Introduction

Osteoporosis is one of the most common metabolic disorders of the skeleton, which is characterized by the reduction of bone mineral density (BMD), bone microarchitecture disturbances and escalated fracture risk. Osteoporosis is more frequent in postmenopausal women, due to estrogen deficiency. Changed lifestyle of the people was found during last years. Deceased physical activity, dietary disbalance can lead to the obesity development. Abdominal obesity, high glucose, triglycerides, hypertension and low high density lipoproteins are named as metabolic syndrome. The last is associated with cardiovascular morbidity and mortality. The association between metabolic syndrome components and BMD has been researched, but results are contradictory.

Objective. The purpose of the study was to determine the frequency of osteoporosis and low BMD in Ukrainian women with obesity and metabolic syndrome.

Materials and Methods

The study involved 1605 person. The mean age of them was 62.31±9.52 years, the mean weight was 76.48±14.65 kg. All women were in postmenopausal period. Patients were compared into three groups. First group (800 people) included women without obesity (body mass index (BMI) ≤ 29.9 kg/m²), second group involved patients (572 persons) with obesity (BMI ≥ 30.0 kg/m²). MS was diagnosed in women of the third group (233 persons). Women were considered to have the MS according to International Diabetic Federation criteria (2005 yr) if they had waist circumference > 80 cm and two or more of the following criteria: hypertriglyceridemia ≥ 1.7 mmol/l; low high-density lipoprotein cholesterol < 1.29 mmol/l; blood pressure ≥130/85 mm Hg or antihypertensive treatment; fasting glucose ≥5.6 mmol/l or usage of antidiabetic medication (insulin or oral agents). BMD of lumbar spine and femoral neck was measured by dual-energy X-ray absorptiometry, “Prodigy” (GE Medical systems, Lunar, model 8743, 2005, USA). Women were considered to have normal or decreased BMD according to criteria of the Official Positions of the ISCD, 2007 yr (revised in 2015 yr). Data were analyzed using Statistical Package 6.0. Results were present as means (±SD) and categorical variables were expressed as frequencies. A two-tailed p value of < 0.05 was considered to be significant. Associations between continuous variables were examined by Pearson correlation coefficient. ANOVA was used to examine differences among the groups for different variables.

Results

The main clinical, anthropometric investigations were comparable between three groups of patients. Mean levels of age, menopause duration were not significantly different (p>0.05) among them. The mean value of weight in the second group of patients (87.67±11.7 kg) was significantly higher in compare with first and third groups (66.53±9.17 kg and 83.14±12.5 kg
respectively) \((p<0.001)\) and in the third group of women were higher than in the first one \((p<0.001)\). The same results of BMI mean values were found.

BMD values of lumbar region (L1-L4) and femur were significantly lower in the women of the first group \((p < 0.001)\) in compare with the patients of another two groups. BMD values of the same regions did not differ between the patients of the second and third groups \((p > 0.05)\).

The prevalence of the lumbar region (L1-L4) osteoporosis was estimated in the first group patients \((32.58\%)\) in compare to patients of the third \((11.60\%)\), and second \((8.22\%)\) groups.

Osteoporosis of the femur region was twice more frequent in the patients of the first group \((21.07\%)\), in compare with third group patients \((11.59\%)\) and three times more frequent than in patients of the second group \((7.52\%)\).

The results of the femur investigation showed significant difference in the frequency of low BMD between patients of the first and second groups \((\chi^2 = 52.97, p < 0.001)\), and significant difference of the same results between patients of the first and third groups \((\chi^2 = 37.28, p < 0.001)\). Significant differences between second and third patients were not found \((\chi^2 = 0.23, p > 0.05)\).

Lower quantity of osteoporosis and low BMD in the patients of the second and third groups can estimate protective effect of fat tissue on BMD.

Higher frequency of osteoporosis and low BMD in patients of the third group in compare with second group women requires more deep study of different MS components influence on the BMD.

**Conclusions**

It was found that osteoporosis and low BMD are significantly much rarer in patients with obesity and MS compared to those without obesity. Our study estimated significant positive association of MS and obesity with bone mineral density in Ukrainian women.