

The prevalence and the risk factors for low-energy fractures in women with type 2 diabetes

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Background and aim

The modeling of the risk of osteoporosis-related fractures in women with type 2 diabetes is important issue for medicine.

The aim of our study was to determine the prevalence and the risk factors for low-energy fractures in postmenopausal women with type 2 diabetes.

Materials and Methods

The study included 236 postmenopausal women with type 2 diabetes, from 50 to 75 years of age. The clinical characteristics of women with type 2 diabetes depending on the BMD are presented in the Tab. 1.

Bone mineral density (BMD), T-score and total body composition (TBC) were determined by dual-energy X-ray absorptiometry.

Table 1. Clinical characteristics of women with type 2 diabetes depending on BMD

Parameter	Women with normal BMD (n=86)	Women with osteopenia (n=105)	Women with osteoporosis (n=45)
Age, years	60.5 (56.0; 65.0)	66.0 (61.0; 71.0)*	67.0 (64.0; 74.0)*
Body mass index, kg/m ²	35.2 (32.1; 38.4)	33.3 (29.7; 37.2)	30.9 (27.5; 33.3) **
Waist circumference, cm	109.5 (101.0; 120.5)	105.0 (97.0; 114.0)	105.0 (90.0; 112.0)*
Hips circumference, cm	114.5 (110.0; 120.0)	110.0 (107.0; 119.0)	109.0 (104.0; 114.0)*
The duration of postmenopause, years	11.0 (6.0; 18.0)	17.0 (11.0; 22.5)*	21.0 (14.0; 28.0) **
T-score, SD	-0.1 (-0.6; 0.4)	-1.6 (-2.0; -1.3)*	-2.7 (-3.0; -2.6) **
FRAX total	6.3 (5.7; 6.9)	8.5 (7.5; 10)*	11 (8.5; 13) **
FRAX (hip fractures)	0,1 (0.1; 0.3)	0,8 (0.4; 1.4)*	1.8 (0.8; 2.9) **

Data are presented as medians (25; 75 percentiles). The significance of differences was estimated by the Mann-Whitney test.

*P <0.05 vs. women with normal BMD, ** P <0.05 vs. women with osteopenia

Results

Based on the T-score, patients were divided into groups with normal BMD (n=86, 36.4%), osteopenia (n=105; 44.5%), and osteoporosis (n=45, 19.1%).

A history of fractures occurred in 72 patients (30.5%). Low-energy fractures (Fig. 1) were observed in the groups of osteopenia (n=8) and osteoporosis (n=14).

The most common localization of low-energy fractures was the radius (57.9% of all low-energy fractures), and proximal femur (36.8%).

The clinical characteristics of women with type 2 diabetes depending on the fractures in anamnesis are presented in the Tab. 2.

Table 2. Clinical characteristics of women with type 2 diabetes depending on fractures in anamnesis

Parameter	Women without fractures (n = 164)	Women with non-low-energy fractures (n = 50)	Women with low-energy fractures (n = 22)
Age, years	64.0 (59; 68)	65.0 (59.0; 69.0)*	70.5 (65.0; 75.0)*
BMI, kg/m ²	33.3 (30.3; 37.6)	33.8 (29.1; 37.8)	31.5 (28.3; 36.4) ***
Waist circumference, cm	108.5 (100.0; 120.0)	106.0 (100.0; 114.0)	104.0 (90.0; 110.0)*
Hips circumference, cm	113.0 (108.0; 120.0)	110.0 (105.0; 118.0)	110.0 (108.0; 114.0)*
Duration of insulin therapy, years	4.0 (1.0; 8.0)	8.0 (3.0; 10.0)	8.5 (3.0; 13.0) **,***
Age of menopause, years	50.0 (45.0; 53.0)	50.0 (45.0; 50.0)	48.0 (45.0; 50.0)
The duration of postmenopause, years	151.0 (9.0; 21.0)	17.0 (9.0; 23)*	22.0 (16.0; 30.0) **,***
T-score	-1,2 (-2,0; -0,4)	-1,1 (-1,8; 0,1)*	-1,9 (-2,4; -1) **,***
FRAX total	7,2 (6,3; 8,7)	7,4 (6,1; 10)*	8,2 (6,8; 11) **,***
FRAX (hip fractures)	0,3 (0,1; 0,7)	0,4 (0,1; 0,9)*	0,7 (0,4; 1,7) **,***

Data are presented as medians (25; 75 percentiles). The significance of differences was estimated by the Mann-Whitney test.

*significant difference with women without fractures

** significant difference with women with non-low-energy fractures

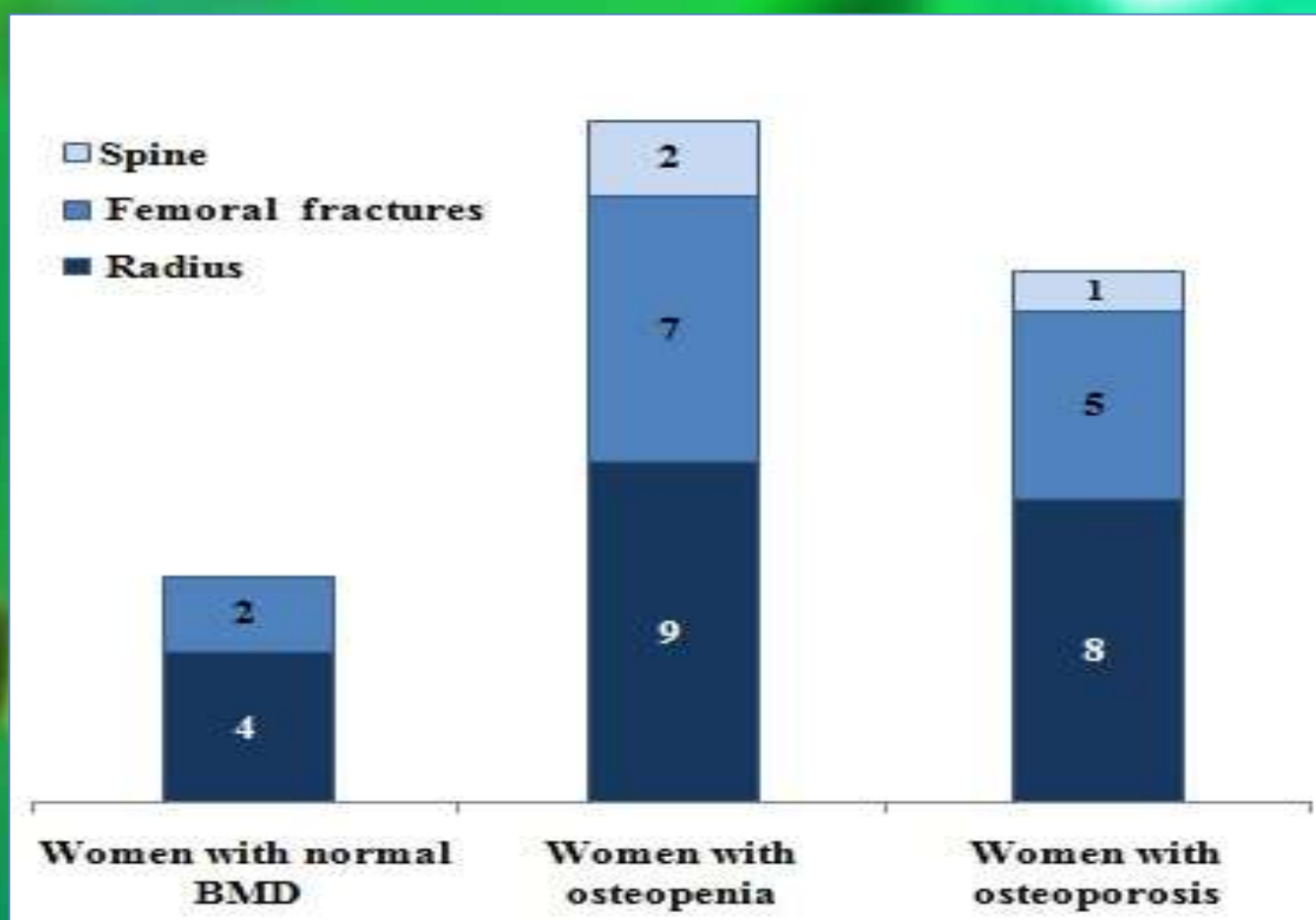


Fig. 1. The sites of the low-energy fractures

No differences were found between the groups in the total number of fractures (including fractures of the upper and lower extremities).

Low-energy fractures in the group of osteoporosis and osteopenia were more common than in the group of patients with normal BMD ($\chi^2=6.97$; $p=0.008$ and $\chi^2=4.18$; $p=0.04$, respectively).

Women with osteopenia and osteoporosis showed a higher incidence of radial fractures compared to those with normal BMD ($\chi^2=3.63$; $p=0.05$).

Table 3. Parameters of TBC in women with type 2 diabetes with and without fracture in anamnesis

Parameter	Women without fractures (n=164)	Women with non-low-energy fractures (n=50)	Women with low-energy fractures (n=22)
Total fat, kg	36.6 (31.5; 45)	32.8 (29.3; 38.2)*	26.8 (23.6; 32.2)***
Lean mass, kg	46.7 (43.2; 53)	45.8 (41.7; 48.3)	42 (39.8; 45.4)*
Trunk fat, kg	22.5 (19.7; 26.8)	19.4 (17.1; 21.8)	16.4 (13.7; 18.5)***
Android fat, kg	4.0 (3.5; 5.0)	3.4 (2.9; 4.3)*	2.9 (2.5; 3.5)***
Gynoid fat, kg	5.7 (4.6; 7.0)	5.1 (4.2; 6.8)	4.2 (3.6; 5.0)***

Data are presented as medians (25; 75 percentiles). The significance of differences was estimated by the Mann-Whitney test. *significant difference with women without fractures ** significant difference with women with non-low-energy fractures

The parameters of TBC in observed women depending on the fractures in anamnesis are summarized in Tab. 3.

Women with low-energy fractures had less total fat mass, abdominal and hip fat mass, and lean mass when compared to those without fractures in anamnesis (all $p<0.001$).

The diabetes duration of 15 years or longer and T-score <-2 SD increased the risk for low-energy fractures (OR 2.14; CI 1.02-4.5; $p=0.04$ and OR 2.86; CI 1.4-5.83; $p=0.004$, respectively).

In discriminant analysis, the duration of diabetes was the most reliable factor associated with low-energy fractures (model parameters: $p=0.01$; $F=6.2$; recognition accuracy 87%).

Conclusions

The age, duration of diabetes, postmenopause and insulin treatment, as well as body composition parameters (fat mass and lean mass), should be taken into consideration when modeling the risk of low-grade fractures in postmenopausal women with type 2 diabetes.