Rocz Panstw Zakl Hig 2014;65(2):147-153

AWARENESS OF FACTORS AFFECTING OSTEOPOROSIS OBTAINED FROM A SURVEY ON RETIRED POLISH SUBJECTS

Natalia Ciesielczuk, Paweł Glibowski, Jolanta Szczepanik*

Faculty of Food Science and Biotechnology, University of Life Sciences in Lublin, Poland

ABSTRACT

Background. Osteoporosis is a growing problem facing modern society and currently poses one of the most serious health challenges. It is a progressive skeletal disease characterised by low bone mineral density whose development depends on multiple factors. These principally include increasing age, nutrition, physical activity, endocrine changes, lifestyles, general health condition and taken drugs.

Objectives. To assess how much subjects (aged >50 years) are aware of the dangers in contracting osteoporosis along with the effects that lifestyle and dairy product consumption can have on this condition developing.

Material and methods. A questionnaire, designed in-house, was used to survey a group of 150 randomly selected individuals aged above 50 years. This was performed in June 2012. Questions were on socio-demographics, milk and dairy product consumption, physical activity as well as assessing knowledge about osteoporosis that included issues such as its incidence, prevention and morbidity.

Results. Osteoporosis was established in 60.7% subjects of whom 69.2% were women. Only 9.3% never consumed any dairy products. Physical activity of some kind was undertaken by 77.3% subjects. Within the last year, 38.0% reported having fractures of whom 46.0% had osteoporosis and 25% were healthy. Respondents were aware that consuming dairy products is beneficial to bone health and this awareness was higher among those with osteoporosis. Physical activity was also recognised to be important in preventing this condition.

Conclusions. Subjects suffering from osteoporosis had twice as many more fractures than healthy subjects.

Key words: *osteoporosis, milk, dairy products, calcium*

STRESZCZENIE

Wprowadzenie. Osteoporoza jest coraz większym problemem współczesnego społeczeństwa. Jest to choroba szkieletu, która charakteryzuje się niską gęstością mineralną kości. Jest ona bardzo poważnym wyzwaniem w obecnych czasach, ponieważ na jej rozwój wpływa wiek a także odżywianie, aktywność fizyczna, zaburzenia hormonalne, styl życia, ogólna kondycja zdrowotna a także przyjmowane leki.

Cel badań. Celem badań była ocena świadomości zagrożenia osteoporozą oraz wpływu stylu życia i spożywania przetworów mlecznych na jej występowanie u osób w wieku powyżej 50 roku życia.

Materiał i metody. Badania zostały przeprowadzone na podstawie ankiety własnego autorstwa w czerwcu 2012 roku. Badaną grupą było 150 losowo wybranych osób w wieku od 50 lat wzwyż. Ankieta zawierała pytania dotyczące sytuacji socjo-demograficznej ankietowanych oraz wiedzy i zagadnień dotyczących osteoporozy, przyczyn jej występowania, zapobiegania, zachorowalności a także spożywania mleka i przetworów mlecznych oraz aktywności fizycznej.

Wyniki. 60,7% badanych miało osteoporozę, a 69,2% chorych stanowiły kobiety. Tylko 9,3% badanych nie spożywała produktów mleczarskich. 77,3% respondentów stosowało jakiś rodzaj aktywności fizycznej. 38,0% deklarowało, że w ciągu ostatniego roku wystąpiło u nich złamanie, przy czym 46% wśród nich miało osteoporozę i 25% wśród zdrowych. Uczestniczący w badaniach byli świadomi, że spożywanie produktów mlecznych ma korzystny wpływ na kościec, jednak większą świadomość miały osoby z osteoporozą. Aktywność fizyczna była częstą praktyką wśród respondentów, wskazywana jako ważna część profilaktyki osteoporozy.

Wnioski. Nadal niewystarczająca wiedza na temat osteoporozy u osób powyżej 50 roku życia i powinna być poszerzana, co mogłoby wpłynąć na zmniejszenie liczby złamań u takich osób, które są niemal dwukrotnie częstsze niż u osób zdrowych.

Słowa kluczowe*: osteoporoza, mleko, przetwory mleczne, wapń,*

***Corresponding author**: Paweł Glibowski, University of Life Sciences in Lublin, Faculty of Food Science and Biotechnology, Department of Milk and Hydrocolloids Technology, 8 Skromna Street, 20-704 Lublin, Poland,
phone: +48 81 462 33 49, fax +48 81 462 33 54, e-mail: pawel.glibowski@up.lublin.pl

INTRODUCTION

Healthy and rational nutrition is essential for the proper development of human physical and mental fitness [12]. Inadequate nutrition may lead to a deterioration of health and emergence of lifestyle-related diseases [26]. Due to an aging population, osteoporosis has become an increasing health problem [22]. The World Health Organisation (WHO) defines osteoporosis as 'an epidemic of the XXI century', which along with obesity, diabetes and cardiovascular disease, is a serious and growing clinical problem associated with the process of aging. Because developing this disease depends on many factors like ageing (along with the increase in bones loss density and strength), nutrition, physical activity, endocrine changes, lifestyles, general health condition, as well as taken drugs, it nowadays poses one of the most serious health challenges [8, 33]. According to the WHO definition, osteoporosis is a systemic skeletal disease, characterised by low bone mineral density and abnormal bone micro-architecture, which in consequence leads to fragility and increased susceptibility to fractures [24]. It is a serious disease that develops slowly over many years and it is often diagnosed too late. Due to current medical advances, a reduction in the risk and incidence of fractures has been demonstrated as well enabling an increase in bone mineral density. The restoration of normal body weight is also important [25].

The main factors affecting maximum bone mass and strength are genetic predisposition and dietary habits acquired from childhood and adolescence. Nutrients supplied regularly and in sufficient quantities (especially calcium and protein), together with physical activity, contribute in achieving a maximum bone mass [3]. The main risk factor for human osteopaenia (a condition where bone mineral density is lower than normal) and osteoporosis is Vitamin D deficiency. This deficiency is the cause of increased secretion of parathyroid hormone (PTH) and reduced calcium absorption from the gastrointestinal tract, which contributes to a reduction of bone mass [16]. The value of the peak bone mass achieved, is dependent on genetic determinants, nutrition, physical activity and environmental pollution (for e.g. lead adversely affects the bioavailability of nutrients that includes calcium) [29].

Osteoporosis is a disease affecting both sexes, however due to the late start of losing bone mass and a milder course with no sudden changes in hormonal activity, osteoporosis develops less often in men than in women [17]. Diagnosis of osteoporosis proposed by the WHO is based on the measurement of bone mineral density [9]. In Poland, there have been a few studies on osteoporosis conducted on the elderly [10, 28], however to the best of our knowledge, there are no studies on Polish men and women (aged above 50 years) regarding their knowledge of osteoporosis. For this reason, the study aim was to investigate awareness about osteoporosis among retired subjects aged above 50 years and analysing their lifestyle and dairy products consumption.

MATERIAL AND METHODS

The study was based on an in-house designed questionnaire, and carried out in June 2012. The target group was 150 randomly selected individuals aged above 50 years. Subjects were divided into gender. The questionnaire asked respondents about socio-demographics and their knowledge on osteoporosis issues that included its occurrence, prevention, morbidity as well as their consumption of milk and dairy products and any undertaken physical activity. The questionnaire consisted of 23 questions, including 3 multiple choice ones and 20 that were single choice.

RESULTS

Subjects consisted of 92 women and 58 men. Socio--demographic details are presented in Table1.

Table 1. Socio-demographics of studied subjects

Characteristic	Variants	Percentage of total
Age range	50-60 years	30.0
	60-70 years	40.0
	70-80 years	20.7
	>80 years	9.3
Location	Village	44.0
	City; to 20 thousand inhabitants	29.3
	City; 20-50 thousand inhabitants	20.0
	City; > 50 thousand inhabitants	6.7
Education	Primary	21.2
	Vocational	17.3
	Secondary	33.3
	Higher	26.0
Financial situation	Bad	14.7
	Average	22.7
	Good	38.0
	Very good	23.3
	Not know	1.3

Of the 150 subjects surveyed, 91 (60.7%) had osteoporosis, among which 22.0% had been diagnosed with osteoporosis at the age of 50-60, 11.3% at 40-50 years, 9.3% at 60-70 years and 8.0% at up to 30 years as well as 3.3% of people over 80 years, 70-80 years and 30-40 years. In most cases, a genetic influence could be probably discerned, as more than 50% subjects declared

Table 2. Surveyed incidence of osteoporosis types broken down according to gender and age

Type of osteoporosis	Ages at which the disease was diagnosed						
	< 30 years	30-40 years	40-50 years	50-60 years	60-70 years	70-80 years	Over 80 years
Idiopathic	10 W	-	1 W	-	-	-	-
Involutional	1 W 1 M	1 W 1 M	- 1 M	1 W -	- -	- -	- -
Senile	- -	- -	2 W -	4 W 4M	3 W 7M	2 W -	1 W -
Post-menopausal	-	1 W	6 W	16 W	2 W	1 W	-
Derivative	- -	1 W 1 M	3 W 3 M	4 W 3 M	3 W 3 M	- 2 M	- 2 M

W- woman, M- man

that osteoporosis had been diagnosed in some of their family members (Figure 1). In addition, 6 osteoporotic subjects (6.6%) were diagnosed with the primary type of this disease. Osteoporosis is a disease that affects people of all ages and both women and men. In our study, 69.2% of those suffering were women. The incidence of the osteoporosis types, according to gender and age, is shown in Table 2.

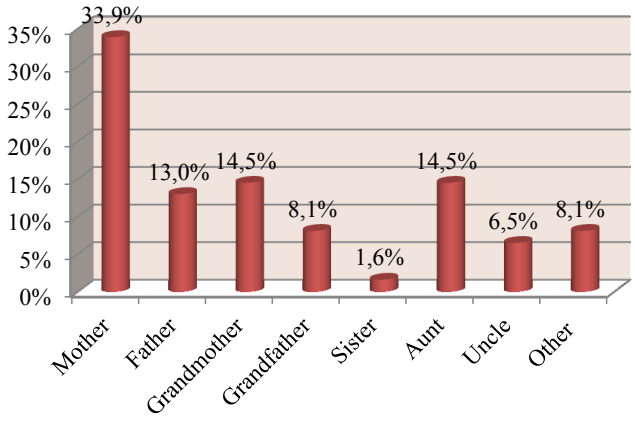

Figure 1. Close relatives of the respondents who were diagnosed with osteoporosis (%)

Subjects were found to well recognise and define osteoporosis, where more than 90% gave correct definitions and furthermore, 37.0% were able to provide reasons for its occurrence. In this latter group, 25 subjects (44.7%) reported low bone mineral density as a reason, 18 (32.1%) believed it to be calcium and vitamin D deficiency, 12 (21.5%) indicated an abnormal bone mass, and only one respondent (0.7%) pointed to age.

When given the opportunity to select up to three answers, as to the basic factors influencing osteoporosis development, respondents mostly selected old age, a genetic predisposition and menopause (Figure 2).

Subjects were aware of the fact that osteoporosis develops more often in women (73.3%), than men (19.3%), or in children (7.3%). The main type of osteoporosis found was the postmenopausal variety affecting more than 17% of the female subjects. Secondary osteoporosis was observed in 16.7% respondents, 15.3% in those with senility and 7.3% were stricken by idiopathic-osteoporosis. The lowest morbidity among respondents (4.0%) concerns involutional-osteoporosis.

Milk and dairy products had been consumed by 80.0% of respondents in their youth. Almost 11% never consumed any dairy products and a little over 9.0% said they couldn't remember. At the present time, 45.3% of respondents declared consuming dairy products several times a week, 30.0% every day, 12.0% once a week, 3.3% several times a month and 9.3% never at all. A significantly higher consumption of dairy products was recorded for osteoporotic individuals compared to the group as a whole. It was found that 31.0% of patients consume milk and dairy products daily, 56.0% several times weekly, 4.4% once weekly and 1.1% several times a month. However only 4.0% (4/91 osteoporotic subjects) did not consume dairy products, which included a single subject in the osteoporotic group that suffered fracture (2%). This, therefore indicates a high awareness in the benefits of consuming such kinds of food. Among those respondents who did not get sick, 18.0% (11/59) never ate dairy products, whilst 20.0% of healthy subjects (3/15) who had fractures never consumed milk nor its products. The most important dairy

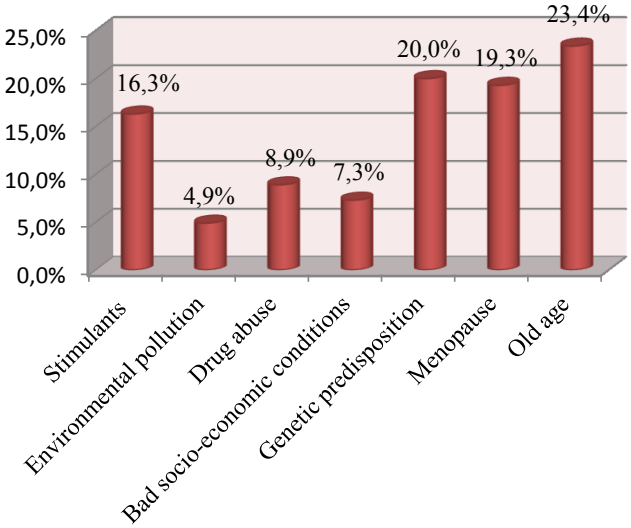

Figure 2. Factors affecting the development of osteoporosis in the opinion of respondents (%)

products found to be consumed were milk, curds, and cottage cheese (Figure 3).

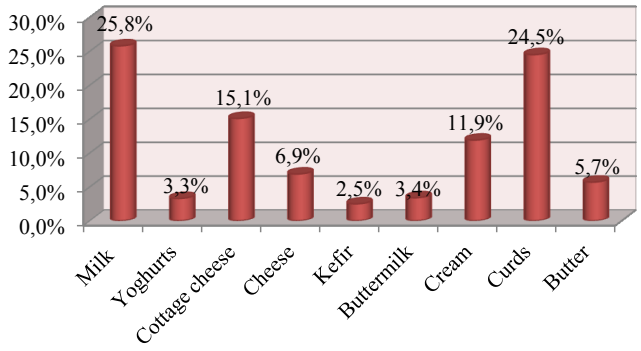

Figure 3. Types of dairy products consumed by respondents (%)

Physical activity was considered to be important in preventing osteoporosis by 81.0% of subjects, whereas 16.0% said otherwise and less than 3.0% answered that they didn't know. The respondents were found to be fairly active physically, where 26.0% said they took walks, 24.7% did exercises, 18.7% went swimming, 16.7% preferred other types of activities and 14.0% said they were passive. Regarding being aware of the importance of physical activity, then 28.0% said they undertook this daily, 26.0% a few times weekly and 23.3% a few times a month; unfortunately 22.7% were not involved in any sport/exercises at all.

Fractures are an inevitable consequence of osteoporosis. The reduced strength of bone tissue due to the lower mineral density results in decreased resistance to damage as compared to those persons with normal bone mineral density. It was found that 38.0% subjects had fractures in the last year, where the wrist, forearm and hip bone were broken most frequently (Figure 4). Of the 91 osteoporotic subjects, 42 (46.0%) had fractures over the last year, whilst 15/59 (25%) healthy subjects suffered fractures.

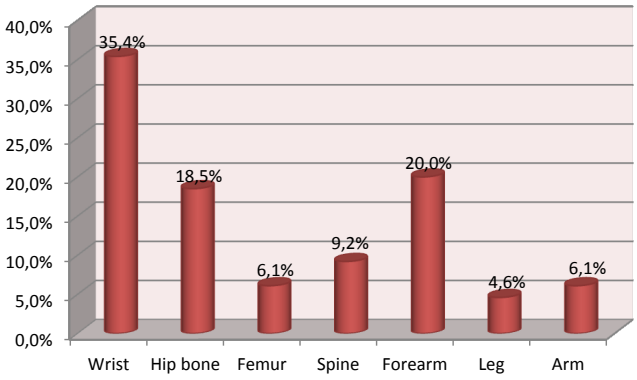

Figure 4. Fractures occurred to the surveyed within a year (%)

More than 47.0% of respondents answered that they knew what helps to prevent osteoporosis, but 63.0% didn't know the importance of daily calcium requirements. Amongst those that knew about calcium, 55.9% believed that such requirements should be 1200 mg/day, and 44.1% - 1500 mg/day. Over 49% of subjects indicated vitamin D to be a nutrient that supports the absorption of calcium from the gastrointestinal tract with the others being ignorant of this fact. Calcium deficiencies were made up for by 54.0% taking supplements, whilst the remainder did not use these type of products. The majority of respondents derived information on osteoporosis from their GP (General Practitioner) and the Internet. Another important source was also from the family, radio and television (Figure 5).

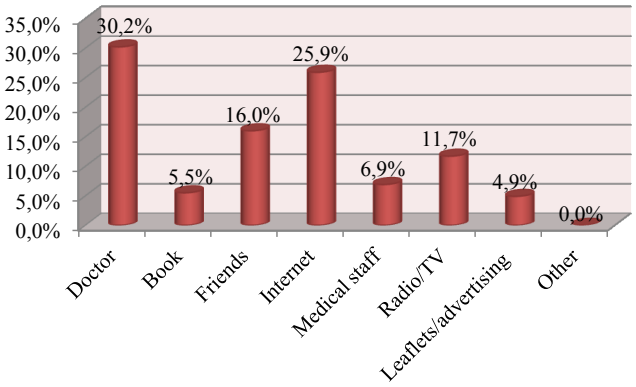

Figure 5. Information sources for respondents concerning osteoporosis (%)

52.0% of respondents were medically examined on occurrence of osteoporosis; the others did not participate in such examination. Furthermore, access to such examinations is sufficient for less than 23% of respondents, while others declare that it is not sufficient. It was found that 31% (15/59) of the subject group suffering from osteoporosis that did not have fractures, didn't practice sport while 27% (13/49) of these did so daily. However, 27.0% (12/44) of healthy persons who didn't have fractures within the last year were observed not practice any sports at all, but 34.0% (15/44) practiced it every day. It is worth noting that the results for these two groups (i.e. osteoporotic and healthy) are very similar. In those osteoporotic subjects suffering fractures, only 10.0% (4/42) didn't practice any sport at all and likewise in healthy subjects who suffered fracture, only 9.0% (4/44) abstained from any sport.

DISCUSSION

Milk and dairy products are necessary foodstuffs in the daily diet of every person. They provide many essential nutrients, of which calcium is the most important. *Nowicka* and *Panczenko-Kresowska* [23] indicate that the calcium deficiency caused by low intakes of milk, give rise to bone abnormalities. According to *Coudray* [5], insufficient intakes of milk and dairy products by

children and adolescents leads to a failure in achieving peak bone mass, and in the case of adults, effects the bone tissue remodelling disorder and fosters the loss of bone mass. Furthermore, *van Staveren* et al. [32] has indicated that an adequate dietary supply of this group of food products helps in preventing osteoporosis. Besides dairy products, drinking water can also be quite an important source of calcium in the diet as reported by *Madej* et al. [20], with a 15 % of the daily calcium intake derived from drinking water.

The Polish WOBASZ study (Multicenter National Study of Population's Health Status) from 2002-2005 showed that current consumption of milk and dairy products is surprisingly low. Similar results of such a decline were obtained by *Bouamra-Mechemache* et al. [2]. The presented survey on the randomly selected subjects however, do not confirm this as demonstrated by the quite high consumption of milk and dairy products. Furthermore, the frequency in consuming this type of food products were also satisfactory. The reason for this is probably the dietary habits acquired in childhood. *Fischer* et al. [11] showed that milk and dairy products are perceived as a major group of foods needed for the growth and development of children and adolescents.

A large assortment and wide availability of milk and dairy products on the market allows consumers to choose those which match their preferences. According to *Henning* et al. [14], development of the dairy industry has had a positive influence on the variety and quality of such available products. *Kozłowska-Wojeciechowska* [19] showed that 51% men meet the daily demand for milk and dairy products but only 41% women do so. This difference is not so apparent in the current study, as both, male and female subjects were found to regularly consume dairy products. Our study showed that respondents know how important calcium and vitamin D are. This quite high awareness of the recommended calcium intake could be due to the high predominance of osteoporosis in the surveyed group. *Marcinkowska-Suchowierska* and *Sawicka* [22] reported that the daily requirement for calcium for older people is 1200 mg/day, which is consistent with *Tang* et al. [30], who proved that a calcium intake of 1200 mg/day alone or in combination with vitamin D, reduces the risk of osteoporotic fractures. *Marcinkowska-Suchowierska* et al. [22] also recommends calcium intake levels of 1200 mg/day and 800-1000 IU/day of vitamin D. Such calcium recommendations (1200 mg/day) for women and men above 50 and 65 years old respectively, can be found in the latest Nutritional Standards established for the Polish population [33]. However, the adequate intake for vitamin D (cholecalciferol) for the same group is 15 μg/day (600 IU) [15].

Subjects recognised that an older age, genetic predisposition, stimulants, drug abuse, poor socio-economic and environmental pollution are factors influencing the development of osteoporosis. Indeed, according to *Tanriover* et al. [31] and *Handa* et al. [13], the main factors affecting the development of osteoporosis are age and gender. *Center* and *Eisman* [4] point out that genetic factors and environmental conditions also have an impact on this illness. *Eastell* [9] agrees with the aforementioned factors, but also considers the impact of drugs and other diseases.

The incidence of osteoporosis (over 60 %) in the presented study is quite striking and it probably results from the relatively small group of respondents taken. Some estimations report that in Poland, osteoporosis affects 30% of women and 8% of men above 50 years age. According to *Koduganti* et al. [18], women are more prone to osteoporosis, but men also suffer. The National Osteoporosis Foundation estimates that in people over 50 years age, the risk of bone fractures due to osteoporosis increases up to 50% in women and 25% in men. *Zdziemborska* et al. [34] reported that osteoporosis occurs in one third of women aged 60-70 years and two thirds of women aged 80 years and above. The results of our study also agree with these data, as over 73% indicated that women suffer from osteoporosis more often. In addition, respondents identified the age of above 50 years as being the threshold when osteoporosis occurs.

Czerwinski and *Kumorek* [6] consider that the incidence of osteoporotic fractures varies across populations, not only in relation to age, gender and race, but also to the region of the world and socio-economic conditions. Data on fractures are alarming, because every year the numbers are increasing. Worldwide, osteoporosis causes more than 8.9 million fractures annually. In Europe, there were 3,119,000 osteoporotic fractures in people aged over 50 years in 2000. Moreover, it is estimated that in 2050 there will be 4.5 million hip fractures, while in 2000 there were only 1.6 million [27].

Badurski et al. [1] suggests that the main goal of treatment is to prevent the risk of osteoporotic fractures. It should include reducing the impact of risk factors for fractures and improve bone density with the use of drug therapy. According to the respondents, osteoporosis tests are necessary and desirable, but equal access to them is not sufficient because of the still small scale of publicising the consequences of this disease.

CONCLUSIONS

1. Respondents were well aware that consuming dairy products has a beneficial effect on bone health; with this awareness being higher among persons afflicted with osteoporosis.

2. Physical activity is indicated as a preventative measure against osteoporosis and was often adopted by respondents.
3. The incidence of fractures in people older than 50 years suffering from osteoporosis was almost twice as frequent as in healthy people.
4. It appears that common knowledge and education of people over 50 years old regarding osteoporosis is still insufficient.

Conflict of interests

The authors declare no conflict of interests.

REFERENCES

1. *Badurski J., Czerwiński E., Marcinowska-Suchowierska E.*: Osteoporosis – fracture risk estimation Status Quo Arte Anno 2007/2008: Review of positions of World Health Organisation (WHO), European Medicine Agency (EMEA), European Society Of Clinical And Economic Aspects Of Osteoporosis And Osteoartritis (ESEAO), International Osteoporosis Foundation (IOF), Polish Foundation Of Osteoporosis (PFO) and Polish Osteoartrology Society (PTOA). Post N Med 2008;6:335-359 (in Polish).
2. *Bouamra-Mechemache Z., Réquillart V., Soregaroli C., Trévisiol A.* : Demand for dairy products in the EU. Food Policy 2008;33(6):644-656.
3. *Caroli A., Poli A., Ricotta D., Banfi G., Cocchi D.*: Invited review:. J Dairy Sci 2011; 94, 11, 4: 5249-5262.
4. *Center J., Eisman J.*: The epidemiology and pathogenesis of osteoporosis. Bailliere's Clinic Endocrinol Metabol 1997;1:23-62.
5. *Coudray B.*: The contribution of dairy products to micronutrients intakes in France. *J* Am *Coll Nutr* 2011;30(Supl. 1):410-414.
6. *Czerwiński E., Kumorek A.*: Falls, vitamin D and fractures, Post N Med 2011;3:226-231 (in Polish).
7. *Dervis E.*: Oral implications of osteoporosis. Oral Surg Oral Med Oral Pathol 2005;100:349-356.
8. *Dobrzańska A., Tymolewska-Niebuda B., Lesińska K.*: The role of nutrition in prevention and treatment of osteoporosis in children and youth. Nowa Pediatr 2001;1:33-38 (in Polish).
9. *Eastell R.*: Investigating suspected osteoporosis. Women's Health Medicine 2006;3(4):161-164.
10. *Filip R. S., Zagorski J.*: Osteoporosis risk factors in rural and urban women from the Lublin Region of Poland. Ann Agric Environ Med 2005;12(1):21-26.
11. *Fischer W. J., Schiller B., Tritscher A. M., Stadle R. H.*: Contaminants of Milk and DairyProducts/Environmental Contaminants. Encyclopedia of Dietary Sciences (Second Edition), 2011.
12. *Głodek E., Gil M., Rudy M., Pawlos M.*: Assessment of frequency of consumption of selected sources of dietary fibre by students. Rocz Panstw Zakl Hig 2011;62(4):409-412 (in Polish).
13. *Handa R., Kalla A. A., Maalouf G.*: Osteoporosis in developing countries. Best Pract Res Cl Rh 2008;22(4):693-708.
14. *Henning D.R., Baer R.J., Hassan A.N., Dave R.*: Major advances in concentrated and dry milk products, cheese, and milk fat-based spreads. J Dairy Sci 2006;89(4):1179-1188.
15. *Jarosz M., Stoś K., Walkiewicz A., Stolińska H., Wolańska D., Gielecińska I., Kłys W., Przygoda B., Iwanow K.*: Vitamins. In: *Jarosz M.* ed. Nutritional standards for the Polish population – amendment. Food and Nutrition Institute (IŻŻ), Warsaw 2012 (in Polish).
16. *Jasik A., Tałałaj M., Paczyńska M., Walicka M., Wąsowski M., Marcinkowska-Suchowierska E.*: Vitamin D and osteoporosis, Post N Med 2008;1:8-13 (in Polish).
17. *Kita K., Lewandowski B., Klimiuk P. A., Sierakowski S., Domysławska I., Wołczyński S., Małyszko J.*: Osteoporosis in men. Nowa Med 2004;3 (in Polish).
18. *Koduganti R.R., Gorthi C., Reddy P.V., Sandeep N.*: Osteoporosis: A risk factor for periodontitis. *J Indian Soc Periodontol* 2009;13(2):90-96.
19. *Kozłowska-Wojciechowska M.*: Council for the Promotion of Healthy Nutrition: Milk and its preserves – necessary products in good health. The newest reports about consumption of milk and dairy preserves and their effect on human health. Warszawa 2007 (in Polish).
20. *Madej D., Kałuża J., Antonik A., Brzozowska A., Roszkowski W.*: Calcium, magnesium, iron and zinc in drinking water and status biomarkers of these minerals among elder people from Warsaw region. Rocz Panstw Zakl Hig 2011;62(2):159-168 (in Polish).
21. *Marcinkowska-Suchowierska E., Czerwiński E., Badurski J., Walicka M., Tałałaj M.*: Oateoporosis – diagnostic and treatment in elderly patients. Post Nauk Med 2011;5:410-423 (in Polish).
22. *Marcinkowska-Suchowierska E., Sawicka A.*: Calcium and Vitamin D in prevention of osteoporotic fractures. Post N Med 2012;3:273-279 (in Polish).
23. *Nowicka G., Panczenko-Kresowska B.*: Coronary heart disease and osteoporosis: factors related to development of both diseases. Prz Lek 2007;64:153-158 (in Polish).
24. *Ostrowska B.*: Postural stability in women with osteopenia and osteoporosis. Wrocław, Wydawnictwo AWF, 2009 (in Polish).
25. *Ravn P., Bidstrup M., Wasnich R. D., Davis J. W., McClung M. R., Balske A., Coupland C., Opinder Sahota O., Amarjot Kaur M., Marianne Daley M., Giovanni Cizza G.*: Alendronate and estrogen - progestin in the long term prevention of bone loss: four year results from the early postmenopausal intervention cohort study: a randomized controlled trial, *Ann Intern Med* 1999;131:935-942.
26. *Seidler T., Szczuko M.*: Nutrition mode evaluation among university of agriculture students in Szczecin in 2006. Part I. Consumption of selected nutrients and nourishment state. Rocz Panstw Zakl Hig 2009;60(1):59-64 (in Polish).
27. *Ström O., Borgström F., Kanis J.A. Compston J. Cooper C. McCloskey E.V., Jönsson B.*: Osteoporosis: burden, health care provision and opportunities in the EU. Arch

Osteoporos International Osteoporosis Foundation and National Osteoporosis Foundation. Springer, 2011.
28. *Szałek E.*: Teaching menopausal and post-menopausal patients about osteoporosis. Farm Współcz 2013;6:51-56 (in Polish).
29. *Śmigiel-Papińska D.*: The nutritional role in children and youth from pollutant areas exposed in aspect of osteoporosis prevention. Med Rodz 2002;1:42-45 (in Polish).
30. *Tang B.M., Eslick G.D., Nowson C., Smith C., Bensoussan A.*: Use of calcium or calcium in combination with witamin D supplementation to prevent fractures of bone in people aged 50 years and older: a meta-analysis. Lancet 2007;370:657-66.
31. *Tanriover M.D., Oz S.G., Tanriover A., Kilicarslan A., Turkmen E., Gusen G.S., Saracbasi O., Tokgozoglu M., Sozen T.*: Hip fractures in a developing country: Osteoporosis frequency, predisposing factors and treatment costs. Arch Gerontoland Geriat 2010;50:3: e13-e18.
32. *van Staveren W.A., Steijns J.M., de Groot L.C.*: Dairy products as essential contributors of (micro-) nutrients in reference food patterns: an outline for elderly people. *J* Am *Coll Nutr* 2008,27:6747S-6754S.
33. *Wojtasik A., Jarosz M., Stosik K.*: Minerals. In: *Jarosz M.* ed. Nutritional standards for the Polish population – amendment. Food and Nutrition Institute (IŻŻ), Warsaw 2012 (in Polish).
34. *Zdziemborska A., Deszczyńska K., Fidecki M.*: Osteoporosis – Bisphosphonate – Dentist. Part II. Nowa Stomatol 2012; 1: 15-18.

Received: 23.10.2013
Accepted: 05.04.2014