



Background

Osteoporosis is a disease affecting the structure of the skeleton as a result low bone mineral density and micro-architectural deterioration of bone tissue is generated. Due to the bone mineral density reduction the risk of fragility increases and because of the muscle mass and muscle strength deterioration the risk of falls also increases which results in higher risk of fractures [1]. It is widely accepted that this disease is associated with impairments of quality of life following fracture, and increased mortality [2–5].

Nowadays it is becoming a major public health problem particularly in postmenopausal women as the incidence of this disease is getting higher and higher. Worldwide more than 200 million people live with osteoporosis that causes 8.9 million fractures per year [6, 7]. In the United States of America 10.2 million adults were diagnosed with osteoporosis and 43.4 million adults with low bone mass. In terms of gender 8.2 million women and 2.0 million men were diagnosed with osteoporosis and 27.3 million women and 16.1 million men had low bone mass. In Europe the problem is also significant, 22 million women and 5.5 million men were estimated to have osteoporosis and 3.5 million new fragility fractures were sustained per year. In Europe the economic burden of the diagnoses and the treatment of the prior fragility fractures was about € 37 billion [6, 8]. In Hungary 10% of the total population is suffering from osteoporosis [9].

Osteoporosis is a disease affecting the structure of the skeleton as a result low bone mineral density and micro-architectural deterioration of bone tissue is generated. Due to the bone mineral density reduction the risk of fragility increases and because of the muscle mass and muscle strength deterioration the risk of falls also increases which results in higher risk of fractures [1]. It is widely accepted that this disease is associated with impairments of quality of life following fracture, and increased mortality [2–5].

among a convenience sample of 40 women from September 2018 to October 2018 to examine the reliability of the questionnaire. The participants completed the questionnaire twice with 3 weeks apart. The measurement of the osteoporosis-related knowledge was assessed at baseline from December 2018 to July 2019.

Selection and description of participants

The total population of Hungary in 2019 was 9,772,756 in the last population census, of which 5,096,935 were women. According to the Hungarian Central Statistical Office the female population was 199,944 in the region (Baranya County) of which, 49,051 were women aged between 25 and 44 years of age [31]. Participants from the

Table 1 Women's characteristics of the sample (n = 557) and the total scores of OKAT examination by variables

Age	No. of the cases (n)	Percentage (%)	Mean ± SD	P value
25–29 years	188	33.75	11.85 ± 4.32	< 0.001
30–34 years	90	16.16	11.18 ± 4.15	
35–39 years	90	16.16	11.33 ± 4.33	
40–44 years	189	33.93	10.03 ± 4.06	
Marital Status				
Single / Divorced / Widow	131	23.52	10.87 ± 4.56	0.162
In relationship	221	39.68	11.45 ± 4.18	
Married	205	36.8	10.7 ± 4.27	
Education level				
Primary education	9	1.62	5.22 ± 3.42	< 0.001
Secondary school (medical)	34	6.09	11.82 ± 3.19	
Secondary school (not medical)	60	10.77	7.68 ± 3.84	
High school	75	13.46	9.61 ± 3.91	
University (Bs)	225	40.39	11.88 ± 3.81	
University (Ms)	140	25.13	11.74 ± 4.38	
University (PhD)	14	2.51	14.43 ± 4.39	
Professions				
Health care profession	181	32.49	14.53 ± 3.58	< 0.001
Non-health care profession	376	67.50	9.99 ± 4.04	
Family history about osteoporosis				
With osteoporosis	270	48.47	12.08 ± 4.17	< 0.001
Without osteoporosis	287	51.53	10.06 ± 4.13	
Family history of fracture				
With fracture	136	24.42	13.4 ± 3.96	< 0.001
Without fracture	343	61.58	10.64 ± 4.04	
Do not know	78	14.00	8.67 ± 3.94	
History of smoking				
Do not smoke	430	77.19	11.32 ± 4.04	= 0.024
Average 1 to 5 cigarette per day	37	6.64	10.76 ± 4.36	
Average 6 to 10 cigarette per day	45	8.08	10.4 ± 5.19	
Average 10 to 20 cigarette per day	36	6.46	8.75 ± 4.78	
On average more than 1 box per day	9	1.62	11.33 ± 4.95	
Alcohol intake				
Never	83	14.90	11.19 ± 4.58	= 0.152
Occasionally (1–2 times a year)	246	44.17	11.19 ± 4.04	
Every 3 month	117	21.01	11.19 ± 4.14	
Several times a month	75	13.46	10.76 ± 4.56	
Weekly	30	5.39	10.47 ± 4.56	
Several times a week	6	1.08	6.17 ± 2.79	
Health promotion (prevention)				
I do lot for it	55	9.87	12.6 ± 4.73	< 0.001
I do several things for it	242	43.44	11.61 ± 4.23	
I do few for it	221	39.68	10.49 ± 3.93	
I do very few for it	30	5.39	9.27 ± 4.1	

related knowledge. The results were higher in the healthcare professions. Higher osteoporosis-related knowledge was found with osteoporosis and fracture by osteoporosis in the family history furthermore with better health status and promotion the knowledge about osteoporosis was significantly higher (Table 1.)

Significant ($p < 0.001$) correlation was found between the education level ($r = 0.25$) and the osteoporosis-related knowledge furthermore with the health status ($r = 0.18$) and negative significant ($p < 0.001$) correlation ($r = -0.18$) with the ages. Based on these with higher level of general education women have higher knowledge about osteoporosis as well as with better knowledge participants have more appropriate health status, over and above appreciable that the osteoporosis-related knowledge is getting worse with aging.

The English version of the OKAT had a Flesch reading ease of 45, the Hungarian form had almost the same with 44. If the word osteoporosis were removed from the English version questions the reading ease rose to 65, while the Hungarian form rose to 53.

The index of difficulty for most items was satisfactory (between 0.25 and 0.716). Items 1, 4, 8 and 15 scored above 0.75, indicating that most participants answered correctly.

The percentage of correct answers as shown is based on Winzenberg et al. [30], furthermore on the latest European guidance for the diagnosis and management of osteoporosis in postmenopausal women according to Kanis et al. [2] (Table 2.)

The reliability statistics for all the 20 items of the Hungarian version of the OKAT was high, Cronbach's alpha was 0.81 which is excellent, and it is in the acceptability range (0.7–0.85).

The mean D-value (item discrimination) for the questionnaire was 50.4%. Discriminatory power was measured by Ferguson's sigma which was 0.94 for the questionnaire.

According to the item-total correlations psychometric properties of the OKAT, there were no negative inter-item correlations. All items had more than 70% of correlations which were significant ($p < 0.001$) and so were satisfactory (Table 3.)

This fact indicating that these four questions were easy to answer and most of the participants answered them correctly.

The mean D-value, that measures the item discrimination for the questionnaire was 50.4%. Discriminatory power for the questionnaire was measured by Ferguson's sigma what was close to the ideal value of 1.0 with the value 0.94. Though factor analysis must be interpreted cautiously when analysing dichotomous variables, the fact that the analysis did not generate factor with an eigenvalue above 1 is consistent with osteoporosis knowledge being the main factor being measured by the questionnaire. This provides some support for the construct validity of the instrument.

The Hungarian version of OKAT showed consistent findings between the test and retest results. The Cronbach's alpha of the original English version was 0.69, which was satisfactory for the authors. In our study the Hungarian version got excellent 0.81 that is in the acceptability range (0.7–0.85). The OKAT must0.y

Table 3 Psychometric Properties of the OKAT by Item

Item Number	Item Discrimination (%)	Item-total correlation	P value	Factor Loading
1. Osteoporosis leads to an increased risk of bone fractures.	12.42	0,7	< 0.001	0.61
2. Osteoporosis usually causes symptoms (e.g. pain) before fractures occur.	58.33	0.85	< 0.001	0.47
3. Having a higher peak bone mass at the end of childhood gives no protection against the development of osteoporosis in later life.	78.42	1.00	< 0.001	0.45
4. Osteoporosis is more common in men.	46.35	0.94	< 0.001	0.56
5. Cigarette smoking can contribute to osteoporosis.	44.95	0.83	< 0.001	0.43
6. White women are at highest risk of fracture as compared to other races.	66.67	1.00	< 0.001	0.43
7. A fall is just as important as low bone strength in causing fractures.	34.71	1.00	< 0.001	0.72
8. By age 80, the majority of women have osteoporosis.	51.61	0.84	< 0.001	0.47
9. From age 50, most women can expect at least one fracture before they die.	45.05	0.89	< 0.001	0.52
10. Any type of physical activity is beneficial for osteoporosis.	62.38	0.95	< 0.001	0.48
11. It is easy to tell whether I am at risk of osteoporosis by my clinical risk factors.	41.76	0.89	< 0.001	0.48
12. Family history of osteoporosis strongly predisposes a person to osteoporosis.	41.47	0.91	< 0.001	0.45
13. An adequate calcium intake can be achieved from two glasses of milk a day.	53.69	0.85	< 0.001	0.66
14. Sardines and broccoli are good sources of calcium for people who cannot take dairy products.	58.99	0.74	< 0.001	0.39
15. Calcium supplements alone can prevent bone loss.	50.54	1.00	< 0.001	0.38
16. Alcohol in moderation has little effect on osteoporosis.	39.04	0.87	< 0.001	0.71
17. A high salt intake is a risk factor for osteoporosis.	42.22	1.00	< 0.001	0.56
18. There is a small amount of bone loss in the ten years following the onset of menopause.	47.65	1.00	< 0.001	0.42
19. Hormone therapy prevents further bone loss at any age after menopause.	70.12	0.95	< 0.001	0.49
20. There are no effective treatments for osteoporosis available in "Hungary				

of potential limitations. The sample was randomly selected, but selection bias is possible due to the moderate response rate. By ages, we have created four categories (25–29 years; 30–34 years; 35–39 years; 40–44 years). In the first category (33.75%) and in the fourth (33.93%) the number of the participants was significantly higher, than in the other two categories that could also influence the results. However, our sample was quite big there were only few women with basic primary education, while the number of the participants with Bs and Ms. Degree were quite high.

Conclusion

This study's aim was to validate the OKAT Hungarian form in a randomly selected sample. Based on the results we achieved the Hungarian version of the OKAT is a reliable and objective method to measure women's knowledge in Hungary between 25 and 44 years. Further research is needed with a representative sample to measure the osteoporosis-related knowledge with this tool to get normal values for the Hungarian population.

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About this supplement

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