ANALYSIS OF THE OCCURRENCE OF DIETARY AND NON-DIETARY FACTORS OF FRACTURE RISK IN RELATION TO BONE MINERAL DENSITY IN WOMEN

Kamila Sobaś[1], Lidia Wądołowska[1], Małgorzata Anna Słowińska[1],
Magdalena Człapka-Matyasik[2], Ewa Niedźwiedzka[1]

[1]University of Warmia and Mazury in Olsztyn
[2]Poznań University of Life Sciences

Background. This study analysed the correlation between characteristic dietary and non-dietary factors of fracture risk in women and mineral density of bone tissue (BMD).

Material and methods. The study involved examination of 172 women, aged between 32 and 59. Calcium intake from a daily diet was determined with the use of the semi-quantitative food consumption frequency method. The physical activity of the women was expressed in MET-minutes/week. BMD was determined by double-energy X-ray absorptiometry (DXA). The frequency of bone fracture and osteoporosis risk factors was determined and a 10-year risk of fracture (RB-10) was individually diagnosed according to the WHO and IOF criteria (2007). A high level of fracture risk (RB-10 > 14%) was assumed according to the Johnell's algorithm [2005].

Results. The most frequent factors of fracture risk in women included: bone pains (76% of the total sample), inadequate calcium intake (43%), smoking (24%), previous fractures (24%), incidence of chronic diseases (22%), menstrual disorders (19%), family history of osteoporosis (17%), low physical activity (15%) and the incidence of thyroid disorders (10%). 85% of women had at least one factor of 10-year absolute risk of fracture. None of the examined women consumed a sufficient amount of calcium and the average calcium intake level was low (median of about 400 mg/day). Bone mineral density did not reveal any relationship with current intake of calcium by women, but depended on the consumption of dairy products in the past.

Conclusions. Daily consumption of dairy products in childhood and in the school period was conductive to a higher mineral density of bone tissue in women. Advanced age and the occurrence of menstrual disorders were conductive to a lower mineral density of bone tissue in women. Women with low bone mineral density (lower BMD tertile) more frequently used supplementation with preparations containing calcium (25%) and more often had at least one RB-10 risk factor (93% of the sample).

Key words: calcium intake, women, fracture risk factors, BMD, osteoporosis

Corresponding author – Adres do korespondencji: Mgr inż. Kamila Sobaś, Department of Human Nutrition of University of Warmia and Mazury in Olsztyn, Słoneczna 44 A, 10-718 Olsztyn, Poland, e-mail: kamila.pabjan@wp.pl

INTRODUCTION

Osteoporosis is a significant health problem which particularly concerns women in the post-menopausal period [Badurski et al. 2007]. Fracture is a basic clinical symptom revealing the disease and causes pain, physical disability and lowers the quality of life. Osteoporosis is defined as a systemic skeletal disease, characterized by low bone mass and disturbed microarchitecture of bone tissue, and in consequence, its increased fragility and susceptibility to fractures [WHO... 1994]. In the recent years, a new approach to the perception of this problem has emerged. Individual, total 10-year fracture risk (RB-10) is assessed taking into consideration independent risk factors [Badurski et al. 2007, Kanis et al. 2005 a]. Non-dietary risk factors of bone fracture include: female sex, Caucasian race, advanced age, menstruation disorders, early menopause, history of fractures, hip fractures in parents, low BMI, low bone mass, therapy with glucocorticosteroids, rheumatoid arthritis, low physical activity, poor health condition in the patient's own assessment, smoking, alcohol abuse.

A particular interest has been taken in the dietary risk factors of bone fracture, with the conviction that the proper intake of calcium, by improving the mineral density of bone tissue, reduces the risk of osteoporosis [Sobczuk and Jabłoński 2005, Teegarden et al. 2005]. The opinion is prevailing that a sufficient calcium supply in childhood and adolescence periods is the most important factor [Fisher et al. 2004, Matkovic et al. 2005, Nieves et al. 2008]. It makes it possible to reach a high, peak bone mass, which constitutes a specific "deposit" for future years of life [NIH 2001, Kanis and Gluer 2000]. The effect of calcium intake on bone density in later decades of life remains less explained [Kanis et al. 2005 b]. In the mature age, the importance of dietary factors may be weakened, and the influence of the intake of calcium and protein, vitamin D, phosphates, coffee and other dietary factors can be expressed primarily by their effects on the rate of bone mass loss [Badurski et al. 2007].

Despite this new concept, the mineral density of bone tissue still remains the key diagnostic factor in the evaluation of the risk of osteoporosis. The aim of this study was to determine the correlation between characteristic dietary and non-dietary risk factors of bone fracture in women and bone mineral density.

MATERIAL AND METHODS

The study involved 172 women aged between 32 and 59 years, living in rural areas and in towns in the province of Świętokrzyskie (Table 1). The sample under examination was selected using the snowball technique, through own contacts and announcements. The conditions of participating in the study included age up to 60, no eating disorders, no sports practiced at advanced level, no diseases, past surgeries or intake of medicines (for longer than a year) which could disturb hormonal balance, metabolism or bone remodeling [Badurski et al. 2007]. Interviews and measurement were carried out in the respondents' homes by a well-trained interviewer.

Most of women lived in villages (64% of the sample; Table 1). Secondary education had almost three-quarters of women and about 28% had higher education. Family economic situation over average was declared by 69% of the sample. Almost 70% of women declared good or very good health status.

Table 1. Sample characteristic

Variables	Sample percentage
Number	172
Age, years	45.5 ±5.8*
	32-59**
Size of place of residence	
country	64
town < 50,000 residents	6
town 50,000-100,000 residents	10
city > 100,000 residents	20
Education level	
primary	1
secondary	71
high	28
Self-declared family economic situation	
over average	69
average	30
under average	1
Self-declared health condition	
very good	3
good	65
quite good	28
bad	3

*Mean value ±standard deviation.
**Minimum – maximum.

Calcium intake from a daily diet (DD) was determined using a semi-quantitative food consumption frequency method on the basis of calcium consumption from dairy products. An ADOS-Ca validated questionnaire was used to assess the consumption of dairy products [Szymelfejnik et al. 2006]. The information obtained concerned customary frequency and the size of normal portions (for the last six months) of 11 groups of dairy products: milk, cheese, white fresh cheese, melted cheese, natural and fruit yogurt, buttermilk/kefir, sour cream/cream, ice-cream in season and off-season, cream cheese and Fromage-type cheese. By applying consumption frequency indicators established during the validation of the questionnaire [Szymelfejnik et al. 2006], eight categories of product consumption frequency (never, more seldom than once a week, once-twice a week, 3-4 times a week, 5-6 times a week, once daily, twice daily, 3 times daily) were converted into a mean frequency of consumption (multiplication factor/day). The average consumption of dairy products (g/day), the average calcium intake from dairy prod-

ucts (mg/day) and the average calcium intake from DD (mg/day) were then calculated individually for each person using the food nutritional tables [Kunachowicz et al. 2005] and regression equations [Szymelfejnik et al. 2006].

An adequate calcium intake (AI) level was applied in order to assess and interpret calcium intake [Jarosz and Bułhak-Jachymczuk 2008]. The z-scores of individual calcium intake (D/SD_D) were calculated for each woman. Women of inadequate ($D/SD_D < -1$), undetermined and adequate calcium intake ($D/SD_D > 1$) were distinguished. The assumed cut-off points D/SD_D made it possible to draw conclusions with a 0.85 probability [Jarosz and Bułhak-Jachymczuk 2008].

The physical activity of the women was expressed in MET-minutes/week, using an international physical activity questionnaire in its full version [IPAQ, http://www.ipaq. ki.se/]. According to the methodology, it was assumed that persons of values < 600 MET-minutes/week had low physical activity.

Bone mineral density (BMD) was assessed using a pDEXA densitometer (Norland STRATEC company) by double-energy X-ray absorptiometry (DXA) and expressed with the T-score indicator [WHO... 1994]. The measurement was performed for a distal forearm.

During the interview (supplemented with necessary explanations), information was collected concerning risk factors affecting the bone mass and the occurrence of osteoporosis [Lorenc and Kaczmarewicz 2006, Kanis et al. 2005 a, Marcinowska-Suchowierska 2002], such as:

   − frequency of sun exposure (I avoid the sun, rarely, often, very often)
   − taking supplements containing calcium (yes, no, I don't know)
   − consuming significant amounts of alcohol (yes, no, I don't know)
   − smoking in the past and at present (no, occasionally, ≤ 5 pcs/day, > 5 pcs/day)
   − family history of osteoporosis (yes, no, I don't know)
   − incidence of thyroid disorders (yes, no)
   − incidence of rheumatoid arthritis (yes, no)
   − incidence of fractures and bone pains (yes, no, I don't know)
   − therapy with glucocorticosteroids (yes, no).

Based on the WHO and the International Osteoporosis Foundation (IOF) guidelines, the total individual 10-year probability of fracture risk (RB-10) was diagnosed [Badurski et al. 2007]. RB-10 components included: age, BMI, history of fractures and bone pains in a given person, incidence of rheumatoid arthritis, treatment with glucocorticosteroids, consumption of significant amounts of alcohol, smoking (in the past and present) and bone mass. The RB-10 calculator was applied in calculations [www.pfo.com.pl]. The results were expressed by the percentage of women having at least one RB-10 risk factors. The percentage of women with a high level of fracture risk (RB-10 > 14%) was calculated according to the algorithm of Johnell [2005].

The average calcium intake was expressed with a median (Me) and quartile deviation (QD) and the age of women with average value (x) and standard deviation (SD). On the basis of tertile ranges of BMD, women were divided into three subgroups (T1: < 351 mg/cm^2; T2: 351-397 mg/cm^2; T3 > 397 mg/cm^2). T1 women were older than T2 and T3 (47.3 vs. 43.8 and 45.3, respectively). Average calcium intake from DD was compared with the use of the Kruskal-Wallis's test. Feature distributions were compared by a chi^2 test and a test for structural indicators.

RESULTS

Fracture risk factors of the highest frequency included: bone pains (76% of the total sample), inadequate calcium consumption (43%), smoking (24%), past fractures (24%), chronic diseases (22%), menstrual disorders (19%), osteoporosis in the family (17%), low physical activity (15%) and thyroid disorders (10%; Table 2).

Table 2. Distribution of selected indicators and factors of fracture risk in relation to bone mineral density (BMD) of women, percentage of the sample

Features	Total	BMD tertiles			p of the test
		T1	T2	T3	
1	2	3	4	5	6
Sample size	172	57	57	58	
Age, x ±SD, years	45.5 ±5.8	47.6 ±6.2^{a,b}	43.8 ±5.3^a	45.3 ±5.2^b	< 0.01#
Dietary risk factors					
Everyday consumption of milk and milk products at the pre-school age	65	63	56^a	74^a	NS
Everyday consumption of milk and milk products at the school age	60	61	47^a	72^a	< 0.05
Calcium intake, Me ±QD, mg/day	417 ±432	432 ±345	397 ±391	378 ±567	NS#
Calcium intake					NS
inadequate $D/SD_D < -1$	43	47	37	45	
undetermined	57	53	63	55	
adequate $D/SD_D > 1$	0	0	0	0	
Non-dietary risk factors					
High alcohol consumption	1	0	1	0	NS
Using calcium supplementation	22	25	19	22	< 0.05
Smoking – at present	24	18	32	24	NS
Low physical activity*	15	7^a	26^{a,b}	10^b	< 0.05
Poor health condition	3	5	2	3	NS
Chronic diseases	22	25	14	26	NS
Thyroid disorders	10	11	5	14	NS
Bone pains	76	74	75	78	NS
Rheumatoid arthritis	5	5	5	3	NS
Therapy with glucocorticosteroids	6	5	9	3	NS
Past fractures	24	25	32^a	16^a	NS
Family history of osteoporosis	17	19	9	22	NS

Table 2 – cont.

1	2	3	4	5	6
Menstrual disorders	19	32[a]	7[a]	19	< 0.01
Using hormonal contraception	6	5	12[a]	2[a]	NS
Avoiding sun exposure	5	7	5	3	NS
Bone fracture risk indicators					
T-score BMD**					< 0.001
above 1SD	34	0[a]	0[b]	100[a,b]	
proper bone density	59	79[a,b]	100[a,c]	0[b,c]	
osteopenia	6	19[a,b]	0[a]	0[b]	
osteoporosis	1	2	0	0	
10-year absolute fracture risk	85	93[a,b]	81[a]	81[b]	NS
High 10-year absolute fracture risk***	2	2	2	3	NS

x – mean value, SD – standard deviation, Me – median, QD – quartile deviation, D/SD_D – z-value of calcium intake; *low physical activity < 600 MET-min/week, **proper bone density: T-score BMD = –1-1 SD, osteopenia: T-score BMD = –1- –2.5 SD, osteoporosis: T-score BMD < –2.5 SD, ***high 10-year absolute fracture risk: RB-10 > 14%; a-a, b-b, c-c – statistically significant differences in pairs between tertile groups; #Kruskal-Wallis's test, NS – statistically insignificant differences (p > 0.05).

Proper BMD (–1-1 SD) or above 1 SD was found in general for 93% of women. Osteopenia was found in 19% of T1 women and osteoporosis in 2%. All T2 and T3 women had proper BMD or above 1SD. At least one factor of the 10-year absolute fracture risk was found in more T1 women than in T2 and T3 women (93% vs. 81% and 81% of the sample, respectively). 2% of the total sample had a high level of 10-year absolute fracture risk (> 14%), irrespective of the bone mineral density.

No differences in calcium intake or distribution of this feature were found between T1, T2 and T3 women. Calcium intake median amounted to 417 mg/day. Inadequate calcium intake was found for 43% of all women. T3 women, in comparison to T2 group, more frequently consumed milk and milk products in their pre-school age (74% vs. 56%, respectively) and in their school age (72% vs. 47% of the sample, respectively).

The largest group of women using supplementation with preparations containing calcium was found in T1 (25%). More T2 women, as compared to T1 or T3, had low physical activity (< 600 MET-minutes/week; 26% vs. 7% and 10%, respectively). Menstruation disorders were found for more T1 than T2 women (32% and 7%, respectively). More T2 than T3 women had a history of fractures (32% and 16% of the sample, respectively), and more frequently used hormonal contraception at present (12% and 2% of the sample, respectively).

DISCUSSION

No relationship between BMD and current intake of calcium by women was established. None of the examined women consumed a sufficient amount of calcium and the average calcium intake level was low (the median of about 400 mg/day). The lack of relationship between mineral density of bones and calcium intake, particularly in women after menopause, was reported by many authors, e.g. Feskaich et al. [2003] and Nieves et al. [2008]. The current results are consistent with these reports. An important finding of the study is the observed effect of consuming dairy products in the period of childhood and early youth. Higher bone mineral density in women was favoured by the daily consumption of dairy products in their pre-school and school period. This provides further evidence confirming that an adequate calcium supply in the period of childhood and youth is of greater significance for bone tissue density than calcium intake in later years of life [Badurski et al. 2007, Fisher et al. 2004, Szymelfejnik et al. 2006]. This conclusion concerns only a low level of calcium intake by adult women. The results are not conclusive concerning the relationship between calcium intake and bone mineral density in the situation of higher and more diversified calcium intake by adult women, since calcium consumption by women was low (the third quartile of calcium intake below 650 mg/day). These comments can explain certain contradictory opinions concerning the role of alimentary calcium in lowering the risk of osteoporosis [Badurski et al. 2007, Lorenc and Kaczmarewicz 2006].

Numerous research studies have shown the effect of low physical activity, avoidance of sun exposure, hormonal disorders, treatment with certain medicines, incidence of chronic diseases and past fractures on the development of osteoporosis [Dziatkowiak and Roztoczyńska 2000, Nieszporek and Więcek 2004, Rell-Bakalarska 2006]. The current research confirms the importance of these risk factors and their combined effect. The most often occurring risk factors of bone fracture in women included bone pains, insufficient calcium intake, smoking, past fractures, incidence of chronic diseases, menstruation disorders and family history of osteoporosis, low physical activity and thyroid disorders. Low bone mineral density in women was favoured by older age and the occurrence of at least one RB-10 risk factor. It justifies the application of densitometry (to measure BMD) in diagnosing osteoporosis when it is not possible to carry out a full assessment of many independent risk factors of bone fracture [Badurski et al. 2008].

Women with the lowest bone mineral density (low tertile of BMD) were older, which can explain the more frequent occurrence of menstruation disorders in this group caused by entering the menopausal period. Additionally, they tended to take calcium supplements more often, perhaps because of higher awareness of osteoporosis risk in older age. However, the intake of calcium supplements was not of crucial importance for improvement of their bone mineral density. Advanced age is a recognized risk factor for low bone mineral density and osteoporosis [Badurski et al. 2007, Kanis et al. 2005 a, Milert et al. 2009, NIH 2001]. Lower toughness of the bone tissue is caused, among others, by degeneration of collagen fibres which progresses with age [Wang et al. 2003].

CONCLUSIONS

The most frequent risk factors of bone fracture in women included bone pains, inadequate calcium intake, smoking, past fractures, incidence of chronic diseases, menstruation disorders, family history of osteoporosis, low physical activity and the incidence of thyroid disorders. 85% of women had at least one factor of 10-year absolute risk of fraction.

None of the examined women consumed sufficient amounts of calcium and the average calcium intake level was low (median of about 400 mg/day). Bone mineral density did not show any relation to the current calcium intake by women, but it depended on the consumption of dairy products in the past.

Daily consumption of dairy products in childhood and in the school period was conductive to higher mineral density of bone tissue in women. Lower bone mineral density in women was favoured by their older age and the occurrence of menstruation disorders. Women with low bone mineral density more frequently used supplementation with preparations containing calcium and more often had at least one RB-10 risk factor.

REFERENCES

Badurski J.E., Czerwiński E., Marcinkowska-Suchowierska E., 2007. Zalecenia Polskiej Fundacji Osteoporozy i Polskiego Towarzystwa Osteoartrologii wobec osteoporozy w oparciu o stanowisko Światowej Organizacji Zdrowia (WHO) i Międzynarodowej Fundacji Osteoporozy (IOF) [Recommendations of the Polish Foundation of Osteoporosis and Polish Osteoartrology Society concerning osteoporosis, based on the standpoint of the World Health Organization (WHO) and International Foundation of Osteoporosis (IOF)]. Ortop. Traumat. Rehab. 9 (2), 45-53 [in Polish].

Badurski J.E., Dobreńko A., Nowak N., Jeziernicka E., Daniluk S., Mrowiec A., 2008. Epidemiologia złamań osteoporotycznych i ocena 10-letniego ryzyka złamania w populacji kobiet regionu Białystok (BOS-2) algorytmem FRAX™ – WHO [Epidemiology of osteoporosis fractures and assessment of the 10-year risk of fracture in population of women of the Białystok region (BOS-2) using FRAX™ – WHO algorithm]. Reumatologia 46 (2), 72-79 [in Polish].

Dziatkowiak H., Roztoczyńska D., 2000. Osteoporoza wtórna u dzieci ze szczególnym uwzględnieniem endokrynopatii [Secondary osteoporosis in children, with particular focus on endocrinopathy]. Post. Nauk Med. 13 (2), 31-37 [in Polish].

Feskaich D., Willet W.C., Colditz G.A., 2003. Calcium, vitamin D, milk consumption, and hip fractures: a prospective study among postmenopausal women. Am. J. Clin. Nutr. 77, 504-511.

Fisher J.O., Mitchell D.C., Smiciklas-Wright H., Mannino M.L., Birch L.L., 2004. Meeting calcium recommendations during middle childhood reflects mother-daughter beverage choices and predicts bone mineral status. Am. J. Clin. Nutr. 79, 698-706.

Jarosz M., Bułhak-Jachymczyk B., 2008. Normy żywienia człowieka. Podstawy prewencji otyłości i chorób niezakaźnych [Standards of human nutrition. Principles of preventing obesity and non-contagious diseases]. Warszawa PZWL [in Polish].

Johnell O., 2005. When is intervention worthwhile in osteoporosis. Fifth Baltic Bone & Cartilafe Conference in Naantali, Finland.

Kanis J.A., Borgstrom F., De Laet C., Johannsson H., Johnel O., 2005 a. Assessment of fracture risk. Osteopor. Int. 16, 581-589.

Kanis J.A., Johamsson H., Oden A., De Laet C., Johnell O., Eisman J.A., Mccloskey E., Mellstrom D., Pols H., Reeve J., Silman A., Tenenhouse A., 2005 b. A meta-analysis of milk intake and fracture risk: low utility for case finding. Osteopor. Int. 16 (7), 799-804.

Kanis J.A., Gluer C., 2000. An update on the diagnosis and assessment of osteoporosis with densitometry. Osteopor. Int. 11, 192-202.

Kunachowicz H., Nadolna I., Przygoda B., Iwanow K., 2005. Tabele składu i wartości odżywczej żywności [Food composition and nutrition tables]. Warszawa PZWL [in Polish].

Lorenc R.S., Kaczmarewicz E., 2006. Strategia diagnostyki osteoporozy 2006 [Strategy for diagnosing osteoporosis 2006]. Terapia Osteopor. 3 (177), 5-10 [in Polish].

Marcinowska-Suchowierska E., 2002. Osteoporoza, diagnostyka, profilaktyka i leczenie [Osteoporosis, diagnostics, prophylaxis and treatment]. Wyd. PZWL Warszawa [in Polish].

Matkovic V., Goel P.V., Badenhop-Stevens N.E., Landoll J.D., Li B., Illich J.Z., Skugor M., Nagode L.A., Mobley S.L., Ha E.J., Hangartner T.N., Clairmont A., 2005. Calcium supplementation and bone mineral density in females from childhood to young adulthood: a randomized controlled trial. Am. J. Clin. Nutr. 81, 175.

Milert A., Jurgiełan A., Borowy P., Król D., Czerwiński E., 2009. Występowanie czynników ryzyka złamań osteoporotycznych w populacji krakowskiej [Occurrence of risk factors of osteoporosis fractures in the population of Kraków]. Ortop. Traumat. Rehab. 11 (2), 128-129 [in Polish].

NIH 2001. Consensus Conference on Osteoporosis Prevention, Diagnosis, and Therapy. JAMA 285, 785-794.

Nieszporek T., Więcek A., 2004. Osteoporozy wtórne [Secondary osteoporoses]. Medycyna po dyplomie, Special Issue, 37-41 [in Polish].

Nieves J.W., Barrett-Connor E., Siris E.S., Zion M., Barlas S., Chen Y.T., 2008. Calcium and vitamin D intake influence bone mass, but not short-term fracture risk, in Caucasian postmenopausal women from the National Osteoporosis Risk Assessment (NORA) study. Osteopor. Int. 19 (5), 673-679.

Rell-Bakalarska M., 2006. Osteoporoza wtórna [Secondary osteoporosis]. Terapia 3 (177), 47-51 [in Polish].

Sobczuk A., Jabłoński E., 2005. Rola diety i wapnia w profilaktyce osteoporozy pomenopauzalnej [The role of the diet and calcium in prevention of post-menopausal osteoporosis]. Przegl. Menopauzal. 48-52 [in Polish].

Szymelfejnik E., Wądołowska L., Cichon R., 2005., Spożycie wapnia z produktów mlecznych przez 18-letnią młodzież a zwyczaje żywieniowe we wcześniejszych okresach życia [Calcium intake from dairy products by 18-year-old youth and dietary habits in previous periods of life]. In: Konsument żywności i jego zachowania w warunkach polskiego członkowstwa w Unii Europejskiej. Wyd. SGW Warszawa, 128-134.

Szymelfejnik E.J., Wądołowska L., Cichon R., Przysławski J., Bolesławska I., 2006. Dairy products frequency questionnaire (ADOS-Ca) calibration for calcium intake evaluation. Pol. J. Food Nutr. Sci. 15/56, SI 1, 229-236.

Teegarden D., Legowski P., Gunther C.W., Mccabe G.P., Peacock G.P., Lyle R.M., 2005. Dietary calcium intake protects women consuming oral contraceptives from spine and hip bone loss. J. Clin. Endocrinol. Metab. 90 (9), 5127-5133.

Wang X., Shen X., Li X., Agrawal C.M., 2003. Age-related changes in the collagen network and toughness of bone. Bone 31, 1-7.

WHO Study Group. 1994. Assessment of facture risk and its application to screening for postmenopausal osteoporosis 1994 Technical Report 843. Geneva.

www.ipaq.ki.se/

www.pfo.com.pl

ANALIZA WYSTĘPOWANIA ŻYWIENIOWYCH I POZAŻYWIENIOWYCH CZYNNIKÓW RYZYKA ZŁAMANIA KOŚCI W RELACJI DO GĘSTOŚCI MINERALNEJ TKANKI KOSTNEJ KOBIET

Wstęp. Analizowano współzależność pomiędzy charakterystycznymi żywieniowymi i pozażywieniowymi czynnikami ryzyka złamania kości u kobiet a gęstością mineralną tkanki kostnej (BMD).

Materiał i metodyka. Badaniami objęto 172 kobiety w wieku od 32 do 59 lat. Metodą półilościowej częstotliwości spożycia żywności określono spożycie wapnia z dziennej diety. Aktywność fizyczną kobiet określono w MET-minutach/tydzień. Metodą dwuwiązkowej absorpcjometrii rentgenowskiej (DXA) oznaczano BMD. Oceniono częstość występowania czynników ryzyka złamania kości i osteoporozy oraz zdiagnozowano indywidualne 10-letnie zagrożenie złamaniem kości (RB-10) według kryteriów WHO i IOF (2007). Wysoki poziom zagrożenia złamaniem kości (RB-10 > 14%) przyjęto według algorytmu Johnella [2005].

Wyniki. Najczęściej występującymi czynnikami ryzyka złamania kości u kobiet były: bóle kostne (76% próby ogółem), niedostateczne spożycie wapnia (43%), palenie papierosów (24%), przebyte złamania (24%), występowanie chorób przewlekłych (22%), zaburzenia miesiączkowania (19%) i osteoporoza w rodzinie (17%), mała aktywność fizyczna (15%) i występowanie chorób tarczycy (10%). Co najmniej jednym czynnikiem 10-letniego bezwzględnego ryzyka złamania charakteryzowało się 85% kobiet. Żadna z badanych kobiet nie spożywała dostatecznej ilości wapnia i niski był przeciętny poziom jego spożycia (mediana ok. 400 mg/dzień). Gęstość mineralna tkanki kostnej nie miała związku z aktualnym spożyciem wapnia przez kobiety, lecz zależała od spożycia produktów mlecznych w przeszłości.

Wnioski. Codzienne spożywanie produktów mlecznych w dzieciństwie i okresie szkolnym sprzyjało większej gęstości tkanki mineralnej kostnej kobiet. Mała gęstość mineralna tkanki kostnej kobiet wiąże się ze starszym wiekiem i występowaniem zaburzeń miesiączkowania. Kobiety wyróżniające się małą gęstością mineralną tkanki kostnej (dolny tercyl BMD) częściej stosowały suplementację preparatami zwierającymi wapń (25%) i częściej były obciążone co najmniej jednym czynnikiem ryzyka RB-10 (93% próby).

Słowa kluczowe: spożycie wapnia, kobiety, czynniki ryzyka złamania, BMD, osteoporoza