Original Article

Development and Validation of India-specific Hindi Version of Osteoporosis Knowledge Assessment Tool

Sitanshu Barik, Vikash Raj, Boudhayan Das Munshi[1], Ojasvi Rajput[2], Shivji Prajapati[3], Sant Guru Prasad, Ashish Kumar

Department of Orthopedics, All India Institute of Medical Sciences, Deoghar, Jharkhand, [1]Department of General Medicine, All India Institute of Medical Sciences, Kalyani, West Bengal, [2]Department of Mathematics and Statistics, Indian Institute of Technology, Kanpur, Uttar Pradesh, [3]Department of Orthopedics, All India Institute of Medical Sciences, Raipur, Chhattisgarh, India

ABSTRACT

Purpose: Patient education is one of the important components of reducing the morbidity of osteoporosis. The aim of this study is to validate the Hindi version of the Osteoporosis Knowledge Assessment Tool (OKAT-H) among a hospital-based sample in the age group of 18–44 years of age. **Methods:** The study was conducted in two phases – translation and adaption of the OKAT in Hindi followed by its validation. The translated tool was analyzed by Flesch reading ease, McNemar test, Cronbach alpha, difficulty index, discrimination index, and principal factor analysis. **Results:** Two hundred and sixty women with a mean age of 28.3 ± 17.2 years were enrolled in the study. The mean score of the OKAT-H tool obtained in the study was 11.3 ± 2.1. A significant difference was noted in the scores based on educational qualification or with any family history of either osteoporosis or fracture ($P < 0.05$). The Flesch score for the OKAT-H tool was 86. Inter-item correlation for all the items ranged between 0.15 and 0.5. The Cronbach's alpha measured 0.892 suggesting high internal consistency. Items number 6, 7, 8, 9, 13, and 14 showed a significant difference on the McNemar test questioning its consistency on test-retest. **Conclusion:** A new shorter version of the tool may be developed since six items showed low consistency. The use of such an instrument in local language would help spread awareness about the disease as well as help the population in adopting osteoprotective strategies and also to seek help and advice regarding treatment.

KEYWORDS: *India, osteoporosis, Osteoporosis Knowledge Assessment Tool, psychometric properties*

INTRODUCTION

*I*ncreasing age leads to a reduction in bone mass and muscle weakness, which increases the fragility and risk of falls leading to fractures.[1] The quality of life is also affected by other symptoms such as back pain and leg pain secondary to low bone mass. These issues are more pronounced in postmenopausal women and are growing to become one of the major public health concerns in developed and developing countries alike. There are more than 200 million people with osteoporosis worldwide, leading to around 8.9 million fractures per year.[2] In India, the prevalence of low bone mass is estimated to be around 11.1%–40.3% in females.[3]

Patient education is one of the important components of reducing the morbidity of osteoporosis. Evidence suggests that knowledge regarding osteoporosis leads to preventive behavior among the population.[4] The knowledge regarding osteoporosis can be gauged through various methods such as the Facts on Osteoporosis Quiz, Osteoporosis Questionnaire, Osteoporosis knowledge Tool, and Osteoporosis Knowledge Assessment Tool (OKAT) but the inherent heterogeneity in these questionnaires may show varied results in various studies.[5,6] There is currently a lack of a reliable and valid tool to measure osteoporosis-related knowledge and

Address for correspondence: Dr. Sitanshu Barik,
All India Institute of Medical Sciences, Deoghar - 814 112,
Jharkhand, India.
E-mail: sitanshubarik@gmail.com

Access this article online

Quick Response Code:

Website: https://journals.lww.com/jomh

DOI: 10.4103/jmh.jmh_219_22

behavior among Hindi speaking population of India, and the presence of such a tool would guide the policymakers and physicians alike on how to manage and prevent the disease burden among the population. The OKAT has been validated in Hungarian and Arabic languages.[7-9] The aim of this study is to validate the Hindi version of OKAT (OKAT-H) among a hospital-based sample in the age group of 18–44 years.

METHODS

Study details

The study was conducted at a tertiary care teaching hospital from February 2022 to May 2022 and women in the age group of 18–44 years who are fluent in Hindi and consented to participate were included in the study. Women who have had a prior diagnosis of osteoporosis, measurement of bone mineral density, thyroid disease, inflammatory arthritis, renal disease, history of hysterectomy, and on hormone replacement therapy were excluded from the study. The data were collected by a paper-based method by the authors after the validation of OKAT-H. Apart from the items in the OKAT-H, the demographic data regarding the study participants were also collected. Clearance was obtained from the institutional review board.

Instrument details

The OKAT is a 20-point questionnaire with "correct," "don't know" and "incorrect" options. They are given a score of 0 for "incorrect" and "don't know" options and a score of 1 for "know" option. The score could vary from 0 to 20. The tool measures domains such as knowledge of osteoporosis, its risk factors, prevention, and treatment options.[10]

Sample size

Since the questionnaire consisted of 20 items, a sample size of at least 100 is needed.[11] Doubling the sample size with a dropout rate of 30%, a sample size of 260 was deemed to be adequate.

Translation and validation

The study was conducted in two phases – translation and adaption of the OKAT in Hindi followed by its validation. Forward translation of OKAT to Hindi was done by two independent bilingual translators who are fluent in Hindi after being explained the meaning of each item by the authors. It was followed by a backward translation and the comparison between the Hindi and English versions was done by two bilingual translators, one of them being a professional medical translator and the other being a medical expert on osteoporosis with high English certification. It was followed by a group discussion among the authors to

weed out any discrepancy followed up by a pilot study on 20 women to understand the readability and ease of administration of the translated tool. Minor changes were made after the pilot test, after which the second phase of the study commenced, which included test–retest to assess reliability in an adequate sample size by convenience sampling of women in the 25–44 years age group matching the inclusion and exclusion criteria. The participants were required to fill out the questionnaire 3 weeks apart.

Statistical analysis

Demographic data will be expressed as ratios and percentages. In the pilot survey, Flesch reading ease was measured. Internal consistency reliability was analyzed by inter-item correlation, which should range between 0.15 and 0.5. With scores more than 0.5, the questions tend to be repetitive, and with scores <0.15, the questions do not seem to relate with each other. Cronbach's alpha was calculated to measure internal consistency. Furthermore, principal components factor analysis was extracted for the factor of OKAT. Since using factor analysis for questionnaires with dichotomous items is problematic, the analysis was based on prevision studies.[7-9] Exploratory factor analysis was performed through principal component analysis on 20 items and yielded one factor with eigenvalues higher than 1. As the criteria for factor extraction, we applied the factor loading at a prefixed cutoff value. Pearson correlation coefficient was used to analyze test-retest reliability. McNemar's test was used to identify nonconsistent items. The index of difficulty was calculated by number of correct responses/total number of responses. Value higher than 0.75 means that question was frequently answered correctly. Item discrimination index (Fergusson sigma) was calculated, which would examine how the items differentiate between patients based on their scores. A score above 0.4 made the item discriminatory. The statistical analysis was done on SPSS (SPSS Version 27, Amonk, United States). The sampling adequacy for the analysis was confirmed by Kaiser–Meyer–Olkin test and Bartlett's test of sphericity.

RESULTS

Two hundred and sixty women with a mean age of 28.3 ± 17.2 years were enrolled for the study [Table 1]. The majority of the females resided in rural area (56.2%), married (85.7%), studied below 10th grade (35%), and were housemaker (78%) by work. Less than 30% of the study sample had any comorbidity (26.5%) or history of drug intake (24.6%) or any family history of prior osteoporosis (18.8%) or any family history of fracture (27.3%). The mean score of the OKAT-H tool

Table 1: Demographic data of the study sample in the study

	n (%)
Age (years)	
18–30	156 (60.7)
31–44	104 (39.3)
Residence	
Urban	114 (43.8)
Rural	146 (56.2)
Marital status	
Single	33 (12.8)
Widow	4 (1.5)
Married	223 (85.7)
Educational qualification	
<10th	91 (35)
10th	36 (13.8)
12th	44 (16.9)
Graduate	75 (28.8)
Postgraduate	13 (5.5)
Profession	
Housemaker	203 (78)
Job	57 (22)
Comorbidity	
Yes	69 (26.5)
No	191 (73.5)
Drug history	
Yes	64 (24.6)
No	196 (75.4)
Family history of osteoporosis	
Yes	49 (18.8)
No	211 (81.2)
Family history of fracture	
Yes	71 (27.3)
No	169 (72.7)

obtained in the study was 11.3 ± 2.1. A significant difference was noted in the scores based on educational qualification or with any family history of either osteoporosis or fracture ($P < 0.05$).

The Flesch score for the OKAT-H tool was 86, which signified its easy readability. Inter-item correlation for all the items ranged between 0.15 and 0.5. The Cronbach's alpha measured 0.892, suggesting high internal consistency. The test-retest reliability of 20 items OKAT-H indicated an excellent reliability and stability of the instrument with Pearson correlation coefficient of 0.712 ($P < 0.05$). The first four items had eigenvalue greater than suggesting multicollinearity and variance can be attributed to these components. Items number 6, 7, 8, 9, 13, and 14 showed a significant difference on McNemar test, questioning its consistency on test-retest. The index of difficulty is between 0.13 and 0.73 [Table 2]. None of the items scored above 0.75, suggesting they were not answered correctly frequently.

None of the items had a Fergusson sigma of 0.4 or above. The measure of sampling adequacy was 0.874, which was statistically significant ($P < 0.001$).

DISCUSSION

With growing life expectancy, one of the biggest challenges for health-care practitioners as well as patients is the management of chronic illnesses like osteoporosis. It has been suggested that the management of such diseases is done effectively if the patient has adequate knowledge of the disease, both in its preventive and curative aspects.[8] There is a paucity of instrument in a local language for the assessment of knowledge on osteoporosis in various countries. The aim of this study is to validate the OKAT-H among a hospital-based sample in the age group of 18–44 years.

This study is the first to validate a OKAT-H tool. A reliable methodology which involved forward-backward-forward translation, a pilot study for comprehensibility and tests for psychometric properties was done. This study showed good readability, consistency, and reliability of the OKAT-H tool. The consistency of a few items was questionable, which can be refined by further large-scale studies on it. A significant difference was noted in the scores based on educational qualification or with any family history of either osteoporosis or fracture. The results of this translated tool were similar to previous studies published.[7,8,10,12]

The prevention of osteoporosis is cost-effective as compared to the curative strategies.[13] The preventive strategies can be summarized as adequate calcium intake and weight-bearing exercise from childhood till thrid decade of life. Progressive resistance exercises have been seen to increase bone mineral health in adulthood.[14] The influence of osteoporosis knowledge has not been studied broadly and widely but the factors can be ascribed to demographic characteristics such as age, gender, educational qualification, and history of osteoporosis in family.[15] Conversely, lack of knowledge regarding the disease makes the patient less likely to adopt the preventive strategies as mentioned above.[16] Hence, the use of such an instrument in local language would help spread awareness about the disease as well as help the population in adopting osteoprotective strategies and also to seek help and advice regarding treatment.

Item numbers 6, 7, 8, 9, 13, and 14 showed inconsistency in this study on test-retest. Similar results with item numbers 1, 4, 7, 10, and 13 were obtained in the original study by Winzenberg *et al*.[10] This has led researchers to work on the shorter version of the tool with improved psychometric properties. Tadic *et al*. developed a shorter version based on their validation results of the original

Table 2: Osteoporosis Knowledge Assessment Tool-Hindi instrument with the properties of its constituent items

OKAT-H item	McNemar test	Index of difficulty	Item discrimination index
1.ऑस्टियोपोरोसिस हड्डियों के कमजोर पड़ने की बिमारी है जिसमे उनके टूटने का खतरा बढ़ जाता है ।	1.000	0.582375	0.619718
2. इस बिमारी में हड्डियों के टूटने के पहले दर्द जैसे लक्षण आते हैं ।	1.000	0.1341	0.169014
3. किशोरावस्था में हड्डियाँ ज्यादा मजबूत होने के बाद भी बुढ़ापे में इस बीमारी का खतरा कम नहीं होता ।	0.070	0.436782	0.619718
4. पुरुषों में यह बिमारी ज्यादा पायी जाती है ।	0.065	0.329502	0.394366
5. तम्बाकू सेवन से इस बीमारी का खतरा बढ़ता है ।	0.267	0.448276	0.478873
6. भारतीय महिलाओं में इस रोग का खतरा बिलकुल नहीं है ।	<0.001	0.482759	0.507042
7. रोगग्रस्त हड्डियाँ मामूली से चोट से भी टूट सकती हैं ।	0.022	0.643678	0.521127
8. 80 साल के उम्र तक अधिकांश महिलाएं इस रोग से पीड़ित होती हैं ।	0.021	0.574713	0.676056
9. अधिकांश महिलाओं के जीवनकाल में 50 की उम्र के बाद कम से कम एक बार हड्डी टूटने की सम्भावना रहती है ।	0.035	0.482759	0.704225
10. किसी भी प्रकार का शारीरिक व्यायाम इस रोग की रोकथाम करता है ।	0.070	0.172414	0.098592
11. व्यक्ति अपने जीवन शैली , स्वास्थ्य और लक्षणों के आधार पर इस रोग के होने के खतरे का अनुमान लगा सकता है ।	0.332	0.517241	0.478873
12. परिवारजनों में ऑस्टियोपोरोसिस होने पर हमें इस रोग का खतरा बढ़ जाता है ।	0.227	0.478927	0.464789
13. प्रतिदिन दो गिलास दूध पीने से हमें पर्याप्त मात्रा में कैल्शियम प्राप्त होता है ।	<0.001	0.731801	0.267606
14. जिन्हें दुग्ध उत्पादों से परहेज हो उनके लिए दाले , हरी पत्तेदार सब्जियाँ और मछलियाँ कैल्शियम के अच्छे स्रोत हैं ।	<0.0001	0.67433	0.380282
15. केवल कैल्शियम की गोलियां ही इस रोग से बचा सकती हैं ।	0.125	0.348659	0.169014
16. थोड़ी मात्रा में शराब पीने से इस रोग का खतरा बढ़ता नहीं है ।	1.000	0.226054	0.197183
17. अत्यधिक मात्रा में नमक का सेवन इस रोग का खतरा बढाता है ।	1.000	0.524904	0.633803
18. मासिक बंद होने के बाद के 10 सालो में हड्डियाँ ज्यादा कमजोर नहीं होतीँ ।	0.092	0.283525	0.380282
19. मासिक के बंद होने के कारण होने वाले हड्डियों की कमजोरी से हॉर्मोन थेरेपी बचाती है ।	0.109	0.390805	0.507042
20. इस रोग का कारगर इलाज़ भारत में उपलब्ध नहीं है ।	0.549	0.386973	0.408451

OKAT-H: Osteoporosis Knowledge Assessment Tool-Hindi

20-item tool.[17] The shorter version consisted of nine items that had improved psychometric properties and would presumably take lesser time to complete. A similar study would be the step forward to identify moderate or low consistency items in OKAT-H and develop a shorter version excluding those items. The shorter version can be compared with the original tool for further validity.

This study has its set of limitations. As with studies which are cross-sectional in nature, the results may not be externally valid. Although the study participants were randomly selected, selection bias cannot be ruled out due to the absence of blinding of the researcher. There was unequal distribution of the various groups created on the basis of demographic factors. Discriminant analysis was not conducted in this study. This study excluded men, which can be considered important because of patriarchy existing in the families of the region. The females usually seek prevention or treatment for their ailment through the males of the family. The adequacy of the sample size is the strength of the study. This is the first study to translate the OKAT tool and identify its psychometric properties. The study was based in an area that could be considered representative of the rural parts of the country. This tool would enable its greater community usage for spreading awareness about the disease without the active direct involvement of health-care practitioners.

CONCLUSION

With growing life expectancy, one of the biggest challenges for health-care practitioners as well as patients, is the management of chronic illnesses like osteoporosis. The mean score of the OKAT-H tool obtained in the study was 11.3 ± 2, pointing toward a low level of knowledge regarding the disease. The Cronbach's alpha measured 0.892, suggesting high internal consistency. A new shorter version of the tool may be developed since six items showed low consistency. The use of such an instrument in local language would help spread awareness about the disease as well as help the population in adopting osteoprotective strategies and also to seek help and advice regarding treatment.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

REFERENCES

1. Kanis JA, Cooper C, Rizzoli R, Reginster JY, Scientific Advisory Board of the European Society for Clinical and Economic Aspects of Osteoporosis and Osteoarthritis (ESCEO) and the Committees of Scientific Advisors and National Societies of the International Osteoporosis Foundation (IOF). Executive summary of the European guidance for the diagnosis and management of osteoporosis in postmenopausal women. Calcif Tissue Int 2019;104:235-8.
2. Kerr C, Bottomley C, Shingler S, Giangregorio L, de Freitas HM, Patel C, *et al.* The importance of physical function to people with osteoporosis. Osteoporos Int 2017;28:1597-607.
3. Kaushal N, Vohora D, Jalali RK, Jha S. Prevalence of osteoporosis and osteopenia in an apparently healthy Indian population – A cross-sectional retrospective study. Osteoporos Sarcopenia 2018;4:53-60.
4. Bilal M, Haseeb A, Merchant AZ, Rehman A, Arshad MH, Malik M, *et al.* Knowledge, beliefs and practices regarding osteoporosis among female medical school entrants in Pakistan. Asia Pac Fam Med 2017;16:6.
5. Darout IA, Alamir A, Sultana S. Osteoporosis knowledge and related health behavior among women in Jazan Region, Kingdom of Saudi Arabia. J Contemp Dent Pract 2017;18:378-82.
6. Senthilraja M, Cherian KE, Jebasingh FK, Kapoor N, Paul TV, Asha HS. Osteoporosis knowledge and beliefs among postmenopausal women: A cross-sectional study from a teaching hospital in southern India. J Family Med Prim Care 2019;8:1374-8.
7. Sayed-Hassan RM, Bashour HN. The reliability of the Arabic version of osteoporosis knowledge assessment tool (OKAT) and the osteoporosis health belief scale (OHBS). BMC Res Notes 2013;6:138.
8. Abdulameer SA, Sahib MN. Cross-cultural adaptation and psychometric properties of osteoporosis knowledge tool-Arabic version among Iraqi population. Open Rheumatol J 2019;13:30-8.
9. Tardi P, Szilagyi B, Makai A, Gyuro M, Acs P, Jaromi M, *et al.* The development of a reliable and valid instrument to measure the osteoporosis-related knowledge: Validation of the Hungarian version of Osteoporosis Knowledge Assessment Tool (OKAT). BMC Public Health 2021;21:1515.
10. Winzenberg TM, Oldenburg B, Frendin S, Jones G. The design of a valid and reliable questionnaire to measure osteoporosis knowledge in women: The Osteoporosis Knowledge Assessment Tool (OKAT). BMC Musculoskelet Disord 2003;4:17.
11. Streiner DL, Norman GR, Cairney J. Health Measurement Scales. Vol. 1. Oxford, United Kingdom: Oxford University Press; 2015. Available from: http://www.oxfordmedicine.com/view/100.1093/med/97801996 85219.001.0001/med-9780199685219. [Last accessed on 2022 Feb 11].
12. Abdulameer SA, Syed Sulaiman SA, Hassali MA, Subramaniam K, Sahib MN. Psychometric properties of osteoporosis knowledge tool and self-management behaviours among Malaysian type 2 diabetic patients. J Community Health 2013;38:95-105.
13. Mohd Hatta NN, Nurumal MS, Isa ML, Daud A, Ibrahim M, Sharifudin MA, *et al.* Knowledge and attitudes of maintaining bone health among post-menopausal women in Malaysia. Cent Asian J Glob Health 2019;8:348.
14. Beck BR, Daly RM, Singh MA, Taaffe DR. Exercise and Sports Science Australia (ESSA) position statement on exercise prescription for the prevention and management of osteoporosis. J Sci Med Sport 2017;20:438-45.
15. Werner P. Knowledge about osteoporosis: Assessment, correlates and outcomes. Osteoporos Int 2005;16:115-27.
16. Zakai G, Zakai HA. Awareness about osteoporosis among university students in Jeddah, Saudi Arabia. J Adv Lab Res Biol 2015;6:49-53.
17. Tadic I, Stevanovic D, Tasic L, Vujasinovic Stupar N. Development of a shorter version of the osteoporosis knowledge assessment tool. Women Health 2012;52:18-31.