ORIGINAL RESEARCH

Psychometric properties and assessment of the Osteoporosis Health Belief Scale among the general Arabic population

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Background: Any educational program should be implemented with a good understanding of the population's beliefs. Therefore, the aims of this study were to validate the Arabic version of the Osteoporosis Health Belief Scale (OHBS-A) and assess the osteoprotective attitude among the Iraqi population.

Methods: A cross-sectional design, with a random cluster sampling method from the community, was used. The forward–backward–forward translation method was used to translate the questionnaire from English to Arabic. In addition, the Arabic version of Osteoporosis Knowledge Tool (OKT-A) and the Arabic version of Osteoporosis Self-Efficacy Scale (OSES-A) were used to assess the osteoprotective behaviors.

Results: The results showed good face validity and reliability. The construct validity analysis showed seven factors that explain 72.82% of the variance. In addition, the results revealed a low health belief score (149.95±35.936) with only 36.67% of the study population found to have a high OHBS-A level. The results showed significant differences among employment status, marital status, and osteoporosis (OP) awareness groups in relation to total OHBS-A scores. In addition, there were significant associations between age groups and OP awareness with health belief levels. Moreover, both exercise and calcium intake subscales of the Osteoporosis Knowledge Tool (OKT) positively correlated with all OHBS-A subscales. Exercise and calcium intake subscales of Osteoporosis Self-Efficacy Scale (OSES) positively correlated with the perceived susceptibility and perceived barriers toward exercise and calcium intake. The binary logistic regression analysis showed that OKT levels, OSES levels, and age were predictors of OHBS-A levels.

Conclusion: Besides cultural obstacles, an educational program for both genders and all age groups is important and should be tailored according to culture needs.

Keywords: health belief, osteoporosis, osteoprotective behavior

Introduction

Osteoporosis (OP) is a skeletal disorder characterized by low bone quality and strength as a consequence of decreasing bone mineral density. This will lead to increased susceptibility to fractures, especially among the elderly.[1–4] The optimum peak bone mass during younger age is an important factor that confers the ability to withstand bone resorption that occurs in advanced age.[5] OP is difficult to treat; however, evidence shows that a healthy lifestyle can prevent its development.[6] Hence, OP can be especially slowed or delayed with behavioral risk factor modification such as increasing dietary calcium and vitamin D, exercising suitably, and stopping smoking and alcohol consumption.[7,8]

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The OP health belief plays a central role in OP prevention and behavior management. Osteoporosis Health Belief Scale (OHBS) is developed based on the health belief model (HBM) theory,[9] which proposes that individual prevention behaviors increase, if patients feel susceptible, believe that the occurrence of disease would have a severe impact on their lives, and conclude that preventive measures are beneficial, outweighing any limitations involved in taking action.[10,11] The major obstacles that were identified in the management of OP included a limited level of awareness and knowledge within the population.[12,13] Moreover, the self-efficacy building process includes an interaction between emotional states, motivation, and outcome expectancy.[14] Therefore, self-efficacy contributes to motivation by helping people determine their goals, how much effort they expend, how long they persevere in the face of difficulty, and their resilience to failures.

Although knowledge is crucial for healthy life style behaviors, it is not solely enough for changing behavior.[15–18] Health care professionals can develop and implement a specific educational program according to good understanding of populations' belief and self-efficacy as changing lifestyle and health behaviors at an early age will have a greater impact on the prevalence of OP.[19–22]

Therefore, the aims of this study were to validate the Arabic version of the Osteoporosis Health Belief Scale (OHBS-A) and assess osteoprotective behaviors among the Iraqi population as a first step for future implementation of the OP prevention program.

Methods
Participants and study design

A community-based, cross-sectional study was conducted from November 2016 to February 2017 in Baghdad, Iraq. Baghdad city has two large areas named Al-Karkh (west of the Tigris; four districts) and Al-Rusafa (east of the Tigris; six districts). A random cluster sampling method was used to select three districts from these areas. Then, systematic samples were randomly selected from the community pharmacies where the undergraduate students underwent training in these districts. Equal numbers of participants were recruited from each district. The inclusion criteria for participants were as follows: >18 years, no cognitive impairment, and able to read and write Arabic. A structured interview included collection of the sociodemographic and translated OHBS-A data. Each participant was interviewed individually by the researcher or trained fifth-year undergraduate student after obtaining written and/or verbal informed consent. Owing to differences

in extent of education and cultural obstacles, some of the participants refused to sign the consent form, because they considered it impolite behavior given that they had already given verbal consent for participation. Therefore, only verbal informed consent was obtained from them. Approval of study protocol and ethical approval (including verbal informed consent) were obtained from the scientific committee of Al-Rafidain University College, Baghdad, Iraq.

Sample size

As per recommendation, at least five subjects per item are needed to evaluate the reliability and validity of a questionnaire.[23] The original OHBS consists of 42 questions; therefore, 210 participants were needed for validation purpose. However, for factor analysis, it is preferable to use 300 subjects.[24] Therefore, doubling the sample size, with an additional 10% as dropout, was considered necessary to overcome reporting error and increase the reliability of results. Moreover, with this number of participants, it would be possible to discriminate between high and low correlations in measuring correlations.[25] While 400 participants were initially found eligible for inclusion, 75 had to be excluded owing to incomplete responses. Therefore, only 325 participants were selected for this study. In all, 25 participants from the sample population were randomly selected for test–retest within 1–2 weeks.

Instruments and measurements

All participants completed the structured questionnaires including the OHBS-A. The original OHBS is in the English language and designed to assess health beliefs about developing OP.[9,26] The OHBS consists of 42 Likert-type scales (1=strongly disagree and 5=strongly agree) and seven subscale items: perceived susceptibility, perceived seriousness, perceived benefits of exercise, perceived benefits of calcium intake, perceived barriers to exercise, perceived barriers to calcium intake, and health motivation. The total possible score ranges from 42 to 210 with each subscale range score from 6 to 30. A cutoff point (169) was used to categorize the OP health belief scores into two levels: low and high OHBS-A.[27]

Beside OHBS-A, unpublished but valid and reliable Arabic version of Osteoporosis Knowledge Tool (OKT-A) and Arabic version of Osteoporosis Self-Efficacy Scale (OSES-A) were administered before and after OHBS-A, respectively, according to the developer's instructions. The original Osteoporosis Knowledge Tool (OKT) and OSES are formulated in English and designed to assess OP

knowledge and self-efficacy of behaviors, respectively.[26,28] The OKT comprises 24 multiple-choice items regarding risk factors and its prevention. It is divided into two parts: OKT-exercise subscale and OKT-calcium subscale. The possible score range is 0–24, and the highest value indicates the highest level of knowledge score. The OSES is a 12-item scale rated by an individual on a 100-mm visual analog scale to assess the confidence in practicing OP-preventive behaviors. The OSES has two subscales, namely, the exercise and calcium. The range of possible total score is 0–1,200 with each subscale score ranging between 0 and 600.

Instrument translation and face validity

The forward–backward–forward translation method was used to translate the questionnaire from English to Arabic according to translation international guidelines including forward translation, reconciliation, reverse translation, and debriefing.[29–31] The translation process was undertaken by two independent, expert translators in Iraq. Then, an expert panel of eight clinical pharmacists and the researcher reviewed the Arabic version for reconciliation. Subsequently, back translation of the reconciled version was carried out by two different translators. Thereafter, repeated discussions between the translators, expert panel, and the researcher were held to resolve any inconsistencies, and the final version was decided as the face validity process.[32]

Finally, a pilot study was conducted by distributing the questionnaire to 30 participants from the same demographic area in Baghdad, and the questionnaire was modified according to their feedback. These 30 participants were excluded from the final study outcome and analysis.

Construct validity

Exploratory factor analysis (EFA) was carried out to examine the factor structures of OHBS-A. A principal axis factoring method for extraction with varimax rotations was used for EFA. The criteria for EFA were factor loading >0.40, Kaiser–Meyer–Olkin (KMO) value >0.5, and significant level of Bartlett's test of sphericity <0.05. The number of factors to retain was dependent on Kaiser's criterion (eigenvalue ≥ 1.0) and theoretical meaning of the rotated factors.[33]

Reliability

Reliability with a minimum acceptable criterion >0.5 was applied to measure the consistency of a measurement item.[34] The internal consistency was evaluated using Cronbach's alpha and corrected item – total correlation values between the scales and their corresponding items (correlation of <0.20

was considered as poor). Pearson's correlation coefficient was used to evaluate test–retest reliability.[23]

Statistical analysis

Predictive analytics software (PASW) version 19.0 was used to analyze data in this study. The significance level was set at P-value <0.05. Descriptive statistics, percentages, and frequencies were used as appropriate. The chi-square (χ^2) test was used for categorical variables, whereas for continuous data, Mann–Whitney U and Kruskal–Wallis tests were used to evaluate the differences between the groups when required. The statistical analysis of the validation processes included assessing construct validity and reliability (Cronbach's alpha and test–retest). In addition, logistic regression analysis using the backward method was used to identify the factors affecting OHBS-A.

Results
Sociodemographic factors

The mean age of the participants was 41.82 ± 12.452 years (range, 18–87 years). Nearly 46% of respondents were male. Approximately 21% of the respondents had educational level <12 years. Approximately 77% of the respondents were not single (including married, widowed, and divorced), and ~62% had a monthly income of $>500,000$ Iraqi Dinar (IQD; 1 US dollar is equivalent to 1,250 IQD). By using the recommended scoring method, the scores of mean (M) $\pm$ SD of the OHBS-A were 149.95 ± 35.936, which are considered as low scores.

Table 1 gives the distribution of the two levels of OP health belief and the demographic data. Only 36.67% of the study population was found to have a high OHBS-A level. The results showed significant difference between the following independent variables in relation to total OHBS-A scores: ever heard about OP, employment status, and marital status. In addition, there were significant association between age and ever heard about OP with OHBS-A belief levels (Table 1). Table 2 gives that moderate health belief in all dimensions (less than 77%) with the lowest values appearing in the subscales of barriers (64%).

Validity
Face validity

As a result of the extensive translation method and pilot testing, qualitative face validity was guaranteed.

EFA

In this study, a principal axis factoring analysis method was conducted on the 42 items with orthogonal rotation (varimax).

Table 1 Demographic characteristics of participants

Characteristics	Total samples (N=300)	Low health belief (n=190)	High health belief (n=110)
42-item OHBS-A score	149.95±35.936	131.44±32.795	181.94±6.902
Perceived susceptibility for OP	20.68±5.594	18.47±5.387	24.49±3.513
Perceived seriousness for OP	22.37±5.990	20.26±6.333	26.00±2.799
Perceived benefits of exercise	22.81±6.385	21.13±7.072	25.70±3.434
Perceived benefits of calcium	22.34±6.016	20.17±6.234	26.08±3.095
Perceived barriers to exercise	19.43±8.257	14.67±6.343	27.66±3.051
Perceived barriers to calcium	19.33±7.928	15.35±6.191	26.22±5.515
Health motivation	23.00±6.174	21.38±6.932	25.78±2.978
Age* (years)			
≤44	59.7	54.2	69.1
≥45	40.3	45.8	30.9
Gender			
Male	46	46.3	45.5
Female	54	53.7	54.5
Educational level (years)			
<12	21	24.2	15.5
≥12	79	75.8	84.5
Marital status**			
Single	23	20	28.2
Not single	77	80	71.8
Employment status**			
Working	84	85.3	81.8
Not working	16	14.7	18.2
Monthly income (IQD)			
≤500,000	38	36.8	40
>500,000	62	63.2	60
Living place			
Rural	22	21.1	23.6
Urban	78	78.9	76.4
Family history of OP			
No	72.7	71.1	75.5
Yes	27.3	28.9	24.5
Family history of fracture			
No	59	55.8	64.5
Yes	41	44.2	35.5
Do you have OP			
No	89.3	87.4	92.7
Yes	10.7	12.6	7.3
Do you have fracture before*			
No	82	80	85.5
Yes	18	20	14.5
Ever heard about OP*·**			
No	7	9.5	2.7
Yes	93	90.5	97.3
OP diagnosis or screening			
No diagnosis before	82	81.6	82.7
Yes	18	18.4	17.3
Smoking habit			
Not smoking	79.3	78.9	80
Smoking	20.7	21.1	20
Alcohol habit			
Nonalcoholic	99.3	98.9	100
Alcoholic	0.7	1.1	0.0

Notes: Data are expressed as mean ± SD or frequency (%). *Significant association between groups, *P*<0.05. **Significant difference, *P*<0.05.
Abbreviations: IQD, Iraqi dinar (1 US dollar is equivalent to 1,250 IQD); OHBS-A, Arabic version of the Osteoporosis Health Belief Scale; OP, osteoporosis.

Table 2 Description of OHBS-A subscale (N=300)

Construct	Mean ± SD (median)	Potential range	Belief (%)
Perceived susceptibility	20.68±5.594 (21)	6–30	68.93
Perceived seriousness	22.37±5.990 (24)	6–30	74.57
Perceived benefits of exercise	22.81±6.385 (25)	6–30	76.03
Perceived benefits of calcium intake	22.34±6.016 (24)	6–30	74.47
Perceived barriers to exercise	19.43±8.257 (19)	6–30	64.77
Perceived barriers to calcium intake	19.33±7.928 (18)	6–30	64.43
Health motivation	23.00±6.174 (25)	6–30	76.67
Total OHBS-A	149.95±35.936 (155.50)	42–210	71.40

Abbreviation: OHBS-A, Arabic version of the Osteoporosis Health Belief Scale.

Upon examination of the correlation matrices, a majority of the results showed a correlation >0.3. The KMO value was 0.954, which indicated that the data set was appropriate for EFA as it was >0.5.[33] The last measure was the Bartlett's test of sphericity, which was found to be highly significant, χ^2(861)=10,940.292; P<0.001. These results allowed us to identify a factor model using the EFA approach.[35,36] In addition, the analysis revealed seven factors with eigenvalues >1, which explained 72.82% of the variance, as given in Table 3. The entire results showed adequacy for factor analysis and seven domain (subscales) variables.

Reliability

For reliability testing, the Cronbach's alpha test of internal consistency was 0.962 for the 42 items in OHBS-A, which was within the recommended acceptable result for reliability.[34] The test–retest reliability of 42 items in OHBS-A indicated an excellent reliability and stability of the instrument with Pearson's correlation coefficient (r=0.869, P<0.001). An initial Cronbach's alpha result for the OHBS-A test–retest group was 0.854, and after 1–2 weeks, it was 0.687. These results demonstrated that OHBS-A was reliable and stable. The corrected item – total correlation values, which were the reliability index values, ranged from 0.278 to 0.757 (Table 4). All items appeared suitable for retention depending on the meaningfulness of the items.[23]

Multivariate and correlation analyses

Correlations were performed to determine the relationship between OKT-A and OSES-A subscales with total OHBS-A and its subscales (Table 5). Both OKT-A exercise and calcium intake subscales were positively correlated with all OHBS-A subscales. OSES-A exercise and calcium intake subscales were positively correlated with the perceived susceptibility, perceived barriers to exercise, and perceived barriers to calcium intake. In addition, the total OHBS-A

score was correlated with total OKT-A (r=0.409) and total OSES-A (r=0.238; all P<0.01). Moreover, total OKT-A score was positively correlated with the perceived susceptibility (r=0.312) and perceived seriousness (r=0.306; all P<0.01). However, total OSES-A score was positively correlated with the perceived susceptibility only (r=0.167, P<0.01). The binary logistic regression revealed that OKT-A (categorical), OSES-A (categorical), and age (categorical) were predictors for OHBS-A levels (Table 6), and the model explains ~68% of the dependent variable.

Discussion

The most important role of any health care professional is to educate patients or the general population at risk regarding ways to improve their healthy behavior. Moreover, before any educational program is to be implemented, knowledge, health belief, and self-efficacy must be assessed so that the program could be tailored according to the population's needs. Therefore, to evaluate these educational efforts, valid and reliable scales must be available. This study showed that the OHBS-A tool in conjunction with OKT-A and OSES-A can be successfully implemented to assess osteoprotective behaviors among the general population and used in clinical settings as well.

The face validity was carefully reviewed and revised by a panel of eight experts in the field of pharmacy. The EFA of the OHBS-A has a stable factor structure with seven domains related to health belief subscales that accounted for 72.82% of the variance, which was higher than that of other studies.[9,37] The reliability of the OHBS-A, which is the consistency of a measurement item, was excellent with overall Cronbach's alpha being 0.962. This value was higher than the original developed OHBS but comparable to that of Malaysian and Persian studies.[9,27,37] This difference was likely because of differences in the population setting. The test–retest reliability showed good results that could be used

Table 3 EFA for OHBS-A

Item	Rotated factor matrix							Communalities
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	
Question 1	**0.519**							0.563
Question 2	**0.735**							0.694
Question 3	**0.837**							0.802
Question 4	**0.845**							0.825
Question 5	**0.781**							0.734
Question 6	**0.581**							0.601
Question 7		**0.608**						0.676
Question 8		**0.565**						0.619
Question 9		**0.715**						0.782
Question 10		**0.582**						0.624
Question 11		**0.708**						0.773
Question 12		**0.569**						0.651
Question 13			**0.774**					0.758
Question 14			**0.708**					0.730
Question 15			**0.754**					0.786
Question 16			**0.799**					0.831
Question 17			**0.806**					0.787
Question 18			**0.701**					0.742
Question 19				**0.714**				0.813
Question 20				**0.72**				0.830
Question 21				**0.752**				0.801
Question 22				**0.726**				0.781
Question 23				**0.693**				0.749
Question 24				**0.717**				0.754
Question 25					**0.769**			0.757
Question 26					**0.767**			0.781
Question 27					**0.701**			0.712
Question 28					**0.803**			0.797
Question 29					**0.818**			0.820
Question 30					**0.819**			0.796
Question 31						**0.61**		0.583
Question 32						**0.796**		0.783
Question 33						**0.535**		0.320
Question 34						**0.867**		0.870
Question 35						**0.851**		0.835
Question 36						**0.586**		0.480
Question 37							**0.615**	0.639
Question 38							**0.589**	0.693
Question 39							**0.683**	0.782
Question 40							**0.678**	0.633
Question 41							**0.759**	0.786
Question 42							**0.767**	0.813
Eigenvalues	4.013	3.565	5.126	4.614	4.938	4.16	4.167	
% of variance	9.555	8.488	12.206	10.987	11.756	9.905	9.92	**Total =72.82%**
Cronbach's α	0.888	0.899	0.938	0.945	0.939	0.802	0.914	**Total =0.962**

Notes: Extraction method: principal axis factoring. Rotation method: varimax with Kaiser normalization. Factor 1, OHBS-A susceptibility; Factor 2, OHBS-A seriousness; Factor 3, OHBS-A benefits of exercise; Factor 4, OHBS-A benefits of calcium intake; Factor 5, OHBS-A barriers to exercise; Factor 6, OHBS-A barriers to calcium intake; and Factor 7, OHBS-A health motivation. Items comprising each factor are in bold.
Abbreviations: EFA, exploratory factor analysis; OHBS-A, Arabic version of the Osteoporosis Health Belief Scale.

in longitudinal studies. For the test–retest group, the Cronbach's alpha value was lower than the initial value, indicating that the respondents may need a continuing educational program. This will increase their awareness about OP and, consequently, improve the outcome. The validity and reliability results revealed successful cultural adaptation.

This study showed low total scores for health belief. This result was comparable to other studies.[21,38,39] After controlling OKT-A (two groups, means high and low knowledge), both age groups with low knowledge score were highly affected by the belief score toward OP, and the age group ≥45 years had lower belief score. This is an important result as it showed

Table 4 Reliability test of OHBS-A

Question number	Mean	SD	Corrected item – total correlation	Cronbach's alpha if item deleted
Question 1	3.59	1.151	0.619	0.961
Question 2	3.37	1.085	0.586	0.961
Question 3	3.40	1.050	0.532	0.962
Question 4	3.50	1.077	0.565	0.961
Question 5	3.40	1.188	0.547	0.962
Question 6	3.43	1.397	0.588	0.961
Question 7	3.81	1.378	0.683	0.961
Question 8	3.64	1.149	0.629	0.961
Question 9	3.74	1.171	0.692	0.961
Question 10	3.72	1.180	0.634	0.961
Question 11	3.69	1.245	0.666	0.961
Question 12	3.76	1.206	0.620	0.961
Question 13	3.79	1.247	0.618	0.961
Question 14	3.77	1.116	0.649	0.961
Question 15	3.84	1.235	0.670	0.961
Question 16	3.84	1.197	0.664	0.961
Question 17	3.73	1.209	0.618	0.961
Question 18	3.83	1.296	0.685	0.961
Question 19	3.82	1.138	0.757	0.961
Question 20	3.83	1.118	0.753	0.961
Question 21	3.68	1.111	0.718	0.961
Question 22	3.62	1.146	0.724	0.961
Question 23	3.66	1.184	0.727	0.961
Question 24	3.72	1.089	0.705	0.961
Question 25	3.33	1.615	0.647	0.961
Question 26	3.22	1.646	0.683	0.961
Question 27	3.19	1.590	0.675	0.961
Question 28	3.27	1.536	0.655	0.961
Question 29	3.20	1.541	0.659	0.961
Question 30	3.22	1.501	0.616	0.961
Question 31	3.45	1.407	0.614	0.961
Question 32	3.13	1.484	0.601	0.961
Question 33	3.27	3.201	0.278	0.968
Question 34	3.17	1.494	0.596	0.961
Question 35	3.14	1.470	0.567	0.961
Question 36	3.17	1.415	0.487	0.962
Question 37	3.69	1.109	0.651	0.961
Question 38	3.83	1.196	0.732	0.961
Question 39	4.08	1.307	0.669	0.961
Question 40	3.69	1.317	0.586	0.961
Question 41	3.80	1.224	0.654	0.961
Question 42	3.90	1.217	0.651	0.961

Abbreviation: OHBS-A, Arabic version of the Osteoporosis Health Belief Scale.

Table 5 OHBS-A correlation matrix

Construct	OKT-A exercise	OKT-A calcium	OSES-A exercise	OSES-A calcium
Perceived susceptibility	0.360[a]	0.320[a]	0.173[a]	0.119[b]
Perceived seriousness	0.323[a]	0.300[a]	0.068	0.066
Perceived benefits of exercise	0.338[a]	0.295[a]	0.104	−0.030
Perceived barriers to exercise	0.360[a]	0.350[a]	0.204[a]	0.120[b]
Perceived benefits of calcium	0.304[a]	0.354[a]	0.030	0.062
Perceived barriers to calcium	0.401[a]	0.421[a]	0.203[a]	0.138[b]
Health motivation	0.347[a]	0.353[a]	0.088	0.049

Notes: [a]Correlation is significant at the 0.01 level (two tailed). [b]Correlation is significant at the 0.05 level (two tailed).
Abbreviations: OHBS-A, Arabic version of the Osteoporosis Health Belief Scale; OKT-A, Arabic version of Osteoporosis Knowledge Tool; OSES-A, Arabic version of Osteoporosis Self-Efficacy Scale.

The results showed moderate perceived susceptibility and seriousness for OP. In addition, there were positive correlations between perceived susceptibility and OKT-A and OSES-A total scores, while perceived seriousness was positively correlated with the OKT-A total score. These are important results given that the participants consider themselves susceptible, and it is a serious matter to get OP. Moreover, enhancing OP knowledge of participants will increase their belief toward susceptibility and seriousness of the disease and consequently enhance the changes in the prevention behavior toward the disease.[42,43]

The OKT-A and OSES-A exercise subscales were positively correlated to the perceived benefit of exercise. Therefore, more attention should be paid to that population and an educational program focusing on the benefit of exercise should be implemented to increase their awareness regarding exercise. The benefits of regular exercise are that it not only increases bone strength but also improves mood and physiological function, reduces the frequency of disease, and increases the quality of life.[44–48] Moreover, perceived benefit of calcium showed same correlation with OKT-A

that any educational program should be highly focused on a high-risk group. Nayak et al[40] showed that health belief was higher in younger than older age groups. However, any program should take into account both age groups and genders. The above result was consistent with the significant difference between OHBS-A score and awareness of the sample population regarding OP (93% heard about OP). An Iranian study showed that the awareness and health belief were significantly different with respect to preventive behaviors.[41]

Table 6 Multivariate regression analysis summary

Variables included	B (SE)	95% CI for odds ratio		
		Lower	Odds ratio	Upper
Constant	−0.847 (0.194)			
Age (categorical)	−0.525 (0.265)*	0.352	0.592	0.995
OKT-A (categorical)	0.916 (0.269)**	1.475	2.499	4.235
OSES-A (categorical)	0.881 (0.336)**	1.249	2.413	4.661

Notes: R^2=0.208 (Hosmer–Lemeshow), 0.097 (Cox and Snell), and 0.133 (Nagelkerke). Model: χ^2(3) =30.676, $P<0.001$. *$P<0.05$. **$P<0.01$.
Abbreviations: OKT-A, Arabic version of Osteoporosis Knowledge Tool; OSES-A, Arabic version of Osteoporosis Self-Efficacy Scale; SE, standard error.

and OSES-A calcium subscales. The calcium-rich foods not only improve bone health but also improve weight lost, decrease the incidence of metabolic syndrome, and decrease blood pressure.[49–53]

Furthermore, the OKT-A and OSES-A exercise and calcium subscales were positively correlated to the perceived barriers of exercise and calcium, respectively. These results revealed that more barriers were encountering the participants to be engaged in OP-preventive behaviors, although they were more aware about OP. The data showed insignificant differences between demographic data and barrier scales (results not shown). These results may be owing to the culture point of view and could be explained as follows: the highest frequencies (agree and strongly agree) were observed in exercise barrier questions "You feel like you are not strong enough to exercise regularly" and "You have no place where you can exercise". These revealed higher perceived difficulties, and the respondents did not know how to cope with these barriers. In Iraq, there are no free public gym centers and running in the streets is not acceptable culturally, and women engaging in outdoor exercises are not culturally acceptable also. Another study showed that inconvenience, cost, and time were the barriers responsible for not engaging in exercise.[54] For calcium barrier subscale, the highest frequencies (agree and strongly agree) were observed for "Calcium rich foods cost too much" (54%) and "You do not like calcium rich foods" (47%), while that for the question "Calcium rich foods have too much cholesterol," it was 41.6%. This implies that the educational program should focus on increasing the participants' knowledge regarding healthy calcium food intake and inexpensive alternatives. Similar results regarding calcium and exercise barriers were reported.[19] In addition, the participants should know that there was no association between dairy products and metabolic disorders.[53,55,56]

Besides that, educators must emphasize on adequate calcium intake during adolescent age, when the peak bone density develops.[57] Moreover, the results showed that the sample population still showed high perceived benefit to exercise and calcium belief percentage than the barrier, which is consistent with a previous report.[58] Regarding health motivation scale, the respondents showed an excellent belief percentage with a positive correlation with knowledge subscales. This revealed that the respondents were highly motivated to engage in healthy behaviors and were concerned about learning the health issue and how to cope with it. Similar results of high health motivation subscale were reported.[19]

Study limitation

As with other cross-sectional studies, the results cannot be generalized for the entire population. However, the full and comprehensive translation and validation with a good sample size would improve the impact of this study.

Conclusion

Given the cultural obstacles, an educational program for both genders and all age groups is an urgent issue and must be tailored according to cultural needs. Thus, knowledge, health belief, and finely engaging in healthy behaviors are warranted.

Disclosure

The author reports no conflicts of interest in this work.

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