem. The most prevalent osteoporosis complications are fractures that are usually caused by falls during walking, or from a sitting position, known as “low-trauma fractures”. Owing to the nature of these falls, spinal vertebrae, hip, lower part of the forearm, and the upper section of the upper arm are the most common osteoporotic fracture sites [4, 6].

The QoL is a multidimensional concept that includes physical, emotional, mental, behavioral, and social components [7]. Social functioning, as a QoL domain, includes individual’s interaction with the environment and the ability to perform workplace duties, as well as take part in social activities, and maintain healthy relationships with the partner and the family [8]. Mental functioning, as another QoL domain, refers to one’s ability to realize his full potential, deal with everyday life stressors, remain productive and contribute to the community [9].

The Quality of Life Questionnaire of the European Foundation for Osteoporosis (QUALEFFO-41) is the original instrument for assessing the QoL in patients with osteoporosis. This questionnaire includes 41 items pertaining to pain, physical functions, social functions, general health perception and mental functions. As QUALEFFO has been validated in a multicenter study in seven countries, it is widely employed when assessing QoL [10].

Tadić and colleagues conducted a case-control study from June 2010 to October 2011, through which the Serbian version of QUALEFFO-41 was validated [11]. The main study objective was to examine the quality of social and mental functioning in postmenopausal women with reduced BMD.

Material and Methods

This prospective cross-sectional study was conducted at the Special Hospital for Rheumatic Diseases Novi Sad, Serbia, in the period from February 24th to April 3rd 2017. The study included 210 postmenopausal women aged ≥ 50 years who were referred to the Special Hospital for Rheumatic Diseases for osteodensitometry. The study was conducted with the approval of the Ethics Committee of the Special Hospital for Rheumatic Diseases Novi Sad, and all respondents signed an informed consent prior to taking part in the study. Body height (cm), body weight (kg), and body mass index (BMI) in kg/m² were measured immediately prior to the DXA scanning. The BMD was measured in two regions of interest, the lumbar spine (L1 - L4) anterior-posterior projection, and the proximal femur. The results were expressed in absolute BMD values (g/cm²) and T-scores. The obtained results were interpreted according to the adopted osteoporosis definition [4]. To increase validity of the findings yielded, the DXA scanner was subjected to daily calibrations. All respondents completed an identical questionnaire, developed by the researchers specifically for this investigation in order to obtain sociodemographic information, including the participants’ age, age at menopause onset, place of residence (rural/urban), educational attainment, and occupation. In addition, low-trauma fracture history (fracture site and frequency) was obtained from medical records. All participants also completed the Serbian version of QUALEFFO-41 in order to assess their QoL. The aim was to examine the social and mental functioning QoL domains in relation to the aforementioned sociodemographic variables.

The reliability of the measuring instrument used in the present study was examined through internal consistency by calculating the Cronbach’s alpha coefficient, for which values above 0.70 are deemed acceptable. The Cronbach’s alpha coefficients for the mental and social functioning questionnaires were 0.726 and 0.867, respectively, confirming their reliability.

The quality of social and mental functioning is a part of the test measuring the QoL. The subtest pertaining to social functioning has seven, while that related to mental functioning consists of nine items, where the respondents express the degree of agreement/disagreement with individual statements on a 5-point Likert scale. In line with the test recommendations, the score is obtained by
recording responses for specific items, their summary, and finally conversion of these values to the scale ranging from 0 to 100. Consequently, subtest scores range from 0 to 100, whereby a higher value indicates a poorer quality of social and mental functioning.

The exclusion criteria were premenopausal stage, presence of metabolic bone disorders, and a BMD T-score less than 1 SD.

Statistical data processing: Descriptive statistics were calculated, and the arithmetic mean was used with the corresponding SD. The minimum and the maximum were also reported, along with frequencies and percentages.

Differences between groups were determined by single-factor analysis of variance (ANOVA). In addition to ANOVA, large independent samples were subjected to the t-test. The Pearson correlation coefficient was also calculated to examine the relationships between two continuous variables. Statistical significance was defined at the probability level of the null hypothesis of either p < 0.01 or p ≤ 0.05.

Statistical processing and analyses were performed using the statistical software SPSS version 20 (Statistical Package for the Social Sciences), while Microsoft Office Excel and Word were used for graphical and tabular representations.

Results

The mean age of the 210 participants was 67.01 ± 7.49 years. The majority of the study sample were urban residents (75.2%) with secondary education (49.5%). Only 9.5% of the respondents were employed, and 70% of these women indicated that their job required prolonged standing or sitting. Almost half of the examinees were overweight (49.52%). In most cases, the mean T-score for the femoral neck, hip and lumbar spine (L1 - L4) was at the level of osteopenia. The average age of subjects at menopause onset was 48.01 ± 4.99 years. The history of low-trauma fractures was noted in 41.9% of the sample, while only two respondents had a hip fracture. Of the 11 respondents that suffered a vertebral fracture, 72.7% had one fracture. Finally, 72% of the participants with non-vertebral fractures had one such fracture (Table 1).

Statistically significant differences were observed in the quality of social functioning between subjects of different ages (F = 8.88, p < 0.001), with the oldest respondents (M = 56.52), as well as those living in rural areas (M = 53.6 vs M = 44.3) having the lowest quality of social functioning.

Moreover, statistically significant differences in the quality of social functioning were found between respondents with different levels of educational attainment (F = 6.69, p < 0.001), whereby those with primary education (M = 57.4), as well as unemployed individuals (M = 47.8 vs, M = 35.4), reported the lowest quality of social functioning.

Single-factor analysis was conducted to establish whether there were statistically significant differences in the quality of social functioning based on the participants’ BMI, and the findings confirmed this hypothesis (F = 2.75, p < 0.05). Rather surprisingly, respondents in the normal BMI range were found to have the lowest quality of social functioning (M = 47.0), as shown in Table 2.

No statistically significant differences in the quality of mental functioning were found between subjects of different ages. However, respondents from rural areas had poorer quality of mental functioning compared to urban examinees (M = 41.6 vs. M = 35.1).

On the other hand, statistically significant differences between respondents with different levels of formal education were found with respect to their quality of mental functioning (F = 10.18, p < 0.001), since women with primary education reported the lowest quality of mental functioning (M = 57.4). Employment status had no bearing on the quality of mental functioning, as no statistically significant differences between employed and unemployed participants were established.

Single-factor analysis confirmed no statistically significant differences in the quality of mental functioning based on the participants’ BMI, as shown in Table 3.

Analyses also revealed that the quality of social functioning statistically and negatively correlated with the femoral neck T-score (r = -0.438, p < 0.001) and BMD (r = -0.401, p < 0.001), the hip T-score (r = -0.412, p < 0.001) and BMD (r = -0.399, p < 0.001), and the spinal T-score (r = -0.226, p < 0.001). However, the spinal BMD was not statistically significantly related with the quality of social functioning.

A statistically significant difference in the quality of social functioning was found between subjects with and without history of bone fractures (t = 2.17, p < 0.05), whereby women who had experienced fractures had lower quality of social functioning (M = 49.6 vs, M = 44.3).

No statistically significant correlations between participants’ quality of social functioning and the total number of fractures (r = 0.013, p > 0.05), number of vertebral fractures (r = 0.419, p > 0.05), or non-vertebral fractures (r = 0.07, p > 0.05) were established (Table 4).

Analyses further revealed that the participants’ quality of mental functioning statistically significantly and negatively correlated with the femoral neck T-score (r = -0.438, p < 0.001) and BMD (r = -0.401, p < 0.001), the hip T-score (r = -0.412, p < 0.001) and BMD (r = -0.399, p < 0.001), and the spinal T-score (r = -0.226, p < 0.001). However, the spinal BMD was not statistically significantly related with the quality of mental functioning.

On the other hand, no statistically significant differences in the quality of mental functioning were found between subjects with and without history of bone fractures (t = 0.92, p > 0.05).

Similarly, no statistically significant correlations between participants’ quality of social functioning and the total number of fractures (r = -0.034, p > 0.05), number of vertebral fractures (r = 0.511, p > 0.05), or non-vertebral fractures (r = 0.15, p > 0.05) were noted.

There was no statistically significant correlation between the quality of mental functioning and the
Table 1. Sample characteristics

| Variables/Parametrs | Frequency/Min Max M SD |
|---------------------|------------------------|
| Age/Year            | 210 (100%)             |
| 50 - 60             | 36 (17.1%)             |
| 61 - 70             | 115 (54.8%)            |
| 71+                 | 59 (28.1%)             |
| Menopause/Menopauza| 210 (100%)             |
| BMI/ITM             | 20 (100%)              |
| Underweight/Pothranjenost (<18.5 - 25) | 2 (1.00%) |
| Normal nutritional status/Normalna uhranjenost (18.5 - 25) | 60 (28.5%) |
| Overweight/Prekomerna uhranjenost (25 - 30) | 104 (49.5%) |
| Obesity/Gojaznost (>30) | 44 (21.0%) |
| Place of residence/Mesto stanovanja | 52 (24.8%) |
| Rural/Selo          | 158 (75.2%)            |
| Level of education/Nivo obrazovanja | 47 (22.4%) |
| Primary school/Osnovno | 104 (49.5%) |
| Secondary school/Srednje | 27 (12.9%) |
| Post-secondary education/Više | 32 (15.2%) |
| Employment/Zaposlenost | 20 (9.5%) |
| Yes/Ne              | 190 (90.5%)            |
| Employment type/Način obavljanja posla | 14 (70%) |
| Sitting/Standing/Sedi/Stoji | 6 (30%) |
| Walking/Physical/Hoda/Radi fizički | 82 (100%) |
| Fracture/Prelom     | 210 (100%)             |
| Yes/Ne              | 88 (41.9%)             |
| No/Ne               | 122 (58.1%)            |
| Hip fracture/Prelom kuka | 2 (1%) |
| Yes/Ne              | 208 (99%)              |
| Number of vertebral fractures/Broj vertebralnih preloma | 11 (100%) |
| 1                   | 8 (72.7%)              |
| 2                   | 2 (18.2%)              |
| 3                   | 1 (9.1%)               |
| Number of non-vertebral fractures/Broj nevertebralnih preloma | 82 (100%) |
| 1                   | 59 (72.0%)             |
| 2                   | 14 (17.0%)             |
| 3+                  | 9 (11.0%)              |

Legend: N – number of patients; Min – minimum; Max – maximum; M – mean value; SD – standard deviation; BMD – Bone Mineral Density; BMI – Body Mass Index

Legenda: N – broj ispitanika; Min – minimum; Max – maksimum; M – medijana; SD – standardna devijacija; MKG – mineralna koštana gustina; ITM – indeks telesne mase
number of fractures ($r = -0.034, p > 0.05$); similarly, no statistical correlation was noted between the quality of mental functioning and the number of vertebral ($r = 0.511, p > 0.05$) or non-vertebral fractures ($r = 0.15, p > 0.05$) (Table 5).

**Discussion**

Osteoporosis is a condition characterized by reduced BMD, which contributes to bone fragility and increases fracture risk. Assessment of functional status and QoL is highly important for the evaluation of disease progression and the development of new treatments, in particular when they pertain to chronic conditions such as osteoporosis. QoL assessments of osteoporotic patients are used in conjunction with biomechanical and radiographic evaluations following each fracture [12].

The present study included 210 women aged 67.01 ± 7.49 years. Our investigation indicated that older participants had a significantly poorer quality of social functioning. Patients living in rural areas and those with lower educational attainment also had a poorer QoL in both domains, while social functioning quality was compromised for unemployed individuals. Nutritional status, as determined by the BMI score, also affected the participants’ quality of social functioning, but had no impact on the quality of their mental functioning.

The world population is rapidly aging. According to the earlier statistics, it was estimated that, globally, the number of individuals aged 65 years and over would double from 2010 to 2014, with the greatest increase in the developing countries. If this trend continues, osteoporosis will become even more prevalent as will bone fractures, resulting in a decline in QoL and rise in the mortality rate [13, 14]. In a study conducted in eastern Poland, BMD of women living in rural and urban areas was estimated and compared, failing to reveal statistically significant differences in the mean BMD values of the two groups. However, the prevalence of osteoporosis and osteopenia was associated with age [15]. Urošević et al. (2015) analyzed and compared the QoL among elderly individuals living in urban

| Table 2. Social functioning and sociodemographic variables |
|------------------------------------------------------------|
| **Variables/Parametri** | **M** | **SD** | **F** | **p** |
| **Age/Godine** | | | | |
| 50 – 60 | 40.0885 | 22.72416 | | |
| 61 – 70 | 43.6591 | 20.45831 | | |
| 71+ | 56.5204 | 23.19639 | 8.885 | 0.000* |
| Total/Ukupno | 46.6604 | 22.44848 | | |
| **Place of residence/Mesto stanovanja** | | | | |
| Rural/Selo | 53.6881 | 22.12535 | | |
| Urban/Grad | 44.3475 | 22.13777 | 6.967 | 0.009* |
| Total/Ukupno | 46.6604 | 22.44848 | | |
| **Level of Education/Nivo obrazovanja** | | | | |
| Primary school/Osnovno | 57.4782 | 20.95613 | | |
| Secondary school/Srednje | 45.9936 | 20.56668 | | |
| Post-secondary education/Više | 42.5112 | 23.95000 | 6.693 | 0.000* |
| Higher education/Visoko | 36.4398 | 23.61347 | | |
| Total/Ukupno | 46.6604 | 22.44848 | | |
| **Employment/Zaposlenost** | | | | |
| Yes/Da | 35.4848 | 27.39116 | | |
| No/Ne | 47.8368 | 21.61547 | 5.599 | 0.019** |
| Total/Ukupno | 46.6604 | 22.44848 | | |
| **BMI/ITM** | | | | |
| Underweight/Pothranjenost (<18.5 – 25) | 26.2202 | 11.82720 | | |
| Normal nutritional status/Normalna uhranjenost (18.5 – 25) | 47.0784 | 23.77554 | | |
| Overweight/Prekomerna uhranjenost (25 – 30) | 43.7365 | 21.02357 | 2.754 | 0.044** |
| Obesity/Gojaznost (>30) | 53.9305 | 22.74495 | | |
| Total/Ukupno | 46.6604 | 22.44848 | | |

Legend: M – mean value; SD – standard deviation; F – single-factor analysis of variance; p – statistical significance; *p < 0.01; **p < 0.05; BMI – Body Mass Index
and rural areas in Serbia. The authors reported significantly higher anxiety/depression scores in the rural population. However, no statistically significant differences in the average QoL scores were noted in urban and rural areas [16]. It is widely assumed that better education helps reducing the risk of a wide range of chronic illnesses, including osteoporosis. This hypothesis was tested in a study conducted in China, whereby the link between educational attainment of 685 postmenopausal women and their BMD and osteoporosis prevalence was examined. The findings yielded by this population-based, cross-sectional study revealed that higher educational attainment, particularly tertiary education, was strongly and positively related with higher BMD values and thus lower likelihood of osteoporosis. These relationships remained significant after adjusting for the most relevant confounders, such as body weight, age, and years since menopause onset [17]. Nutritional status is an important predictor of bone metabolism, which is adversely affected by both obesity and weight loss. Given that in the developed world, the percentage of overweight individuals is rapidly growing and many of these individuals are undergoing some weight loss regimen, these findings are important, as they indicate that further research into bone metabolism is needed. The link between BMI and bone quality, and thus fracture risk, in obese individuals is presently insufficiently understood, and must be further explored by well-designed prospective trials. In particular, it is necessary to elucidate the mechanisms that regulate the effect of excess adiposity on bone quality [18].

Analyses of the measured parameters obtained through DXA scanning and the participants’ history of fractures revealed that patients with lower BMD tend to have lower quality of social and mental functioning, while prior experience of fractures has a significant adverse impact on social functioning.

As a part of their study conducted in Morocco, Abourazzak and colleagues assessed the health-related QoL in postmenopausal women with osteoporosis using the Arabic version of the QoL questionnaire. The study sample included 357 postmenopausal women.

### Table 3. Mental functioning and sociodemographic variables

| Variables/Parametri                        | M (mean) | SD (standard deviation) | F | p |
|-------------------------------------------|----------|-------------------------|---|---|
| Age/Godine                                |          |                         |   |   |
| 50 – 60                                   | 36.8056  | 15.62026                |   |   |
| 61 – 70                                   | 34.5894  | 15.04111                | 2.856 | 0.060*|
| 71+                                       | 40.8192  | 18.81334                |   |   |
| Total/Ukupno                              | 36.7196  | 16.42336                |   |   |
| Place of residence/Mesto stanovanja        |          |                         |   |   |
| Rural/Selo                                | 41.6132  | 17.09233                |   |   |
| Urban/Grad                                | 35.1090  | 15.92542                | 6.292 | 0.013**|
| Total/Ukupno                              | 36.7196  | 16.42336                |   |   |
| Level of Education/Nivo obrazovanja       |          |                         |   |   |
| Primary school/Osnovno                    | 46.9267  | 16.28214                |   |   |
| Secondary school/Srednje                  | 35.4434  | 14.87842                |   |   |
| Post-secondary education/Više             | 32.7160  | 17.30154                | 10.187 | 0.000*|
| Higher education/Visoko                   | 29.2535  | 14.26872                |   |   |
| Total/Ukupno                              | 36.7196  | 16.42336                |   |   |
| Employment/Zaposlenost                    |          |                         |   |   |
| Yes/Da                                    | 31.6667  | 12.00363                |   |   |
| No/Ne                                     | 37.2515  | 16.75703                | 2.103 | 0.148|
| Total/Ukupno                              | 36.7196  | 16.42336                |   |   |
| BMI/ITM                                   |          |                         |   |   |
| Underweight/Pothranjenost (<18.5 – 25)    | 40.2778  | 5.89256                 |   |   |
| Normal nutritional status/NORMALNA UHRANJENOST (18.5 – 25) | 37.9167  | 17.26655                |   |   |
| Overweight/Prekomerna uhranjenost (25 – 30) | 35.6571  | 14.49389                | 0.308 | 0.820|
| Obesity/Gojaznost (>30)                   | 37.4369  | 19.80098                |   |   |
| Total/Ukupno                              | 36.7196  | 16.42336                |   |   |

Legend: M – mean value; SD – standard deviation; F – single-factor analysis of variance; p – statistical significance; *p < 0.001; **p < 0.05; BMI – Body Mass Index

Legenda: M – medijana; SD – standardna devijacija; F – jednofaktorska analiza varijanse; p – statistička značajnost; *p<0.001; **p<0.05; ITM – indeks telesne mase
aged 58 ± 7.8 years, 30.1% of whom had been diagnosed with osteoporosis. The authors reported that three risk factors were associated with lower QoL, namely low educational attainment, and history of both vertebral and non-vertebral fractures. The lowest QoL scores were found in subjects with vertebral fractures, especially among those with a greater number and severity of these fractures [19].

Similar results to those reported in this study were obtained by Ferreira and associates in 2009. These authors compared the scores of 220 postmenopausal women obtained by QUALEFFO-41 and Short Form Health Survey 36 (the SF-36 questionnaire). Their findings revealed that BMI > 25 and a sedentary lifestyle were the only factors associated with poor QoL, as measured by QUAL-EFFO-41. Women suffering from osteoporosis had a poorer QoL, especially in relation to physical, psychological and social aspects [20].

In 2014, Palacios et al. conducted a study on the impact of osteoporosis on QoL. Their sample included 3,328 Spanish women who had osteoporosis for at least two years. Analyses of their BMD measurements and QoL scores revealed that women with osteoporosis, lower BMD and history of osteoporotic fractures had poorer QoL (in terms of physical and mental functioning) compared to women with osteoporosis who had not experienced fractures [21].

Table 4. Social functioning and the measured parameters

| Variables/Parametri | N   | M   | SD  | t    | F    | r    | p    |
|---------------------|-----|-----|-----|------|------|------|------|
| T-score for the femoral neck/T-skor vrat butne kosti | -0.438* | 0.000 |
| T-score for the hip/T-skor kuka | -0.412* | 0.000 |
| T-score for the spine (L1-L4)/T-skor kičme (L1-L4) | -0.226* | 0.001 |
| BMD for the femoral neck/MKG vrat butne kosti | -0.401* | 0.000 |
| BMD for the hip/MKG kuka | -0.399* | 0.000 |
| BMD for the spine (L1-L4)/MKG kičme (L1-L4) | -0.101 | 0.143 |

Table 5. Mental functioning and the measured parameters

| Variables/Parametri | N   | M   | SD  | t    | F    | r    | p    |
|---------------------|-----|-----|-----|------|------|------|------|
| T-score for the femoral neck/T-skor vrat butne kosti | -0.424* | 0.000 |
| T-score for the hip/T-skor kuka | -0.454* | 0.000 |
| T-score for the spine (L1-L4)/T-skor kičme (L1-L4) | -0.319* | 0.000 |
| BMD for the femoral neck/MKG vrat butne kosti | -0.389* | 0.000 |
| BMD for the hip/MKG kuka | -0.453* | 0.000 |
| BMD for the spine (L1-L4)/MKG kičme (L1-L4) | -0.104 | 0.134 |

Legend: N – number of patients; M – mean value; SD – standard deviation; t-test; F – single-factor analysis of variance; r – Pyreson coefficient of correlation; *p < 0.01; **p < 0.05; BMD – Bone Mineral Density

Legenda: N – broj ispitanika; M – medijana; SD – standardna devijacija; t – t test; F – jednofaktorska analiza varijanse; r – Pirsonov koeficijent korelacije; *p<0,01; **p<0,05; MKG-mineralna koštana gustina
Grbović and colleagues conducted a study in 2016, aiming to establish the correlation between the QoL in postmenopausal women with osteoporosis and osteodensitometry parameters. Their study sample included 100 women whose BMD was measured by the DXA apparatus. FRAX index was employed to estimate the risk of osteoporotic fractures, and all participants completed the QUAL-EFFO-41 questionnaire. Subsequent data analysis revealed a correlation between BMD and the femoral neck T-score, as well as among pain level, social functioning and perception of health.

The results yielded by the present study support those reported by Vujasinović et al. in 2005. As a part of their investigation, the authors assessed the QoL of patients with osteoporosis and vertebral fractures and compared it to that of osteoporotic subjects that had not experienced fractures. The study included 63 patients whose osteoporosis was managed in the outpatient settings. The relevant data was obtained through DXA scanning, X-rays (confirming or ruling out the existence of fractures) and the QUAL-EFFO-41 questionnaire. Based on the patients’ scores on the questionnaire, differences in QoL in these two groups were identified. Specifically, the authors noted that patients with history of fractures had a significantly lower QoL in the areas of pain, daily activities, and mobility, as well as social and mental functioning.

The influence of vertebral fractures on the QoL was also examined by Salaffi et al. (2007) in a sample of 234 and 244 women, with and without history of fractures, respectively. The data were gathered through the mini-Osteoporosis Quality of Life Questionnaire, the Medical Outcomes Study Short Form (SF-36) and the EuroQuol-5D. Based on the evaluation of all clinical variables and anthropometric data, physical functioning emerged as the most important determinant of poor QoL in patients with osteoporosis. Findings yielded by the SF-36 summary scales indicated that participants’ mental and physical health was primarily affected by comorbid conditions. Moreover, even a single fracture had a significant adverse effect on the QoL. In addition, lumbar fractures were shown to be more strongly related to the QoL reduction compared to those in the thoracic segment. The authors concluded that the QoL in women with osteoporosis depends on the number of vertebral fractures, comorbidities and age.

In another study, the timing of which coincided with our investigations, QoL among patients with reduced BMD was examined. However, the authors focused on physical functioning using a sample of elderly undernourished women, all of whom had low BMD and poor socio-demographic characteristics, and suffered low-trauma fractures. An extensive review of the available literature has failed to reveal any studies directly comparable to our research, making it difficult to contextualize our results. In the study published by other authors, the focus was mostly on the QoL in women with bone fractures and the effects of comorbidities on their treatment. Moreover, in most cases, the emphasis was placed on initiating timely and adequate therapy for chronic diseases, especially rheumatoid arthritis, which is an independent factor in the development of osteoporosis [26, 27].

A study published by Ramirez-Perez et al. in 2014, included 115 subjects with vertebral fractures and 135 without fractures, investigating effects of vertebral osteoporotic fractures on QoL. Their QoL was assessed using the QUAL-EFFO-41 questionnaire adapted for the Mexican population. Significant QoL reduction was established among respondents with a history of fractures, in the domain of pain, physical, social and emotional functioning, while age emerged as the main risk factor for deteriorating QoL in all domains [28].

Yoon et al. (2014) investigated the QoL in patients with osteoporosis and vertebral fractures, as well as the impact of fracture treatment on participants’ QoL. According to the results of this study, fractures reduce QoL in all domains measured by the questionnaire. In addition, patients whose fractures were surgically treated had a significantly lower QoL compared to those whose fractures were managed conservatively [29]. Similar results were obtained in other studies.

Conclusion

In the present study, older age was significantly related to a poorer quality of social functioning, while having no effect on participants’ mental functioning. Rural lifestyle and primary-level education also emerged as predictors of a poorer quality of social and mental functioning, while unemployment led to lower quality of social functioning.

Statistically significant differences were observed in the quality of social functioning (but not mental functioning) of examinees with different nutritional status. Lower quality of life in the social and mental domains was noted among women with lower bone mineral density, as well as those with history of fractures; however, mental functioning was not correlated with the existence of fractures.

Apart from timely diagnosis of reduced bone mineral density, adequate treatment, and prevention of osteoporotic fractures, it is also necessary to assess the quality of life of osteoporotic patients, with the aim of improving their quality of life in all domains of functioning.

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