

# Knowledge of osteoporosis prophylaxis and health behaviours of the population of chosen countries of the world

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## Abstract

**Introduction.** Osteoporosis is recognized by the World Health Organization as a disease associated with the progress of civilization, also called the 'epidemic of the 21<sup>st</sup> century'.

**Objective.** An attempt to portray the level of knowledge and health behaviours of societies of selected countries of the world in the prevention of osteoporosis, based on available studies.

**Materials and method.** Theoretical concepts and reviews of current published studies.

**Results.** Accessible study findings conducted worldwide are not exhaustive and often present the subject in a fragmentary way. Data presented in the presented article shows that knowledge of osteoporosis among the Polish population and the population of selected countries of the world appears insufficient in the issues associated with its prophylaxis and prevention; they also testify to a disregard and lack of application of the principles of a healthier lifestyle in daily life regarding this still little-known illness. Since the number of people threatened with osteoporosis, as well as the number of bone fractures, is constantly rising, versatile action should be undertaken aimed at preventing falling ill and progression of the disease.

**Conclusions.** After reviewing the literature, it was realized that few researchers have been interested in the issue of osteoporosis. This fact is proved by an insufficient amount of publications dealing with the subject and the problem associated with osteoporosis from the point of view of the public. The findings of presented study show that most often the subject is not portrayed as a whole, but concerns only selected preventive behaviours or learning about some risk factors.

## Key words

osteoporosis, prophylaxis, level of knowledge, health behaviours, society

## INTRODUCTION

According to the definition by experts at the National Osteoporosis Foundation and National Institute of Health (NOF/NIH, 2001), osteoporosis is an illness of the skeleton which is characterised by the handicapped endurance of the bones, causing increased risk of fracture [1]. Osteoporosis is being ranked among the most often appearing diseases in the adult population. Statistical data show that this illness constitutes the most popular osteopathy, affecting about 75 million individuals in Europe, the USA and Japan, and every third postmenopausal woman, as well as the majority of individuals above 70 years of age [2].

The level of medical knowledge of society is one of main indicators of behaviour, directed at preserving health and preventing potential disease. Determining the state the knowledge of society allows the forming of health behaviours and undertaking educational programmes for eliminating undesirable behaviour with reference to lifestyle. The medical knowledge of society usually regards the 'image' of a given illness, from the aspect of its etiology, definition, treatment, as well as prevention, is all based on own experience, opinions of other individuals, information obtained from employees

of the medical sector, or taken from the media. Studies concerning the state of knowledge of populations offer the possibility of appointing directions for health education taken by institutions connected with healthcare [3].

Quoting Majchrowska [4, p 295]: 'health behaviour is that which, in the light of contemporary medical knowledge, gives rise to definite positive or negative health effects on individuals executing them.' This quotation needs to be checked. The version originally written here – Polish-English – did not make sense – MT. Maintaining one's medical condition at the appropriate level and its proper care remain in close relationship with health behaviour, which is possible to divide into: pro-health – one that supports health, and anti-health – influencing the worsening of a medical condition. Health behaviour is regarded as a component of a lifestyle directly influencing its quality; therefore, issues associated with these factors are truly essential. Becoming familiar with and understanding the mechanisms guiding health behaviour offer the population the opportunity to approve of health changes.

**Objective.** An attempt to portray the level of knowledge and health behaviours of selected countries of the world in the prevention of osteoporosis, based on available studies. Theoretical concepts and reviews of current published studies were used as the method.

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**Prophylaxis of osteoporosis.** Considering the knowledge and health behaviour of society with reference to osteoporosis one should present fundamentals for preventing this disease. According to the World Health Organization (WHO), prevention is defined as a sequence of operations the main purpose of which is to prevent disease by monitoring the causes and risk factors [5].

Prevention of osteoporosis is avoiding the appearance of a disease of the skeleton, as determined by the National Institute of Health (NIH), manifesting itself with insufficient endurance of the bone structure, and strictly connected with it, the increased susceptibility to fractures [6].

Division of preventive action into primary – consisting in preventing disease by controlling and eliminating risk factors, and secondary – directed at diagnosing the illness at a very early stage, often even an asymptomatic stage and tertiary stage, which restores full health and efficiency, also applies to osteoporosis [5].

Prophylactic assumptions for osteoporosis should be implemented at every stage of life; however, care of the bone tissue, already in the period of childhood and maturation as part of the primary prevention, is extremely important. This is the period in which the organism receives 90% of top bone mass. The pace of bone mass accumulation is greatest in the period of the first three years of life, and during maturation; whereas top bone mass is reached in the period between the ages of 16–30 [6, 7]. Considering the fact that the level of top bone mass is conditioned in 30% by a lifestyle, hormone economy and influence of the environment, implementing principles of prophylaxis may influence the alteration of these risk factors and prevent falling ill with osteoporosis.

The period of childhood and maturation support the formulation of correct behaviour connected with lifestyle, which means forming desirable dietary patterns, implementing physical activity, and acquiring awareness of the harm caused by smoking and alcohol consumption [6, 7]. Of particular importance is the application of a diet rich in calcium and vitamins D, A, C, K, and the elements magnesium, copper and zinc. Also keeping a correct proportion between the level of calcium and phosphorus, and the correct supply of the protein is significant. Correct physical activity exerts an undeniable influence on the increase in bone mass at every stage of life; however, regular physical exercise, even before the stage of pubescence, is definitely advantageous.

In principle, among children and teenagers every kind of activity is to be recommended. However, it should be remembered that an uncontrollable, exaggerated physical effort can cause the loss of bone mass [7, 8]. The syndrome ‘female athlete triad’, which involves secondary menostasis, too low bone mineral density and osteoporosis, is caused exactly by intensely practised sport [8].

In spite of the fact that the ‘roots’ of osteoporosis can originate in childhood, there is time in every period of life for action associated with the prevention of osteoporosis, as it is possible to commence the process of altering lifestyle, applying a diet, physical activity or the elimination of substances, irrespective of age [8].

The base of preventive action from the aspect of osteoporosis is applying a proper diet throughout the entire period of life, with knowledge that the demand for energy and mineral elements must be appropriate to age, gender and medical condition. A moderate amount of protein is recommended in the diet, covering 10–13% of the all-day demand for energy.

Diet excessively rich in animal proteins is not recommended, since it causes exaggerated loss of calcium, whereas a too small supply of protein (especially of dairy and plant origin) exerts an adverse impact on the mineral density of bone. Too many fats of animal origin (acceptable amount 25–30% of daily demand) cause loss of calcium from the organism. Carbohydrates should not exceed 50–65% of daily demand (monosaccharides can constitute 10% of the demand) [9].

Appropriate amount of calcium in the diet constitutes the factor assisting reaching top bone mass in the growing period, as well as keeping the state of the bone tissue at the appropriate level at the older age. Eating foods rich in calcium is the best way to provide this element in the correct amount; however in the situation of supplies not satisfying the daily demand, one should supplement deficiencies through supplementation [10, 11]. The best source of calcium is milk and its preserves: yellow cheeses, curd cheeses, kefir, yogurts or ice-cream. Wholegrain cereals, leguminous plants and leafy vegetables are also recommended, as are sprouting broccoli, nuts, almonds, sesame seeds, cocoa, some fruits, e.g. figs and oranges, as well as soya products and protein hydrolysates. Sardines (with bones) and salmon are also excellent source of calcium [9, 12].

Vitamin D is essential for supporting normal process of absorbing calcium from the intestines. It has been proved that vitamin D and its active metabolites have a positive effect on the quality of bone mass and causes an increase in their density. Vitamin D is synthesized in the skin with influence of ultraviolet (UV) radiation (even 80% of vitamin D can originate from the skin synthesis, but only in the summer months). Therefore, exposure to sunlight constitutes a crucial factor in the prevention of osteoporosis. It turns out that in the period from June – September, it is sufficient to stay in the sun several times during the week, but only for 15 minutes at a time, in order to obtain the effective synthesis of vitamin D.

Foods rich in vitamin D, above all, are: oily fish (mackerel and halibut), chicken liver, eggs and dairy products. As D<sub>3</sub> deficiencies are frequent, their supplementation is recommended [13, 14]. For guaranteeing the normal metabolism of bone tissue and maintaining its better quality, phosphorus, magnesium, vitamins A, K and C are vital. Keeping a balance between consuming calcium and phosphorus in a 1:1 proportion is especially important since an excess of phosphorus can cause loss in bone weight, particularly when the supply of calcium is insufficient [9, 12, 13].

In order to effectively prevent osteoporosis, elimination, or at least restriction, of the use of substances of abuse is essential. Both alcohol abuse and cigarette smoking negatively affect bone metabolism and, in consequence, bone mineral density. An excess of caffeine, present in coffee, tea, chocolate, coca-cola and energy drinks, also has its impact on the quality of bone tissue. Adding milk or cream to coffee, to some extent, can balance the loss of calcium caused by caffeine. Reducing the supply of sodium is also recommended, mainly in the form of table salt whose excess triggers loss of calcium in urine [7, 9]. Pytasz et al. [12] maintain that the consumption of sodium (salt) by Poles remains at a level twice as high as the recommended intake. An excess of sugar in the diet should also be reduced, as well as phosphates which disturb calcium absorption in the digestive tract, but are applied as additives to many ready-made foodstuffs [15].

In the primary prevention of osteoporosis, appropriate physical activity is an essential factor for the appropriate

development of bone tissue and correctly functioning of bone metabolism. Keeping generally physically fit, proper functioning of the organism and muscle power, maintaining relevant mobility in the joints, as well as the improvement of coordination and balance, are the main purposes behind regular motor activity [16]. Some authors claim that physical activity leads to increase in bone mass in the period of growing up, whereas in the adolescent life it increases only to a very little degree [17]. However, studies pointing at a close relationship between regular moderate physical activity and increase in bone mineral density still exists. It is also possible to state that everyday exercises cause an increase in top bone mass in adolescence, and slows down the processes of re-absorption in older age [18, 19]. Isometric exercises are especially recommended for increasing muscle mass during significant limitation of mobility, weight training, as well as stretching, suppleness, endurance exercises, fast step walks, swimming, Nordic walking, or T'ai Chi. [16, 20].

When discussing issues concerning the primary prevention of osteoporosis, it is impossible not to mention hormone replacement therapy (HRT) which, in the case of women at menopausal age can also be used as a way of preventing osteoporosis. However due to a number of complications and the increased risk of breast cancer, such a treatment can be conducted for a short period of time and only as a way of mitigating manifestations associated with the menopause. Unfortunately, the positive action of HRT on bone mineral density disappears soon upon completion of the therapy [14].

Some authors emphasize the significance of phytoestrogens in the prevention of osteoporosis, although their influence on bone metabolism remains unexplained. Phytoestrogens are compounds plant origin which demonstrate an estrogen-like action, their source being soya as well as other pulses [21, 22]. Acquaintance of assumptions for the prevention of osteoporosis among women in the perimenopausal period is of key importance for preserving the health of elderly women.

Studies by Rudnicka-Drożak et al. [23] conducted on a group of women in the age range of 40–60, indicate a low level of knowledge on the subject of osteoporosis and a disregard of the detrimental effects of substances of abuse – cigarettes, alcohol or strong coffee – on the state of bone tissue. The studied women did not demonstrate correct physical activity or did not undergo regular gynaecological control because of hormonal disorders associated with the menopause. Pilewska et al. obtained similar results [24] in studies concerning the health behaviour of women aged 45–60. Almost half of the respondents admitted smoking cigarette, although it was a comforting fact that about 60% of the women ceased smoking in the perimenopausal period. It turned out that many as 78.9% of the respondents drank coffee every day, including every fourth woman even on a 'few times per day' basis. Frequent consumption of alcohol concerned 11.1% of respondents. It was a highly alarming fact that every fourth woman did not have the slightest notion about osteoporosis. The findings of Mędrela-Kuder [25] also point to the disregard of the principles of a healthier lifestyle. On average, about half of the women examined smoked more than 10 cigarettes per day, drank alcohol, as well as confessed to drinking strong coffee more than four times a day.

Pilewska et al. [26] examined the connection between the physical activity of women at menopausal age and the threat of osteoporosis. The results showed that physical activity was at a low level, and therefore could have been a factor

predisposing to osteoporosis. Only every fourth respondent preferred active forms of rest, whereas every third declared performing any kind of physical activity. Similarly, Mędrela – Kuder [25] demonstrated that over a half of the women examined did not prefer an active holiday and did not plan any physical activity.

Szczygielska-Majewska et al. [27] emphasize the urgent need for education of society about the basic principles for preventing osteoporosis and taking action aimed at introducing pro-health changes in lifestyle. Individuals between the ages of 25–87 were studied and the findings indicated a low level of knowledge about osteoporosis – 66.6% of respondents, and the risk factors involved – 45.6% of the examined knew a single risk factor of osteoporosis. Implementing principles of prophylaxis of osteoporosis was also insufficient. As many as 65.8% of individuals did not apply any form of physical activity and over 24% included almost no products with a large calcium content in their diet. Appalling data concerned drinking alcohol, admitted by as many as 70% of the examined. It should be mentioned that this was similar to the results of other studies [28, 29]. It is also an alarming fact that knowledge about osteoporosis was mainly obtained from the media, although the majority of individuals (85%) expressed a desire to increase their knowledge, and almost 60% of respondents expected to obtain such knowledge from medical staff, mainly doctors.

A well-balanced diet, taking into account the supply of appropriate mineral elements and vitamins constitutes the crucial factor in preventing osteoporosis [30, 31]. The findings of both Bronkowska et al. [30] and Filip [31], point out the insufficient consumption of calcium and vitamin D and little awareness of respondents in this respect. Bronkowska also showed the insufficient content of mineral constituents in the diet, disturbances in the calcium-phosphoric balance, and an exaggerated amount of preservatives [30].

Kozielec et al. [29], examining two groups of women at menopausal age, healthy but afflicted with osteoporosis, stated that the majority of respondents had known the notion of osteoporosis, and confirmed the legitimacy of performing tomodensitometry. However, only a small proportion of those examined applied prophylactic principles. Admittedly, 40% of healthy women and the 60% of women with osteoporosis declared everyday consumption of foods rich in calcium, but only 13% of healthy women and appropriately 30% of sick individuals performed any form of physical exercise.

The level of knowledge, health beliefs, and sense of self-efficiency associated with osteoporosis is a frequent subject of research in the USA. For example, an investigation led at the George Mason University in Washington, DC, included a group of women aged 22–84 and indicated an insufficient level of knowledge concerning risk factors and the prevention of osteoporosis [32]. At the Thomas Jefferson University Hospital in Philadelphia, Pennsylvania, USA, the health beliefs of women associated with the prevention of osteoporosis revealed the fact that although the majority of women regarded osteoporosis as a major disease, only few respondents (40%) tried actively to prevent it. This resulted from the fact that the majority of the women did not state their increased susceptibility to falling ill. However, they were willing to implement changes concerning taking the physical activity into account, and to apply a well-balanced diet with the view of preventing osteoporosis [33]. Similar results were obtained in the College of Education and Professional Studies,



Eastern Illinois University, Charleston, USA, in which the knowledge and health beliefs associated with osteoporosis were the subject of research amongst young women. The respondents largely recognised that the risk of osteoporosis among them was slight and therefore did not follow pro-health diets, and did not perform any physical exercise. Only a small group of women – 6.7%, stated that they cared about the appropriate supply of calcium in their everyday diet, as well as maintaining everyday physical activity [34].

Norwegian studies concerning women and men, showed that a much bigger knowledge about osteoporosis was shown by women, who knew the substantial role of oestrogens and physical activity in the prevention of osteoporosis. Also, their level of knowledge was conditional, primarily, to the degree of their education. The results from the above-mentioned study showed that Norwegian society is characterized by a good sense of direction in the subject matter of osteoporosis and its consequences [35]. In Glasgow, Scotland, UK, a densitometric laboratory studied patients in order to discover the level of knowledge about osteoporosis and its prevention. The resulting low level of knowledge of the respondents showed the need for undertaking an educational programme about risk factors and the prevention of osteoporosis. It turned out that a considerable group of the examined (31.8%) had no knowledge about risk factors, whereas 19.3% of respondents did not know in which way it is possible to prevent osteoporosis [36]. Studies conducted in San Paulo in Brazil, South America, among postmenopausal women, demonstrated the existence of a strong relationship between the state of knowledge about osteoporosis and education, together with socio-economic status and lack of accompanying diseases. However, in this case, the level of knowledge was also determined as being insufficient [37]. A study conducted in Turkey, in which women living in the city and in the country were included, determined the level of knowledge about osteoporosis and its risk factors as insufficient. Both groups examined, in most cases, were not familiar with the risk factors and ways of preventing osteoporosis; they were also unaware of the health consequences resulting from falling ill. As found in other studies, the level of knowledge was conditional on education [38, 39]. It is puzzling that almost 90% of women living in towns had sufficient knowledge about illness, while over 65% of those examined did not link falling ill with osteoporosis with a femoral neck fracture. Only few were able to show that they consumed foodstuffs rich in calcium [39].

In Auckland, New Zealand, research was conducted on a group of women aged 20–49, concerning the knowledge about risk factors and health beliefs associated with osteoporosis. In this case, the level of education correlated with the level of knowledge. In spite of the fact that the respondents were aware of the benefits of eating products rich in calcium and the importance of physical activity, the state of their knowledge was moderate. The study showed that together with age, motivation for the care of own health increased, with older women demonstrating greater knowledge about the influence of the menopause on the progression of the disease.

Even though a great majority of women were strongly motivated towards looking after themselves, they did not state an increased susceptibility to falling ill. Only about 35% of the women paid attention to being exposed to the development of osteoporosis. According to the author of the study, the obtained results cannot constitute a complete image of the knowledge about osteoporosis in New Zealand,

since they were conducted exclusively in a group of educated women [40]. Peculiarly alarming are the findings of a study conducted in Da Nang, Vietnam, which show that about 80% of those examined had not heard about osteoporosis. Similar to other countries, the state of knowledge was conditional to education. Women working in the medical professions presented the highest level of knowledge, and individuals in whom there were family members who had fallen ill with osteoporosis. Nearly all the surveyed expressed the desire to become acquainted with the principles of prevention and the treatment of osteoporosis, which shows the need for educating Vietnamese society, especially in consideration of the fact that Asians are particularly prone to the risk of falling ill. [41]. In Singapore, a group of nurses were studied in an attempt to determine their level of knowledge about the nature of osteoporosis and of risk factors associated with it. As much as 94.6% of respondents presented knowledge about the threat of osteoporosis and low-energy fractures at peri and postmenopausal age; 92.9% of respondents associated the process of the fastest bone mass loss with menopause, whereas 91.1% knew that cigarette smoking constituted a risk factor of osteoporosis. However, only 57.1% indicated physical activity as a crucial element in the prevention of osteoporosis, and knowledge about the benefits of supplementing their diet with calcium was insufficient. In summing up, the authors of the study determined that the level of knowledge of nurses in Singapore was insufficient, which is alarming because it is exactly the medical sector who, in principle, are responsible for the process of educating society in that country [42]. Studies conducted among Indian women also showed a low level of knowledge, especially concerning risk factors, and of the consequences of osteoporosis. Although about a half of those surveyed were able to correctly state the nature of osteoporosis, only 16% were able to describe the age at which the fastest bone mass loss occurred. Fewer than 50% of the women regarded the early menopause, alcoholism and wrong diet as risk factors of osteoporosis. The majority of women were not able to describe the significance of hormone replacement therapy in the prevention of osteoporosis, and only 6.2% of respondents were aware of the fact that the occurrence of a low-energy fracture increased the risk of a subsequent fracture. In this case, the authors paid attention to the need for health care employees educating the population about the prevention of osteoporosis [43].

From studies conducted into San Salvador in Latin America, the existence was also proved of a relationship between the level of knowledge about osteoporosis and education. Women having secondary and the higher education presented the highest level knowledge, irrespective of their age. However, this correlation was not connected with the need for implementing pro-health principles of lifestyle from the aspect of preventing osteoporosis. Few respondents were engaged in any physical activity, which influenced an increase in bone mass, nor did they eat products containing large amounts of calcium [44]. Similar conclusions were reached by Riaz et al. [45] after conducting an examination of osteoporosis and its risk factors amongst Pakistani women in all age groups. The majority of respondents had insufficient knowledge about the disease, and the level of knowledge depended on age, education and socio-economic status. The highest level of knowledge was presented mainly by older respondents; however, this did not mean compliance with the principles of prevention of osteoporosis in daily life.



## CONCLUSIONS

Analysis of the literature described in the presented study shows that few Polish researchers have dealt with the problem of evaluation of the state of knowledge and health behaviours associated with osteoporosis. The studies mentioned are most often fragmentary and concern knowledge among populations about selected risk factors and ways of preventing osteoporosis. Similarly, worldwide, knowledge about osteoporosis and health behaviour associated with it did not constitute a universal subject of research; existing results are incomplete and often do not reflect the state of knowledge among the general public. The findings of available studies show an insufficient level of knowledge of societies on the subject of osteoporosis, and ignorance of preventive principles associated with this disease. Therefore, since falling ill with osteoporosis, to a large extent, is connected to lifestyle, there is a need to increase educational programmes by the medical profession to teach the principles of a healthier lifestyle among society, and undertake efforts to enforce the taking of responsibility for the own health by patients and those at risk of the disease.

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