Knowledge of osteoporosis correlated with hormone therapy use and health status

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Abstract

Objectives: The study objectives were: (a) to evaluate knowledge about osteoporosis and to identify its correlates among women ≥ 40 years of age attending outpatient centers; (b) to compare the level of knowledge between women already receiving treatment for osteoporosis and first-time attendees.

Methods: A cross-sectional survey was conducted with women recruited from nine outpatient centres in the Czech Republic. The women were divided into two subgroups: patients who have already been diagnosed with osteoporosis (osteopenia) and who are receiving treatment for the disease (OS group); first-time attendees who have been referred for the assessment of osteoporosis (comparison group). The patient's knowledge of osteoporosis was assessed using the Osteoporosis Questionnaire (OPQ) developed by Pande et al. [Pande KC, Takats D, Kanis JA, Edwards V, Slade P, McCloskey EV. Development of a questionnaire (OPQ) to assess patient's knowledge about osteoporosis. Maturitas 2000;37:75–81].

Results: A total of 474 women (median age 63 years) were studied (306 in the OS group, 168 in the comparison group). Knowledge scores based on OPQ (median) were 7 and 6 points in the OS and comparison groups, respectively. When adjusted for age, the statistics showed better knowledge patients in the OS group ($P = 0.019$). In both the OS and comparison groups, knowledge was found to be correlated positively with education ($P < 0.001$) and experience of hormone replacement therapy (HRT) ($P < 0.001$) and negatively with age ($P < 0.001$). Knowledge was higher among women with better health status in the OS group.

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Conclusion: Knowledge about osteoporosis among Czech women aged ≥40 years and attending outpatient centers is relatively poor. To improve it, special attention should be paid to elderly women, those who have not used HRT, poorly educated women and those treated with several drugs.

1. Introduction

Osteoporosis has been recognized as an important health problem worldwide. Increasing life expectancy is the main reason for the marked increase in osteoporosis-related fractures in developed countries. A model of osteoporosis impact in Switzerland from 2000 to 2020, published by Schwenkglenks et al. [1], predicts increases in the incidences of osteoporotic hip, vertebral and distal forearm fractures by 33, 27, and 19%, respectively, if the current prevention and treatment patterns are maintained.

In addition to resulting in mortality, disability and quality of life reduction, osteoporosis and its associated condition are also an extremely expensive health concern. A Californian study calculated direct healthcare costs to be more than $2.4 billion in 1998 [2]. In their study, three-quarters of the hospitalization costs were incurred by women [2]. Swiss data show that in women, osteoporosis is the cause of more hospital days than stroke and myocardial infarction together [3].

In the Czech Republic there is a lack of comparable economic data; however, a pilot study [4] calculated that expenditure related to osteoporosis, and osteoporotic fractures in particular, are enormous; moreover, less than 5% of people with osteoporosis receive effective treatment. Therefore, recent clinical data should be used to make informed decisions regarding the management of the disease, and should be done in every country. Emphasis should be placed on preventive behavior, including secondary prevention and prevention of falls.

Although a good understanding of the disease may not be sufficient to bring about changes in health-related behavior, knowledge is a prerequisite for the success of preventive efforts. Effective education programs and counselling provided by physicians and other healthcare professionals (such as pharmacists and nurses) should be based on the current level of the patient's knowledge and should be directed mainly to at-risk groups.

Both cross-sectional [5–7] and interventional studies, especially those using visual and/or interactive methods [8–10], have shown that increased knowledge about osteoporosis (receiving education about the disease) is associated with greater compliance (willingness to adhere) to preventive behaviors.

Although Werner [11] summarized that this "knowledge–prevention" relationship is mostly limited to calcium intake and/or physical activity, and encouraged further research to be directed at other health-related behaviors, low calcium intake and physical inactivity seem to be important risk factors for osteoporosis-related fractures. Furthermore, physical inactivity was the strongest predictor of hip fracture in the Australian BoneCare Study [12].

Many studies, including those with large random samples, examined osteoporosis knowledge among the general, middle-aged or elderly populations [13–15]. However, we know relatively little of the level of knowledge among women with risk factors for osteoporosis [16] or who are already affected by osteoporosis and thus at considerably increased fracture risk [17].

Osteoporosis is a chronic (often silent) disease; therefore, its successful management requires a long-term commitment to the treatment and compliance with the accompanying lifestyle recommendations. Based on this fact, we hypothesized that women treated for the disease have better knowledge than those who have only recently been referred for the assessment of osteoporosis.

The study objectives were: (a) to evaluate knowledge about osteoporosis and to identify its correlates among women aged ≥40 years attending outpatient centers; (b) to compare the level of knowledge between women treated for osteoporosis (osteopenia) and first-time attendees.

2. Methods

We conducted a cross-sectional survey among women attending outpatient centers providing healthcare to patients with osteoporosis (outpatient centres) in the Czech Republic.

2.1. Participants

A total of 474 women aged ≥40 years were included in the study. Patients were divided into two different participant subgroups: patients with diagnosis of osteoporosis or osteopenia and who are receiving treatment for the disease, including those treated with calcium and/or vitamin D supplementation only (OS group); and first-time attendees referred for the assessment of osteoporosis (comparison group). The diagnosis of osteoporosis (osteopenia) was obtained from medical records and based on the most recent bone mineral density measurements of the hip or spine (DXA, WHO criteria). Patients with femoral or lumbar T-scores below −1 SD were included in the OS group.

Participants were recruited from nine outpatient centers between March and October 2004. The number of subjects from each center ranged from 5 to 144. Women meeting the criteria of either the OS or comparison group were asked to complete a self-administered or (if necessary) interviewer-assisted questionnaire. Altogether, 530 (87%) women agreed to participate and returned the questionnaire. Of these, 21 subjects were excluded as they were aged <40 years, and 35 subjects were excluded due to incomplete questionnaire forms. The questionnaire forms available for analysis covered 78% of all women recruited and approximately 81% of the target population.

The study protocol was approved by the local Ethical Committees.

2.2. Questionnaires

We used two types of questionnaire forms, the OS form and comparison form, which were completed during participants' visits to the centers.

Both questionnaire forms collected information on age, level of education, menopausal status, osteoporosis-related fractures, hormone replacement therapy (HRT) and health status markers—the number of concomitant prescription drugs and the patient's self-perceived general health status. The OS form also included questions on treatment duration and a set of questions directed at current and past osteoporosis medication, adverse events and compliance with the treatment (these data will be published at a later date).

Participants' knowledge about osteoporosis was assessed using the Osteoporosis Questionnaire (OPQ) developed by Pande et al. [18]. Czech translation of the OPQ formed the final part of both types of the questionnaire forms. OPQ is a 20-item multiple-choice questionnaire covering general information about osteoporosis (5 questions), risk factors (7 questions), consequences and treatment (4 questions on each). There are three possible responses to each question, only one of which is correct. A "do not know" response is provided for each question to avoid guessing. Each correct response scored 1 point, each incorrect response scored −1 point, and a "do not know" response scored 0 point, as used in the original instrument [18]. More than 5 missing responses was considered significant and was a reason for exclusion from the analysis ($N = 35$). Occasional missing responses in the OPQ were treated as "do not know". As emphasis was placed on anonymity of the respondent, no effort was made to recheck the forms and encourage completion of missing answers.

To ensure optimal quality of the questionnaires, back translation of the OPQ, consultations with clinicians and piloting of both the OS and comparison forms (each administered to 10 women) were carried out before study start.

2.3. Statistical analysis

Quantitative analysis (medians, means, percentages) was performed for the cohort as a whole and separately for the OS and comparison subgroups.

Since most variables did not follow a normal distribution, non-parametric statistics were applied. To investigate differences between the OS and comparison groups, as well as relationships between knowledge score and other variables, the following statistical tests were used:

(1) Simple chi-square test for two dichotomous (categorical) variables;
(2) Non-parametric Kendall correlations [19] for two continuous (continuous and ordinal) variables;

(3) Mann–Whitney test for dichotomous and continuous (ordinal) variables;
(4) Partial Kendall correlations were used to control associations between knowledge and its correlates for potential confounders (age, education). The intensity of association was determined by the Kendall's tau correlation coefficient [19]. *P* values represent two-tailed significance.

Experience with HRT was treated as an ordinal variable (0, never used; 1, previous user; 2, current user).

With the exception of partial Kendall correlations, all statistical analyses were calculated using SPSS software Version 12.0. $P < 0.05$ was considered statistically significant.

3. Results

3.1. Characteristics of participants

The median age of the total cohort was 63 years (the range was 41–82 years). Most women were menopausal never HRT users. Almost one-third of patients reported one or more osteoporotic fractures. Characteristics of study participants are summarized in Table 1. Patients in the OS group were older and reported less frequent HRT use.

3.2. Knowledge about osteoporosis

Table 2 summarizes the OPQ responses of the two groups. Participants in the OS group gave more correct answers (17 from 20) but also more incorrect answers (12 from 20) than participants from the comparison group.

Unadjusted statistics showed no significant differences in the level of knowledge about osteoporosis between the two groups. Mean scores (median; range) were 6.6 points (7; from −7 to 20) and 6.1 points (6; from −4 to 17) in the OS and comparison groups, respectively. When controlled for age, statistics revealed the OS group to have better knowledge than the comparison group (Kendall's tau 0.07; $P = 0.019$).

There were no significant differences between the groups in responses to questions about risk factors (questions 2–4, 7, 9, 17 and 18), HRT (questions 1, 5 and 14) and fractures (questions 16, 19 and 20).

Table 1
Sociodemographic and health characteristics of the study population

Characteristic	Total cohort (N = 474)	OS group (N = 306)	Comparison group (N = 168)
Age (median)	63	65***	60
Education level	N = 468	N = 301	N = 167
Elementary (%)	38.3	38.6	37.8
Secondary (%)	51.7	50.8	53.3
University (%)	10.0	10.6	9.0
Education type	N = 316	N = 226	N = 90
Health care (%)	16.8	16.8	16.7
Other (%)	83.2	83.2	83.3
Menopausal status	N = 456	N = 298	N = 158
Premenopausal (%)	2.9	2.0	4.4
Natural menopause (%)	76.5	75.2	79.1
Surgical menopause (%)	20.6	22.8	16.5
No. of concomitant	N = 451	N = 289	N = 162
Rx drugs, median (mean)	2 (2.8)	2 (2.9)	2 (2.6)
General health status	N = 463	N = 298	N = 165
Very good (%)	2.6	2.3	3.0
Good (%)	33.9	31.2	38.8
Satisfactory (%)	50.5	52.3	47.3
Poor (%)	13.0	14.1	10.9
Low trauma fracture	N = 464	N = 300	N = 164
Yes (%)	31.3	32.0	29.9
No (%)	68.7	68.0	70.1
HRT	N = 474	N = 306	N = 168
Ever user (%)	17.7	10.5***	31.0
Current user (%)	7.4	5.6*	10.7
Previous user (%)	10.3	4.9***	20.2
Never user (%)	82.3	89.5	69.0

$^*P < 0.05$; $^{**}P < 0.01$; $^{***}P < 0.001$.

3.3. Correlates of knowledge about osteoporosis

Table 3 shows correlations between level of knowledge and demographic or health characteristics, for the total cohort and by group.

3.3.1. Age
Based on OPQ score, the level of knowledge decreased with increasing age.

3.3.2. Education
Women with a higher level of education achieved a better knowledge score. The median score was 10 points for women who had received university education, 8 points for secondary school graduates and 4 points for respondents with elementary education. The

Table 2
Summary of responses to the OPQ questions, showing percentages of women responding correctly (incorrectly)

Question no.	Total cohort $N = 474$	OS group $N = 306$	Comparison group $N = 168$
1. A woman cannot take hormone replacement therapy (HRT) if she			
C: Has breast cancer (I: Is above 60 years of age, has hot flushes)	46.2 (13.5)	49.3 (12.1)	40.5 (16.1)
2. Early menopause is a risk factor for osteoporosis because of			
C: Lack of sex hormones (I: Psychological distress, neither of the above)	70.7 (6.8)	73.9 (7.8)	64.9 (4.8)
3. An excessive intake of which of the following is most likely to cause osteoporosis			
C: Alcohol (I: Leafy green vegetables, multivitamins)	47.0 (5.1)	50.0 (5.6)	41.7 (4.2)
4. Excessive dieting			
C: Can cause osteoporosis (I: Is good for your bones, has no effect on bones)	61.8 (10.5)	63.1 (10.5)	59.5 (10.7)
5. Side effects of HRT include			
C: Clots in the leg veins (I: Low back pain, vaginal dryness)	28.3 (15.0)	28.4 (16.0)	28.0 (13.1)
6. More women than men are reported to have osteoporosis because			
C: They actually do get osteoporosis more than men do (I: Men are not aware of it, women are more concerned about their health problems than men)	73.8 (15.8)	74.2 (17.3)	73.2 (13.1)
7. Osteoporosis is more likely to develop in people who			
C: Do not exercise at all (I: Exercise regularly, exercise occasionally)	76.4 (3.0)	76.8 (2.9)	75.6 (3.0)
8. Which of the following types of exercise will NOT strengthen bones much in osteoporosis			
C: Swimming (I: Running, walking)	10.5 (58.0)	11.1 (62.1)	9.5 (50.6)[*]
9. What is the LEAST likely cause of osteoporosis			
C: Weather changes (I: Genetic factors, lack of exercise)	70.5 (8.4)	69.6 (8.8)	72.0 (7.7)
10. Osteoporosis and osteoarthritis are			
C: Are different conditions with few similarities (I: Different names for the same disease, differ only in the parts of the body that are affected)	40.3 (22.2)	40.8 (21.2)	39.3 (23.8)
11. The condition characterized by fragile or brittle bones is commonly known as			
C: Osteoporosis (I: Arthritis, spondylitis)	81.2 (3.4)	83.0 (3.9)	78.0 (2.4)
12. The following is NOT a common complaint in patients with osteoporosis			
C: Swelling of the feet (I: Low back pain, loss of height)	58.6 (15.8)	61.1 (16.7)	54.2 (14.3)
13. A woman over 60 years is LEAST likely to develop			
C: Bone cancer (I: Osteoporosis, arthritis)	29.5 (13.3)	31.7 (14.1)	25.6 (11.9)
14. All types of hormone replacement therapy (HRT)			
C: Help prevent progress of osteoporosis (I: Cause regular menstrual bleeding, have no effect on bones)	53.4 (7.8)	54.6 (7.8)	51.2 (7.7)
15. Our bones are strongest at the following age			
C: Between 20 and 50 years (I: Below 20 years, over 50 years)	37.1 (54.2)	35.3 (56.9)	40.5 (49.4)
16. Having broken your wrist			
C: You are more likely to break the other wrist (I: Your chance of breaking the other wrist is lower, the chances of further fractures remains unchanged)	15.8 (61.2)	17.6 (58.8)	12.5 (65.5)
17. If your mother or father have had osteoporosis			
C: You are more likely to suffer from it (I: It does not affect your chance of suffering from it, you are less likely to suffer from it)	57.6 (17.9)	59.5 (17.3)	54.2 (19.0)
18. If you have an overactive thyroid			
C: You are more likely to suffer from osteoporosis (I: It does not affect the bones, you are less likely to suffer from osteoporosis)	23.8 (12.7)	25.8 (12.7)	20.2 (12.5)

Table 2 (*Continued*)

Question no.	Total cohort $N = 474$	OS group $N = 306$	Comparison group $N = 168$
19. Muscle weakness			
C: Makes you more likely to break bones (I: Does not affect your chance of breaking bones, has no effect on the chance of falling over)	59.3 (13.5)	61.8 (21.1)	54.8 (16.1)
20. You are more likely to fall over if you take			
C: Sleeping tablets, e.g. Diazepam (I: Hormone replacement therapy, aspirin)	59.9 (2.3)	57.2 (1.3)	64.9 (4.2)

C: correct response, % (I: incorrect responses, %); the rest to 100% represents "do not know" response alternative.
* $P < 0.05$.

level of achieved education was not affected by age of the participants. Healthcare education graduates were more knowledgeable than those who had received education of another subject: median scores were 10 and 6 points, respectively ($P < 0.001$). However, this question was not completed by a large number of participants.

3.3.3. Hormone replacement therapy

Participants who reported HRT use had better knowledge about osteoporosis than those who did not report HRT use. The median knowledge scores for current users, previous users and never HRT users were 10, 8 and 6, respectively. This association was significant, even when questions about HRT were excluded from the calculation of the knowledge score.

3.3.4. Health status

Associations between knowledge and health status markers were significant in the total cohort. The knowledge score was shown to be negatively correlated with the number of concomitant prescription drugs, and was significantly higher among women reporting a better self-perceived general health status. When analyzed separately by group, correlations between knowledge and health status markers did not show statistical significance in the comparison group.

The relationships between knowledge score and type of menopause (natural/surgical) or between knowledge score and osteoporosis-related fracture (yes/no) were not statistically significant, even when analysed separately by group. In the OS group, knowledge was not associated with treatment duration.

Table 3
Correlates of knowledge about osteoporosis based on the OPQ responses (correlation coefficient Kendall's tau, two-tailed significance)

Knowledge score correlated with	Total cohort ($N = 474$)	OS group ($N = 306$)	Comparison group ($N = 168$)
Age			
Simple	−0.14 (<0.001)***	−0.12 (0.004)**	−0.22 (<0.001)***
Education			
Simple	0.29 (<0.001)***	0.29 (<0.001)***	0.31 (<0.001)***
HRT experience			
Simple	0.18 (<0.001)***	0.15 (0.001)**	0.26 (<0.001)***
Control-age	0.15 (<0.001)***	0.14 (<0.001)***	0.21 (<0.001)***
Control-education	0.16 (<0.001)***	0.14 (<0.001)***	0.23 (<0.001)***
Concomitant prescription drugs			
Simple	−0.12 (0.001)**	−0.14 (0.002)**	−0.09 (NS)
Control-age	−0.09 (0.003)**	−0.12 (0.002)**	−0.06 (NS)
Control-education	−0.09 (0.004)**	−0.11 (0.005)**	−0.08 (NS)
General health status			
Simple	−0.11 (0.002)**	−0.09 (0.054)	−0.17 (0.007)**
Control-age	−0.11 (<0.001)***	−0.09 (0.019)*	−0.09 (NS)
Control-education	−0.06 (0.053)	−0.04 (NS)	−0.04 (NS)

*$P < 0.05$; **$P < 0.01$; ***$P < 0.001$

4. Discussion

The present study is the first multi-center study to examine the level of knowledge about osteoporosis in women in the Czech Republic, and is among the first studies to compare such knowledge in women with and without diagnosis of osteoporosis.

The knowledge level should be assessed using psychometrically valid instruments. We have chosen OPQ [18] because this tool shows good levels of difficulty and discrimination, excellent reliability and high criterion validity (based on contrasted groups). Questions in the OPQ cover the topics of which patients need to be aware (such as general information, risk factors, consequences and treatment). Content validity of questions included in the final questionnaire (20 of 71 questions tested in the prototype questionnaire) was ensured by review by clinicians. In the Czech translation we tried to retain the original level of readability. As in the study by Pande et al., the questionnaires in our study (containing Czech translation of OPQ as the final part) were completed by participants (either by themselves or with interviewer assistance) during a clinic visit.

In the sample of 474 women aged ≥40 years and attending outpatient centers, we found relatively poor levels of knowledge about osteoporosis in both the OS (mean score 6.6) and comparison (mean score 6.1) groups; the maximum possible score was 20 points. The sample of first-time attendees aged >50 years examined by Pande et al., achieved a mean score of 8.5 points. However, the direct comparison could be misleading because the study by Pande et al., was relatively small (50 subjects) and participants were selected for the purpose of developing the OPQ tool.

We found differences in age between the analyzed subgroups. Patients in the OS group were significantly older and consequently reported less frequent experience with HRT. After accounting for differences in age, we showed that women treated for osteoporosis have better knowledge than first-time attendees to the center. However, this difference was not as great as we had hypothesized, as unadjusted statistics had not revealed any difference in knowledge between the OS and comparison groups.

The basic level of knowledge about osteoporosis (questions 11 and 6 regarding disease characteristics and a higher prevalence in women, respectively) was relatively good in both the OS and the comparison groups. Eighty-three percent of participants with osteoporosis or osteopenia (OS group) chose the correct answer concerning definition of osteoporosis. Kutsal et al. [17] found that only 54% of participants, based on self-reporting, were aware of osteoporosis. However, they had addressed apparently a less educated population. More than three quarters of participants in our study know that lack of exercise is an important risk factor for osteoporosis. This result corresponds with the findings of Magnus et al. (72% of women) [13] and Drozdzowska et al. (74–84%, according to age category) [15]. However, when asked more detailed question about exercise (question 8, which type of exercise will not strengthen bones much in osteoporosis), only 10% of participants give the correct answer, and, perhaps surprisingly, the OS group were less knowledgeable than the comparison group. We expected better levels of knowledge concerning fractures, especially in the OS group. Knowledge of risk factors was also relatively poor. Excessive intake of alcohol (a risk factor for many chronic diseases) was identified as a risk factor by less than 50% of the participants.

Our data confirm previous findings indicating a positive correlation between knowledge (awareness) of osteoporosis and higher levels of education [5,14,15,17,20], and a negative correlation between knowledge and increasing age [13–15,17].

Other observations concerning the relationship between level of knowledge about osteoporosis and personal experience of this disease are less consistent. In the study by Drozdzowska et al. [15], osteoporosis was not found to significantly influence the level of knowledge, although answers to some questions (calcium intake) were found to be affected by personal experience with the disease. In a large Norwegian study by Magnus et al. [13], having osteoporosis or knowing somebody with osteoporosis were associated with increased knowledge. However, in another study, first-degree relatives of individuals with osteoporosis did not have greater levels of knowledge than people without such diagnosed family member [16].

It is surprising that the proportion of women who reported an osteoporotic fracture was approximately the same in both groups. Although self-reporting of fractures may not be sufficiently accurate [21,22], comparisons between education-balanced groups could be informative. This finding indicates that a fracture is often the first manifestation of osteoporosis. We did

not find any association between level of knowledge and fracture history in our study.

We observed substantially better knowledge among women reporting experience with HRT. It has previously been shown that knowledge about oestrogen was among the most important factors associated with the use of HRT [23]. It can be expected that increased knowledge about oestrogen corresponds with increased understanding of the menopause and its consequences (increased osteoresorption) and such knowledge can contribute to the decision of starting (increasing) preventive efforts such as HRT. In a study of Belgian women aged ≥50 years and working in a university hospital, however, osteoporosis was not perceived to be a more important disease by women with HRT experience than by those without such experience [24].

Poor self-perceived health status and self-reports of multiple prescription medications were associated with poor knowledge about osteoporosis in the total cohort. It is possible that a good understanding of the disease could reduce the anxiety and thus lead to better-perceived health. In addition, less-knowledgeable patients are probably less interested in their own health and less involved in prevention. Therefore, they are more likely to present with advanced osteoresorption or symptomatology and to suffer from more chronic diseases. It is also possible that less-knowledgeable individuals exert pressure on physicians to prescribe more drugs. Number of concomitant prescription drugs correlated negatively with knowledge in the OS group but not in the comparison group. One explanation could be that an osteoporotic patient with no comorbidity is more concentrated to osteoporosis and motivated to understand the disease than a patient suffering from a variety of other diseases. At present, how an increased knowledge about osteoporosis in osteoporotic women may influence health-related quality of life is unknown and further research in this field is needed.

There were several limitations to the survey. Our sample is not a randomly selected population. Recruiting participants directly from the clinics might have biased the sample by including participants with relatively high health beliefs and those better motivated to co-operate with healthcare providers. Individuals attending outpatient centers are likely to gain better knowledge in comparison with women (even those women suffering from osteoporosis) who do not seek

medical attention. Furthermore, women with better knowledge of osteoporosis could have been more willing to participate in this survey and to return fully completed questionnaire forms, consequently achieving higher knowledge scores. However, the percentage of individuals who returned fully completed questionnaires is relatively high (81% of the target population). In patients with osteoporosis, it has been shown that non-respondents have poorer health than respondents [25]. We found good general health status was an important factor associated with increased knowledge, and this may also have contributed to a slightly higher knowledge score.

As knowledge about osteoporosis among female attendees of outpatient centers was relatively poor, and increased knowledge was associated with the use of HRT that prevents osteoporosis, it is necessary to promote knowledge in this field. In Belgium, a long-term health promotion strategy increased awareness of osteoporosis in women aged ≥45 years [26]. On the other hand, in Israel, Werner et al. found a low level of knowledge about the disease after an education campaign that was focused on osteoporosis and the authors encouraged complementary methods [16]. It is evident that improving awareness of the target population through healthcare providers is of general concern. As osteoporosis management is an interdisciplinary challenge, face-to-face consultations with physicians, pharmacists and nurses seem to be an important step in raising knowledge about osteoporosis. This approach is cheap and should be interactive with feedback from patients to ensure good understanding of the advice given (interactive methods with involvement of participants seem to be effective [10]); however, healthcare providers need to be adequately trained and skilled for the approach to be successful. There should be a particular focus on increasing knowledge of the areas essential for successful prevention (or treatment) and early diagnosis—for example, types of exercise suitable for bone health and risk factors. It is also important to provide detailed information concerning fractures and how to prevent them among patients with osteoporosis.

In summary, we found that knowledge about osteoporosis among Czech women aged ≥40 years and attending outpatient centers is relatively poor. When controlled for age, women diagnosed with osteoporosis (osteopenia) and treated for the disease showed better

knowledge levels than first-time attendees to the center. Women who reported experience with HRT and those with better health status also achieved better knowledge scores. To improve knowledge of osteoporosis, special attention should be paid to elderly women, those who have never used HRT, poorly educated women and those treated with several prescription drugs.

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