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Employed Women's Knowledge and Health Beliefs About Osteoporosis Prevention : A Comparative Study

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Background: Osteoporosis is a chronic skeletal disease characterized by decreased bone density and deterioration of bone microstructure, leading to an increased risk of fractures and serious health consequences, particularly among women. Understanding women's knowledge and health beliefs is essential for effective osteoporosis prevention; therefore, this study aimed to compare employed women's knowledge and health beliefs regarding osteoporosis prevention based on type of residence (urban versus rural). **Methods:** A cross-sectional study was conducted at AL-Dewaynia Governorate , Iraq, from December 20, 2024, to May 1, 2025. A convenience sample of 200 employed women was recruited. Data were collected using the Osteoporosis Health Belief Scale (OHBS) and a structured questionnaire for socio-demographic characteristics. Anthropometric measurements were obtained to calculate body mass index (BMI). Data were analyzed using descriptive and inferential statistical methods. **Results**: The mean age of participants was 42.2 ± 6.3 years, with 53% aged 35–44 years. Significant differences were observed between urban and rural women in knowledge and health beliefs related to osteoporosis prevention. Urban women reported higher perceived severity of osteoporosis, greater perceived benefits of exercise and calcium intake, and higher health motivation, whereas rural women experienced greater barriers to exercise and lower health motivation. **Conclusion**: The study revealed significant disparities in knowledge and health beliefs about osteoporosis prevention between urban and rural employed women. These findings highlight the need for targeted educational interventions, particularly in rural areas, to improve health literacy, motivation, and engagement in osteoporosis preventive behaviors.

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INTRODUCTION

Osteoporosis, often referred to as the *"silent killer,"* is a chronic and progressive disease characterized by reduced bone density and deterioration of bone microarchitecture,

typically advancing without obvious clinical symptoms (1). Global alarming statistics indicate that more than 200 million people worldwide are affected by osteoporosis(2) , and approximately one-third of women aged over 50 years will experience at least one osteoporosis-related fracture during their lifetime(3) . This condition has become one of the most significant public health challenges, particularly among women and the aging population(4) . The decline in estrogen levels following menopause plays a crucial role in accelerating bone resorption (5)and increasing fracture risk. Osteoporotic fractures especially those involving the hip, spine, and wrist are associated with increased disability, reduced quality of life, loss of independence, and higher mortality rates. With rising life expectancy across countries, the prevalence of osteoporosis and its related consequences is expected to increase markedly in the coming decades(6).

In the Middle East, particularly in Iraq, osteoporosis represents a major yet underrecognized public health concern. Limited public awareness, the absence of structured preventive programs, poor nutritional status, reduced physical activity, and restricted access to screening services are among the factors contributing to the growing burden of this disease in the region(7) . Despite the increasing risk, preventive behaviors and early diagnostic practices especially among women remain insufficiently addressed (8).

Effective prevention of osteoporosis requires an approach that goes beyond therapeutic interventions and necessitates a deeper understanding of individuals' knowledge, health beliefs, and attitudes toward preventive behaviors. Studies have shown that more than 50% of women in developing countries lack adequate knowledge about osteoporosis risk factors and preventive measures, and less than 40% adhere to preventive behaviors such as regular calcium intake and appropriate physical activity. Furthermore, evidence suggests that women living in rural areas have significantly lower levels of awareness and face greater barriers to accessing health information and screening services compared to their urban counterparts(9).

Employed women constitute an important and active segment of society, whose health behaviors are influenced by occupational demands, lifestyle factors, and environmental conditions. Available evidence indicates that type of residence (urban versus rural) can account for up to a 30% difference in levels of knowledge and health beliefs related to osteoporosis prevention, which in turn plays a critical role in the adoption or non-adoption of preventive behaviors(10) .

Despite extensive global evidence highlighting the importance of knowledge and health beliefs in osteoporosis prevention, limited studies in Iraq have systematically examined the knowledge, health beliefs, and preventive behaviors of women particularly employed women. Moreover, existing data are often generalized and fail to adequately address potential disparities based on place of residence. This lack of context-specific evidence poses a challenge to the effective planning of targeted educational interventions and culturally appropriate preventive policies. Therefore, the present study aims to compare employed women's knowledge and health beliefs regarding osteoporosis prevention based on their type of residence, thereby addressing the existing knowledge gap and providing valuable evidence to support the development of effective osteoporosis prevention strategies within the Iraqi healthcare system

METHODOLOGY

A cross-sectional study was conducted at AL-Dewaynia Governorate, Iraq, between December 20, 2024, and May 1, 2025, to assess employed women's knowledge and health beliefs regarding osteoporosis prevention. Official approval to conduct the study was obtained from the College of Nursing at Al-Qadisiyah University. All participants were informed about the purpose of the study, and written informed consent was obtained individually prior to data collection.

Data were collected using the Osteoporosis Health Belief Scale (OHBS), originally developed by Kim, Horan, and Gendler in 1991(11). The OHBS comprises 30 items encompassing seven health belief domains, including perceived susceptibility, perceived severity, perceived benefits of exercise, perceived benefits of calcium intake, perceived barriers to exercise, perceived barriers to calcium intake, and health motivation. Responses were recorded on a 3-point Likert scale (1 = Never, 2 = Sometimes, and 3 = Always). In addition, a structured questionnaire was used to obtain demographic characteristics of the participants. Anthropometric measurements, including weight and height, were measured using standard procedures, and body mass index (BMI) was calculated accordingly.

The validity and reliability of the OHBS have been well established in previous research. In the original validation study, the scale demonstrated good internal consistency, with an overall Cronbach's alpha coefficient of 0.89. For use in the Iraqi context, the questionnaire was reviewed by a panel of experts in nursing and public health to ensure its content validity, clarity, and cultural appropriateness. Minor linguistic modifications were made where necessary without affecting the original meaning of the items

The sample size was determined using the standard formula for estimating a proportion in cross-sectional studies. Assuming a 95% confidence level (Z = 1.96), an expected proportion of 0.5, and a margin of error of 0.07, the minimum required sample size was calculated to be 196 participants. To enhance precision and based on sample sizes used in similar studies, the final sample size was increased to 200 participants. A non-probability convenience sampling technique was employed to recruit eligible employed women from AL-Dewaynia Governorate, Iraq.

Results and discussion:

The study was conducted among 200 employed women, with a mean age of 42.2±6.3 years. The participants were classified according to age groups, body mass index (BMI), type of residence, and educational level. Table (1) presents the demographic characteristics of the participants. The distribution of these demographic variables describes the characteristics of the study population in terms of age, body composition, place of residence, and educational attainment.

Table (1): Socio-demographic characteristics of the participants (n = 200)

Variable	Category	Frequency	%
Age groups (years)	25–34	44	22
	35–44	106	53
	≥55	50	25
	Mean ± SD	42.2 ± 6.3	—
BMI	Normal	50	25
	Overweight	24	12
	Obese class I	100	50
	Obese class II	26	13
Residence	Urban	64	32
	Rural	136	68
Level of education	Institute	40	20
	College	140	70
	Postgraduate	20	10

Analysis of the data presented in Table (2) showed that in both urban and rural groups, the highest mean knowledge scores were related to physical activity–based preventive behaviors,

particularly weight-bearing exercises and maintaining a healthy body weight, which were rated at a high level. In contrast, knowledge regarding nutritional and medical factors, including adequate calcium intake, the role of vitamin D, the effect of prolonged breastfeeding, and thyroid disorders, was rated at low to moderate levels, especially among rural women. The findings also indicated that urban women obtained higher mean scores than rural women in defining osteoporosis and identifying its risk factors, whereas rural women were predominantly rated at a low level in these items.

Table 2: Employed women's knowledge about preventive behavior of osteoporosis

No.	Information about preventive behavior	Urban		Rural	
		M.S	Eva.	M.S	Eva.
1.	Osteoporosis means that the bones are weak and easy to break.	1.44	L	1.55	L
2.	Osteoporosis causes symptoms such as pain before a fracture occurs.	1.71	M	1.42	L
3.	One of the benefits of early detection of osteoporosis is a speedy recovery	1.91	M	1.77	M
4.	Prolonged breastfeeding affects bone structure	1.85	M	1.36	L
5.	Hyperthyroidism affects osteoporosis	1.12	L	1.97	M
6.	Consuming sufficient calcium is essential for bone health	2.25	M	1.42	L
7.	Vitamin D is crucial for calcium absorption. Sun exposure, dietary sources (like fatty fish), and supplements can help maintain adequate vitamin D levels	2.62	H	1.74	M
8.	Engaging in weight-bearing exercises, such as walking, jogging, and resistance training, helps strengthen bones and improve overall bone density.	2.83	H	2.46	H
9.	Smoking and excessive alcohol consumption can weaken bone structure and increase the risk of osteoporosis	2.13	M	1.91	M
1(	Achieving and maintaining a healthy body weight through balanced nutrition and regular physical activity can reduce the risk of osteoporosis and promote overall health.	2.62	H	2.52	H

M.S: Mean of Scores, Eva. : Evaluation, L: Low (M.S=1-1.66), M: Moderate (M.S= 1.67- 2.33) *H: High (M.S= 2.34-3).*

According to Table (3), urban women's health beliefs regarding the benefits of exercise were rated at a high level, while their beliefs related to the severity of osteoporosis, health motivation, and barriers to calcium intake were rated at a moderate level. In contrast, rural women demonstrated lower mean scores across most health belief domains, particularly in perceived disease severity, health motivation, and benefits of exercise.

Table 3: Employed women's health beliefs about preventive behavior of osteoporosis

No.	Domains of preventive behavior	Urban		Rural	
		M.S	*Eva.*	*M.S*	*Eva.*
1.	The severity of osteoporosis	1.81	M	1.61	L
2.	The Benefits of taking calcium	1.41	L	1.92	M
3.	The Benefits of exercising	2.52	H	1.83	M
4.	Barriers to exercise	1.71	M	2.45	H
5.	Barriers of taking calcium	1.92	M	1.33	L
6.	Healthy Motivation	1.83	M	1.44	L

M.S: Mean of Scores, Eva. : Evaluation, L: Low (M.S=1-1.66), M: Moderate (M.S= 1.67- 2.33) H: High (M.S= 2.34-3).

Results of the independent samples t-test presented in Table (4) revealed statistically significant differences between urban and rural women regarding perceived severity of osteoporosis, benefits of calcium intake, benefits of exercise, barriers to exercise, health motivation, and overall knowledge ($P < 0.05$). The most pronounced significant differences were observed in barriers to exercise and health motivation. No statistically significant difference was found between the two groups in perceived barriers to calcium intake ($P = 0.18$).

Table 4: significance deference of employed women's knowledge and health beliefs about osteoporosis prevention by type of residence

No.	Domains of preventive behavior	Urban	Rural	Independent sample t test		
		M.S	M.S	df	t	P value (Sig.)
1.	The severity of osteoporosis	1.81	1.61	58	2.45	0.02 (S)
2.	The Benefits of taking calcium	1.41	1.92	58	3.12	0.003 (S)
3.	The Benefits of exercising	2.52	1.83	58	2.68	0.01 (S)
4.	Barriers to exercise	1.71	2.45	58	3.50	0.001 (HS)
5.	Barriers of taking calcium	1.92	1.33	58	1.35	0.18 (NS)
6.	Healthy Motivation	1.83	1.44	58	4.20	0.001 (HS)
7.	Over all knowledge	2.04	1.81	58	2.44	0.03 (S)

DISCUSSION

The present study was conducted to compare employed women's knowledge and health beliefs regarding osteoporosis prevention based on type of residence. The findings indicated significant differences between employed women living in urban and rural areas in terms of their level of knowledge and health beliefs related to osteoporosis prevention. These findings are consistent with the results of studies conducted in Iraq and other countries. Previous studies have shown that women residing in rural areas have lower levels of knowledge and weaker health beliefs regarding osteoporosis prevention compared to their urban counterparts, highlighting the important role of place of residence in shaping preventive health behaviors(12 ,10).

From a demographic perspective, the majority of the participants were middle-aged employed women. This finding is consistent with previous studies indicating that women in this age group, particularly those approaching menopause, are considered one of the main target groups for preventive interventions due to the gradual decline in estrogen levels and the increased risk of osteoporosis and fractures (5, 6).

In addition, the distribution of body mass index showed that a considerable proportion of the participants were overweight or obese. Scientific evidence suggests that overweight and obesity may be associated with bone health and osteoporosis risk through their effects on bone metabolism, increased chronic inflammation, and greater mechanical load on the musculoskeletal system(4, 13).

Regarding type of residence, the findings indicated that rural women had lower levels of knowledge and weaker health beliefs compared to urban women. This result is consistent with evidence from recent systematic reviews and meta-analyses, which have shown that women living in rural areas generally have lower awareness and poorer preventive behaviors related to osteoporosis due to limited access to educational services, preventive programs, and health resources(9, 14)

Regarding knowledge of preventive behaviors, the findings showed that both urban and rural women demonstrated the highest level of awareness related to physical activity, particularly weight-bearing exercises and maintaining a healthy body weight. This finding is consistent with previous research emphasizing the essential role of regular physical activity in maintaining bone mineral density and preventing osteoporosis (15, 16).

However, knowledge concerning nutritional and medical factors—such as adequate calcium intake, the role of vitamin D, and the impact of hormonal and metabolic disorders on bone health—was rated at low to moderate levels, particularly among rural women. Similar findings have been reported in studies conducted in developing and low-resource settings, indicating persistent gaps in nutritional and medical knowledge related to osteoporosis prevention (17, 18).

The analysis of health beliefs indicated that urban women had higher scores in perceived benefits of exercise and calcium intake, as well as greater health motivation, compared to rural women. In contrast, rural women reported greater barriers to exercise and lower levels of health motivation. According to contemporary applications of the Health Belief Model, perceived disease severity, perceived benefits of preventive behaviors, and health motivation are key determinants influencing the adoption of preventive health behaviors. Therefore, lower scores in these domains among rural women may partially explain their reduced engagement in osteoporosis preventive practices(19)

The presence of statistically significant differences between urban and rural women in perceived disease severity, perceived benefits of exercise, perceived benefits of calcium intake, perceived barriers to exercise, health motivation, and overall knowledge underscores the important role of environmental and social factors in shaping health beliefs. These findings are consistent with previous studies indicating that inadequate knowledge and low health motivation negatively influence engagement in preventive

health behaviors(19). Furthermore, the greater exercise-related barriers reported by rural women may be attributed to limited access to sports facilities, safety concerns, and the lack of structured physical activity programs in rural areas (20)

Meanwhile, no statistically significant difference was observed between urban and rural women regarding perceived barriers to calcium intake, suggesting that challenges related to calcium consumption such as dietary habits, cost, and access to calcium-rich foods may be common across both groups. This finding is consistent with previous studies reporting similar barriers to adequate calcium intake among women regardless of place of residence (21).

Overall, the results of the present study are consistent with existing national and international evidence, indicating that urban women generally demonstrate higher levels of knowledge and more favorable health beliefs regarding osteoporosis prevention compared to rural women(10, 22). These disparities highlight the need for designing and implementing targeted educational interventions tailored to the cultural and environmental context of rural areas, with a focus on improving health literacy, enhancing motivation, and reducing behavioral barriers to osteoporosis preventive practices.

Limitations of the Study

Despite providing valuable findings, this study has several limitations that should be considered when interpreting the results. Due to the cross-sectional study design, causal relationships between knowledge, health beliefs, and osteoporosis preventive behaviors cannot be established, and the findings reflect only the situation at the time of data collection. In addition, the use of a non-probability convenience sampling method may limit the generalizability of the results to other employed women or similar populations in different regions of Iraq. Data were collected using self-reported questionnaires, which may increase the likelihood of response bias, including social desirability bias and recall bias. Furthermore, although the Osteoporosis Health Belief Scale (OHBS) is a standardized and validated instrument, cultural and social differences may have influenced participants' interpretation of some items, despite minor linguistic adaptations made to ensure cultural appropriateness.

Conclusions and recommendation

This study highlights significant disparities in knowledge and health beliefs about osteoporosis prevention between urban and rural employed women. Urban women exhibited greater awareness of the severity of osteoporosis, the benefits of preventive behaviors, and higher health motivation, while rural women faced more barriers to exercise and lower motivation levels.

To address these gaps, targeted educational interventions tailored to rural populations are essential. Programs should focus on enhancing health literacy and providing resources to overcome barriers to calcium intake and physical activity. Community-based initiatives could foster a supportive environment for rural women, encouraging them to engage in osteoporosis prevention measures. Moreover, integrating health motivation strategies into educational programs may empower rural women to adopt healthier lifestyles. By prioritizing these recommendations, we can improve health outcomes and reduce the risk of osteoporosis among women in both urban and rural settings.

Authors' contributions

MJW and HE conceptualized the study and designed the cross-sectional study protocol. MJW and HKR were responsible for data collection, participant recruitment, and data analysis. KNA contributed to data interpretation and manuscript drafting. HE supervised the study process and critically reviewed the manuscript. All authors read and approved the final version of the manuscript

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Data Availability Statement

The data supporting the findings of this systematic review are entirely based on published articles available in the public domain. No new datasets were generated or analyzed for this study

Competing Interests

The authors declare that there are no conflicts of interest related to the authorship or publication of this article.

Clinical trial number

Not applicable.

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