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ORIGINAL RESEARCH

Osteoporosis Awareness, Self-Efficacy and Health Beliefs Among Staff in an Obstetrics and Gynecology Hospital: A Cross-Sectional Study

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Background: We investigated the key factors that influence the awareness, health beliefs, and self-efficacy of osteoporosis among the staff of an obstetrics and gynecology hospital to identify the key target population for carrying out education and promotion in medical institutions, hoping to improve women's awareness and prevention and treatment consciousness of osteoporosis from the source.

Methods: A cross-sectional study was conducted from October 15 to October 24 in 2023, and 200 staff members were randomly sampled from an obstetrics and gynecology hospital in Hangzhou city for a questionnaire survey. We used a quantile regression model to analyze the key factors influencing the scores of each item.

Results: The study results showed that undergraduate degree or above, working as a doctor, work experience of <5 years or 10–20 years and high professional technical title are related to a higher level of osteoporosis knowledge. Male gender was associated with higher exercise efficacy and calcium barriers scores. Older age and long years of working experience were associated with higher susceptibility score. Lower education level was associated with higher calcium barriers score. Doctor occupation was associated with lower seriousness score, higher exercise benefits score, higher calcium benefits scores and higher health motivation score. Professional and technical title was also related to exercise and calcium benefits score.

Conclusion: When carrying out education and promotion work on osteoporosis prevention and treatment targeting the group of healthcare workers, different content and emphases should be considered, and different groups should be selected for more targeted publicity and popularization.

Keywords: obstetrics and gynecology hospital, osteoporosis, awareness, health belief, self-efficacy

Background

Osteoporosis is a metabolic bone disease characterized by a decrease in bone mass per unit volume, deterioration of bone microarchitecture, and increased bone fragility due to various causes.[1] Women are more susceptible to osteoporosis than men because after menopause, ovarian function declines, and estrogen levels in the circulation drop rapidly, severely affecting the body's bone homeostasis system. With the increasing life expectancy, osteoporosis has become an increasingly concerning health issue. Epidemiological data show that about one-third of women over 50 in China have osteoporosis.[2] Therefore, the World Health Organization lists osteoporosis as one of the three major diseases in the elderly.[3]

Early bone loss may not have any clinical symptoms, which makes it difficult for high-risk groups to pay enough attention to the disease, thus missing the best time for diagnosis and treatment. In some cases, patients may even present

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with a fracture as the first symptom. Due to its strong insidiousness and harmfulness, osteoporosis is known as a *silent killer*.[3,4] Therefore, it is necessary to emphasize the early screening and prevention of osteoporosis, which can help slow down the rate of bone loss in patients, reduce the risk of fractures in high-risk groups, and improve bone and joint health in the elderly. Unfortunately, at present, the awareness rate and consultation rate of osteoporosis are still relatively low worldwide, especially in developing countries, and public health management departments still need to make great efforts to improve this situation.[5]

Healthcare providers' health beliefs and attitudes greatly affect patients' degree of recognition and confidence in preventing and treating diseases, which play an important role in disease prevention and treatment.[6] A limited number of studies have investigated the osteoporosis awareness of medical staff. A study investigating female medical workers in Northeast China showed that physiological stage and job position affected female healthcare professionals'level of cognition of osteoporosis.[7] An Iranian study investigated the knowledge and attitudes of nurses towards the prevention and treatment of osteoporosis and the results showed that the nurses had high scores in osteoporosis prevention knowledge, attitude, practice, and nutritional behavior. Meanwhile, the knowledge, attitude, practice, and nutritional behavior were significantly correlated.[8] However, to our knowledge, no studies have investigated this issue in the context of obstetrics and gynecology specialized hospital staff. Indeed, the employees of obstetrics and gynecology hospitals have lots of opportunities to interact with women from adolescence to post menopause, which provides a good platform for the promotion of osteoporosis knowledge.

Therefore, this study conducted a questionnaire survey targeting the staff of a third-grade class gynecology hospital in Hangzhou city to understand the level of awareness, self-efficacy, and health beliefs of hospital staff regarding osteoporosis. The aim was to more accurately identify the target population for osteoporosis prevention and treatment education and promotion in medical and health institutions in the future, so that lectures and publicity can be more efficient, targeted, and purposeful, thereby indirectly enhancing residents' cognition and degree of emphasis of the disease, which is conducive to the prevention and management of this disease.

Methods

Study Design and Population

A cross-sectional study was conducted from October 15 to October 24 in 2023, which enrolled employees in medical, nursing, logistics and management positions in a third-grade class-A obstetrics and gynecology hospital in Hangzhou city. The selection of respondents was based on simple random sampling. After obtaining the informed consent of the respondents, an online questionnaire survey was conducted through the hospital information system to collect the data.

Study Measures

Sociodemographics (sex, age, education level, occupation, years of service, professional and technical title) were collected using a structured questionnaire. Educational levels were classified as college and below, undergraduate, postgraduate and above. Professional and technical titles were classed as primary and below, intermediate, senior.

We utilized a questionnaire that was translated from the existing questionnaires to investigate osteoporosis knowledge, self-efficacy and beliefs by Yuping Chen, which was divided into the following parts.[9]

Part 1: The Knowledge Scale

This part includes three dimensions: knowledge of risk factors (items 1–11), knowledge of exercise (items 12–18), and knowledge of calcium (items 19–26). The questionnaire score ranges from 0 to 26 points, with 1 point for each correct answer and 0 points for incorrect or do not know answers. The higher the score, the better the individual's knowledge of osteoporosis-related knowledge.

Part 2: Osteoporosis Self-Efficacy Scale

This part involves 12 items and contains 2 dimensions: exercise self-efficacy (items 1–6) and calcium intake self-efficacy (items 7–12). The original scale was divided into 10 parts and assigned scores from 0 to 10 points. Each item is scored from 0 to 10, with 0 indicating no confidence and 10 indicating a lot of confidence. The score for each item is multiplied by 10 to get the final score. The total scale score and each sub-dimension score are calculated by dividing the

respective scores by the number of items, ie, the scale score ranges from 0 to 100 points, with higher scores indicating greater confidence in adopting healthy behaviors for osteoporosis prevention.[10]

Part 3 health Belief Scale

This part includes 42 items covering 7 dimensions: susceptibility (items 1–6), severity (items 7–12), benefits of exercise (items 13–18), benefits of calcium intake (items 19–24), barriers to exercise (items 25–30), barriers to calcium intake (items 31–36), and health motivation (items 37–42). The scale uses a 5-point Likert scale: strongly disagree (1 point), disagree (2 points), neutral (3 points), agree (4 points), and strongly agree (5 points). Except for the barriers to exercise and barriers to calcium intake dimensions, which are scored in reverse, all other dimensions are scored positively. Each dimension score ranges from 6 to 30 points, with a total score ranging from 42 to 210 points.[11]

Data Collection and Quality Control

The survey questionnaires were distributed and collected by trained investigators through the hospital's information system, and the information of the subjects was verified to eliminate selection bias. A specialist supervised the questionnaires irregularly to check their reliability and whether they contained any outliers. The returned questionnaires were reviewed in time, and the missing information was supplemented to ensure the quality.All returned questionnaires were valid. Cronbach's α coefficients of the three scales used in our study were 0.720, 0.970–0.963, and 0.844–0.918, respectively. Since the osteoporosis knowledge questionnaire had the largest number of respondents, it was used as an example to count the basic information of the participants.

Statistical Analysis

Statistical analyses were performed using SPSS 27.0 software. The K–S test was used to determine whether the variables were normally distributed. Continuous variables were reported as mean ± standard deviation or median (25th percentile, 75th percentile) based on whether they are normally distributed. *t*-test and *U*-test were used for two-group comparisons of normally distributed and skewed data, respectively. One-way ANOVA test and nonparametric test were used for multiple group comparisons of normal data. L-S-D test and Kruskal–Wallis test were used for post hoc pairwise comparison of normally distributed and skewed data, respectively. Pearson/Spearman correlation test was used for correlation analysis. $P<0.05$ was considered statistically significant. The scores of each scale were used as dependent variables for regression analysis, in which normally distributed data were subjected to stepwise linear regression and skewed data were subjected to quantile regression. In order to increase the interpretability of the data, dummy variables were set for unordered polytomous independent variables when constructing the regression model. Variables that showed $P<0.1$ in the bivariate analysis were entered into multivariate regression model.

Results

Sociodemographic of the Participants

A total of 200 copies of each of the three questionnaires were distributed in this survey: The Knowledge Scale, 198 copies were recovered, with a recovery rate of 99.0%; Osteoporosis Self-Efficacy Scale, 185 copies were recovered, with a recovery rate of 92.5%; and Health Belief Scale, 145 copies were recovered, with a recovery rate of 72.5%. Table 1 shows the characteristics and distribution of the participants.

Bivariate Analysis

To explore the factors influencing the level of osteoporosis knowledge among hospital staff, we conducted an analysis based on the different characteristics of the respondents. The results showed that the respondents' level of education, job position, years of service, and professional title significantly influenced their knowledge of osteoporosis. Compared with those with an undergraduate degree or below, those with a postgraduate degree or above had significantly higher knowledge levels ($P=0.001$, $P=0.017$, respectively). Compared with nurses as well as administrative and logistic personnel, doctors had significantly higher knowledge levels ($P=0.008$, $P=0.006$, respectively). Compared with those with 6–10 years of work experience, those with 20 years or more of work experience had significantly higher knowledge

Table 1 Sociodemographic and Other Characteristics of the Participants

Demographics	Groups	Number (%)
Age, y	<40	128 (64.65)
	≥40	70 (35.35)
Gender	Male	33 (16.67)
	Female	165 (83.33)
Education level	College and below	10 (5.05)
	Undergraduate	142 (71.72)
	Postgraduate and above	46 (23.23)
Occupation	Doctor	73 (36.87)
	Nurse	81 (40.91)
	Administration and logistics	44 (22.22)
Years of service	<5	20 (10.10)
	6–10	77 (38.89)
	11–20	64 (32.32)
	>20	37 (18.69)
Professional and technical title	Primary and below	91 (45.96)
	Intermediate	66 (33.33)
	Senior	41 (20.71)

levels (P=0.007). Compared with those with primary or below professional titles, those with intermediate and senior professional titles had significantly higher knowledge levels (P<0.001, P<0.001, respectively). Table 2 shows the results of the bivariate analysis of osteoporosis knowledge level.

The results of osteoporosis self-efficacy scores showed that males had significantly higher exercise self-efficacy scores than females (P=0.01), while the other factors had no significant impact on the self-efficacy of the respondents.

As for osteoporosis health belief, results showed that the susceptibility scores of people aged 40 and over were significantly higher than those of people under 40 years old (P=0.006). Compared with females, males had significantly higher calcium intake barriers scores (P=0.006). Employees with higher educational attainment demonstrated significantly lower calcium intake barriers scores (P=0.024). The staff in different positions had significantly different severity scores and calcium intake benefit scores (P=0.029 and P=0.012, respectively). Specifically, the severity score of the doctor group was significantly lower than that of the nurse group (P=0.044), and the calcium intake benefit score of the physician group was significantly higher than that of the administrative and logistic personnel group. Compared to those with shorter years of service, those with longer years of service had significantly higher susceptibility score (P=0.012). Table 3 shows the results of the bivariate analysis of self-efficacy and health belief.

Since there were significant differences between the doctors and other positions on several scales, we further conducted subgroup analysis and divided the respondents into two subgroups. The results showed that doctors had significantly higher osteoporosis knowledge level (P=0.02), higher calcium intake self-efficacy (P=0.031), lower severity score (P=0.008) and higher health motivation score (P=0.046). The subgroup analysis results are shown in Tables 2 and 3.

Table 2 Bivariate Analysis of Osteoporosis Knowledge Scores

Factors	Knowledge Score	*P* value
Age, y		0.087
<40	16 (14.25, 19)	
>40	18 (15, 20)	
Gender		0.137
Male	16 (11.5, 19)	
Female	17 (15, 19.5)	
Education level		0.001
College and below	13.5 (9, 16.25)	
Undergraduate	17 (14.75, 19)	
Postgraduate and above	18 (16, 20)	
Occupation		0.002
Doctor	18 (16, 20)	
Nurse	16 (14.5, 19)	
Administration and logistics	16.5 (11, 19)	
Years of service		0.014
<5	16.5 (15, 19)	
6–10	19 (17, 20)	
11–20	17 (15, 19)	
>20	16 (13.5, 19)	
Professional and technical title		<0.001
Primary and below	15 (13, 17)	
Intermediate	18 (15, 20)	
Senior	19 (17, 20)	
Subgroup analysis: Medical position /non-medical position		
Medical position	17 (15, 20)	0.068
Non-medical position	16.5 (11,19)	
Subgroup analysis: Doctor position /other position		
Doctor position	18 (16, 20)	<0.001
Other position	16 (14, 19)	

Multivariable Analysis

Since the K–S test showed that the data of this study, except for the exercise self-efficacy score, were all skewed, and could not be transformed into normal distribution after transformation, we chose quantile regression for multivariable analysis. Table 4 presents the effects of independent variables on dependent variables under different quantile conditions (only the results that showed statistical significance in at least three quantile conditions were presented).

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Table 3 Bivariate Analysis of Osteoporosis Health Beliefs and Self-Efficacy

Variable	Calcium Self-efficacy Score	Exercise Efficacy Score	Susceptibility Score	Seriousness Score	Exercise Benefits Score	Calcium Benefits Score	Exercise Barriers Score	Calcium Barriers Score	Health Motivation Score
Age, y									
<40	75.00 (51.67, 88.33)	54.96±28.34	17.50 (13.00, 20.00)	17.00 (14.00, 19.00)	24.00 (21.00, 25.00)	23.00 (19.75, 24.00)	16.00 (12.00, 18.00)	13.00 (12.00, 18.00)	24.00 (22.75, 26.00)
>40	79.17 (65.00, 87.50)	61.87±25.61	19.00 (17.00, 23.00)	18.00 (15.00, 20.00)	24.00 (23.00, 24.00)	24.00 (22.00, 24.00)	16.00 (13.00, 18.00)	13.00 (12.00, 16.00)	24.00 (23.00, 26.00)
P value	0.240	0.117	0.006**	0.159	0.507	0.139	0.654	0.672	0.373
Gender									
Male	75.00 (50.83, 88.33)	73.33±21.06	16.50 (12.00, 22.00)	18.00 (13.00, 20.00)	23.50 (20.25, 24.25)	20.00 (17.75, 25.25)	14.50 (12.00, 19.00)	16.50 (12.75, 18.50)	23.50 (20.25, 24.00)
Female	79.17 (66.67, 88.75)	54.19±27.73	18.00 (15.00, 22.00)	17.00 (15.00, 19.00)	24.00 (22.00, 24.00)	23.00 (21.00, 24.00)	16.00 (12.00, 18.00)	13.00 (12.00, 16.00)	24.00 (23.00, 26.00)
P value	0.150	0.001**	0.283	0.512	0.626	0.095	0.729	0.006**	0.122
Education level									
College and below	83.34 (70.00, 100.00)	73.83±24.56	20.00 (15.00, 22.75)	19.50 (17.25, 23.00)	24.00 (20.25, 25.75)	20.00 (17.75, 25.25)	17.50 (12.75, 20.50)	18.00 (15.00, 19.75)	23.00 (21.00, 25.25)
Undergraduate	75.00 (50.00, 86.67)	57.09±28.04	18.00 (15.00, 22.00)	18.00 (15.00, 20.00)	23.00 (21.00, 24.00)	23.00 (20.00, 24.00)	26.00 (13.00, 18.00)	13.00 (12.00, 18.00)	24.00 (23.00, 26.00)
Postgraduate and above	76.67 (56.35, 88.33)	53.61±26.38	17.00 (13.25, 21.00)	16.50 (14.00, 19.00)	24.00 (23.00, 25.00)	24.00 (22.00, 24.75)	14.00 (12.00, 17.75)	12.00 (11.25, 14.75)	24.00 (23.25, 26.00)
P value	0.199	0.109	0.649	0.242	0.147	0.093	0.140	0.024**	0.238
Occupation									
Doctor	80.00 (62.50, 93.33)	57.42±28.32	18.00 (14.00, 20.00)	13.00 (16.00, 18.00)	24.00 (23.00, 25.00)	24.00 (22.00, 25.00)	16.00 (12.00, 18.00)	12.00 (12.00, 15.00)	24.00 (23.00, 26.00)

Nurse	69.17 (48.33, 86.67)	54.90±28.14	18.00 (15.00, 22.00)	18.00 (15.00, 20.00)	23.00 (20.00, 24.00)	22.00 (20.00, 24.00)	16.00 (13.00, 19.00)	13.00 (12.00, 18.00)	24.00 (21.00, 26.00)
Administration and logistics	75.00 (59.17, 88.33)	61.35±25.42	17.00 (12.00, 22.00)	18.00 (14.00, 20.00)	23.00 (18.00, 24.00)	21.00 (18.00, 24.00)	13.00 (12.00, 18.00)	12.00 (14.00, 18.00)	24.00 (19.00, 27.00)
P value	0.083	0.498	0.451	0.029**	0.077	0.012**	0.056	0.207	0.137
Years of service									
<5	75.00 (55.00, 95.00)	61.03±	16.00 (12.25, 18.75)	17.50 (15.00, 19.00)	23.50 (22.00, 24.75)	23.50 (20.25, 24.75)	14.00 (12.00, 18.00)	13.00 (12.00, 16.50)	24.00 (23.00, 24.00)
6–10	70.00 (50.00, 90.84)	53.54±	17.00 (12.75, 19.25)	18.00 (15.00, 20.00)	24.00 (20.75, 24.25)	22.50 (19.75, 24.00)	16.00 (12.00, 18.00)	13.00 (12.00, 18.00)	24.00 (21.00, 27.00)
11–20	76.67 (54.17, 83.33)	56.23±26.18	19.00 (15.00, 23.00)	17.00 (13.00, 19.00)	24.00 (22.00, 25.00)	23.00 (19.00, 25.00)	16.00 (13.00, 18.00)	13.00 (12.00, 17.00)	24.00 (23.00, 26.00)
>20	78.33 (62.50, 90.00)	63.45±27.72	19.00 (17.00, 23.75)	18.50 (16.00, 20.00)	24.00 (23.00, 24.00)	24.00 (23.00, 24.00)	14.50 (12.00, 18.00)	12.00 (12.00, 14.75)	24.00 (23.25, 26.00)
P value	0.755	0.364	0.012**	0.314	0.716	0.407	0.620	0.764	0.392
Professional and technical title									
Primary and below	75.00 (52.09, 90.00)	56.79±28.57	18.00 (13.00, 20.00)	18.00 (15.00, 20.00)	23.50 (19.00, 25.00)	23.00 (19.75, 24.00)	16.00 (12.00, 19.00)	13.50 (12.00, 18.00)	24.00 (21.00, 26.25)
Intermediate	75.84 (51.25, 83.33)	56.09±26.43	18.00 (14.75, 23.00)	16.00 (14.00, 19.00)	24.00 (22.00, 24.00)	23.00 (20.75, 24.00)	15.00 (13.00, 18.00)	13.00 (12.00, 15.00)	24.00 (23.00, 26.00)
Senior	80.00 (71.67, 85.00)	60.56±28.09	19.00 (17.00, 23.00)	17.00 (14.00, 20.00)	24.00 (23.00, 25.00)	24.00 (23.50, 24.00)	16.00 (12.00, 18.00)	12.00 (12.00, 14.00)	24.00 (23.00, 28.00)
P value	0.490	0.772	0.107	0.345	0.418	0.549	0.756	0.131	0.179
Subgroup analysis: Doctor position /other position									
Doctor position	80.00 (62.50, 93.33)	57.42±28.32	18.00 (14.00, 20.00)	13.00 (16.00, 18.00)	24.00 (23.00, 25.00)	24.00 (22.00, 25.00)	16.00 (12.00, 18.00)	12.00 (12.00, 15.00)	24.00 (23.00, 26.00)
Other position	71.67 (50.00, 86.67)	56.90±27.38	18.00 (14.00, 22.00)	18.00 (15.00, 20.00)	23.00 (20.00, 24.00)	22.00 (19.00, 24.00)	16.00 (12.75, 18.25)	13.00 (12.00, 18.00)	24.00 (21.00, 26.00)
P value	0.046*	0.625	0.920	0.008**	0.028	0.008**	0.377	0.089	0.046*

Notes: * *P*<0.05, ** *P*<0.01.

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Table 4 Quantile Regression Analysis of Osteoporosis Knowledge, Self-Efficacy and Health Beliefs

Variable	q=0.05	q=0.15	q=0.25	q=0.35	q=0.45	q=0.55	q=0.65	q=0.75	q=0.85	q=0.95
Quantile regression 1: taking the osteoporosis knowledge score as the dependent variable										
Professional and technical title (intermediate vs primary and below)	2.000 (1.712)	3.000** (3.520)	2.000* (2.097)	2.000* (2.097)	3.500** (4.071)	4.000** (4.813)	3.500** (4.487)	4.000** (5.271)	3.000** (3.343)	3.000** (3.214)
Professional and technical title (senior vs primary and below)	4.000* (1.977)	5.000** (3.554)	2.000 (1.323)	4.000** (2.950)	4.500** (3.472)	4.000** (3.272)	4.000** (3.417)	4.000** (3.359)	2.000 (1.479)	3.000 (1.726)
Quantile regression 2: taking the exercise efficacy score as the dependent variable										
Gender (male vs female)	28.333** (3.082)	31.667** (3.511)	26.655** (3.025)	18.333* (2.200)	16.667 (1.957)	18.333* (2.183)	16.667 (1.953)	15.018 (1.857)	13.333 (1.465)	0.000 (0.000)
Quantile regression 3: taking the susceptibility score as the dependent variable										
>40 years old vs <40 years old	3.000 (1.541)	2.000 (1.299)	4.000** (3.133)	3.000* (2.505)	2.000 (1.643)	2.000 (1.662)	4.000** (3.235)	3.000* (2.195)	2.000 (1.413)	−0.000 (−0.000)
Quantile regression 4: taking the seriousness score as the dependent variable										
Occupation (doctor vs others)	−2.000 (−1.007)	−1.000 (−0.663)	−2.000 (−1.709)	−1.000 (−1.043)	−2.000* (−2.459)	−2.000* (−2.435)	−1.000 (−1.222)	−2.000* (−2.543)	−3.000** (−2.688)	−1.000 (−0.423)
Quantile regression 5: taking the exercise benefits score as the dependent variable										
Professional and technical title (intermediate vs primary and below)	3.987** (3.557)	3.000** (2.824)	2.500* (2.265)	1.000 (1.251)	0.000 (0.000)	0.500 (0.782)	0.000 (0.000)	−0.000 (−0.000)	−3.000** (−3.142)	−0.000 (−0.000)
Occupation (doctor vs others)	0.987 (0.783)	2.000* (2.068)	2.000* (2.294)	1.667* (2.580)	1.000* (2.126)	0.500 (0.937)	0.000 (0.000)	−0.000 (−0.000)	−0.000 (−0.000)	1.000 (0.526)
Quantile regression 6: taking the calcium benefits score as the dependent variable										
Occupation (doctor vs others)	3.000 (1.382)	3.000** (3.018)	2.000* (2.421)	1.750* (2.360)	1.000 (1.303)	1.000 (1.238)	0.000 (0.000)	0.500 (0.656)	−0.000 (−0.000)	−0.667 (−0.578)
Professional and technical title (senior vs primary and below)	−2.000 (−0.539)	−2.000 (−1.213)	−2.000 (−1.345)	−3.000* (−2.147)	−2.000 (−1.340)	−1.000 (−0.661)	−1.500 (−1.167)	−2.000 (−1.520)	−6.000** (−2.899)	−4.333* (−2.316)

Gender (male vs female)	−3.000 (−1.124)	−3.000** (−3.006)	−3.000** (−3.384)	−3.250** (−3.768)	−4.000** (−4.589)	−2.000* (−2.219)	−0.500 (−0.644)	0.500 (0.619)	1.000 (0.887)	1.667 (1.281)
Quantile regression 7: taking the calcium barriers score as the dependent variable										
Gender (male vs female)	4.000* (2.201)	3.000* (2.075)	1.000 (1.074)	1.000 (1.110)	2.000 (1.973)	4.000** (3.800)	2.000 (1.657)	4.000** (2.871)	4.000* (2.569)	9.000** (2.975)
Quantile regression 8: taking the health motivation score as the dependent variable										
Occupation (doctor vs others)	4.000** (4.218)	3.000** (3.442)	2.000* (2.428)	1.000 (1.466)	0.876 (1.345)	0.000 (0.000)	0.000 (0.000)	−0.000 (−0.000)	0.333 (0.292)	0.000 (0.000)

Notes: The data in the table are presented in the form of regression coefficient (t value). * $P<0.05$, ** $P<0.01$.

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The results, taking the knowledge score as the dependent variable, showed that employees with intermediate professional title (at the 0.15 to 0.95 quantiles, t=2.097 to 5.271, *P*=0.000 to 0.037) and with senior professional title (at the 0.05, 0.15, 0.35 to 0.75 quantiles, t=1.977 to 3.554, *P*=0.000 to 0.05) compared to those with primary and below professional titles, were significantly associated with higher knowledge about osteoporosis.

Taking the osteoporosis self-efficacy scores as the dependent variable, the results showed that males were significantly associated higher exercise self-efficacy score (at the 0.05 to 0.35 and 0.55 quantiles, t=2.183 to 3.511, *P*=0.001 to 0.030).

Taking the health beliefs scores as the dependent variable, the results showed that age greater than 40 was significantly associated with higher susceptibility score (at the 0.25, 0.35, 0.65, 0.75 quantiles, t=2.195 to 3.235, *P*=0.002 to 0.030). Doctor occupation was significantly associated with lower seriousness score (at the 0.45, 0.55, 0.75, 0.85 quantiles, t=2.195 to 3.235, *P*=0.002 to 0.030), higher exercise benefits score (at the 0.15 to 0.45 quantiles, t=2.068 to 2.580, *P*=0.011 to 0.041), higher calcium benefits scores (at the 0.15 to 0.35 quantiles, t=2.360 to 3.018, *P*=0.003 to 0.02) and higher health motivation score (at the 0.05 to 0.25 quantiles, t=2.428 to 4.218, *P*=0.000 to 0.016). Males was significantly associated with lower calcium benefits score (at the 0.15 to 0.55 quantiles, t=2.219 to 4.589, *P*=0.000 to 0.028) and higher calcium barriers score (at the 0.05, 0.15, 0.55, 0.75 to 0.95 quantiles, t=2.075 to 3.800, *P*=0.000 to 0.029). Professional and technical title was also found to be significantly related with exercise and calcium benefits score, but the effects were not very stable To be more precise, intermediate title was associated with higher exercise benefits score at the 0.05, 0.15, 0.25 quantiles (t=2.265 to 3.557, *P*=0.001 to 0.025) and was associated with lower exercise benefits score at the 0.85 quantile (t=−3.142, *P*=0.002). Moreover, senior title compared with primary and below titles was associated with lower calcium benefits score (at the 0.35, 0.85, 0.95 quantiles, t=−2.899 to −2.147, *P*=0.004 to 0.034).

Discussion

This study investigated the knowledge level, health beliefs and self-efficacy for preventing and treating osteoporosis, and health beliefs of staff at a gynecology and obstetrics hospital in Hangzhou. The results showed that gender, age, education level, years of service, job position, and professional technical title were all associated with the osteoporosis awareness, self-efficacy and health beliefs among staff in an obstetrics and gynecology hospital.

This study found that education level, work experience, professional and technical title, and occupation type were all associated with the level of osteoporosis knowledge among hospital staff. Consistent with the findings of previous community-based studies, our study confirmed the importance of education.[12,13] In healthcare institutions, employees who work as doctors tend to have higher levels of education and have received more systematic health education, so it is reasonable that they have more osteoporosis knowledge. Besides, as hospital employees, as their titles increase, they would accumulate more experience, which also gives them more comprehensive knowledge of disease. It should be noted that there was a non-linear relationship between years of service and osteoporosis knowledge in our study, which might be related to the limited sample size. Our results indicate that the target audience for osteoporosis education should be employees with relatively low education level and professional title, as well as hospital staff who are not doctors.

Gender is one of the important factors affecting self-efficacy and health beliefs for osteoporosis, and this influence is mainly reflected in attitudes towards exercise and calcium intake. Adequate exercise and calcium intake are very important primary preventive measures for early bone loss.[14,15] We found that although women are at higher risk of developing osteoporosis than men of the same age, their exercise efficacy scores were significantly lower, which means that women are not as active as men in exercise. Besides, the calcium benefits scores were significantly lower while the barriers to calcium intake were significantly higher in men. That is to say, men's cognition of the benefits of calcium supplementation is not as clear as that of women. This interesting finding may be attributed to the differences in psychological characteristics, interests, and lifestyles between the two genders.[16] Therefore, when conducting health education, we can choose more appropriate content based on the gender of the audience.

As people get older, their attitudes towards health and disease may change.[17] This study showed that the disease susceptibility scores of people over 40 years old were significantly higher than those under 40 years old, indicating that they believed that they were more likely to develop osteoporosis. It can be inferred that the older staff may be more

empathetic in their daily clinical work. In contrast, the younger group may pay less attention to the patients' suspected osteoporosis symptoms and risks and may be more likely to overlook the promotion of osteoporosis knowledge in their daily communication with patients. Therefore, medical institutions can carry out corresponding education activities for the younger employees, so as to promote the awareness and level of attention of osteoporosis among the general public.

Occupation type is also closely related to the self-efficacy and health beliefs of hospital staff regarding osteoporosis.[18] The bivariable analysis showed that there were significant differences in the scores of doctors and other hospital staff on several scales. Thus, we entered it into the regression analyses as a variable. Results showed that the disease severity score of doctors was lower, which may be attributed to their more adequate knowledge and understanding of the disease. The benefits of exercise and calcium intake in the doctor group were significantly higher than those in other positions, which may be related to the comprehensive and accurate knowledge of disease they have received. Meanwhile, doctors have higher health motivation and are more willing to improve their own health status, which may also stem from their better understanding of the harmfulness of osteoporosis. Hence, if we want to improve the overall understanding of osteoporosis in healthcare institutions, all staff other than doctors will be the main targeted for education and promotion.

Years of service, professional and technical titles both represent the work experience and professional capacity.[19] In our study, professional and technical title was associated with respondents' osteoporosis knowledge, exercise benefits score, and calcium benefits score. Unexpectedly, intermediate title was associated with higher exercise benefits score, whereas senior title was associated with lower calcium benefits score. The reason for this result may be due to the sample size or certain confounding factors, and the results need to be further verified. In addition, years of service seemed not significantly correlated with our results. Therefore, in general, when carrying out publicity activities, the audience's work experience is not the main factor to consider.

We further analyzed the correlation between the osteoporosis knowledge and each item of health belief and self-efficacy but results showed that the knowledge level was not related to any item. This result is quite different from a study on Lebanese women, which showed that the osteoporosis knowledge score was significantly positively correlated with the health motivation score.[20] This difference might be attributed to special medical background and small sample size of responders in our study.

It should be pointed out that most of the results in our survey showed a skewed distribution. In order to minimize the impact of skewed distribution on data analysis, we used quantile regression instead of traditional linear regression. Quantile regression can analyze data at different quantile points, so as to more accurately reflect the relationship between independent and dependent variables, and can also evaluate the robustness of the model, which can effectively solve the problems in this study.

This research project has following limitations. First, there may be selection bias because of the small sample size of the population participating in this survey. Second, this study has regional limitations and is a single-center study, so the representativeness of the results obtained may not be strong. Third, the lack of a general community control group limits our ability to address differences between the general public and healthcare professionals. Fourth, quantile regression analyses showed that some models only showed statistical significance in less than half of the quantiles, suggesting that the robustness of some models is not particularly high. For the above reasons, caution is needed when extrapolating the conclusions of this study. In future studies, the scope of the survey and the number of medical centers can be expanded to reflect the situation more comprehensively and realistically.

Conclusion

Through this single-center, cross-sectional study, we found that education level, work experience and job position have a great impact on the osteoporosis knowledge level of obstetrics and gynecology hospital staff, while osteoporosis self-efficacy and health beliefs are related to gender, age, education level, job position, and years of service. Therefore, when carrying out osteoporosis education activities for employee in healthcare institutions, different groups should be selected for more targeted publicity and promotion, so as to make the education work more accurate and efficient.

Data Sharing Statement

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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Author Contributions

Y.Z. made the conception for this research and collected the raw data. Z.Y.X analyzed the data and drafted the article. Z. F.Z. and J.S. reviewed and edited the manuscript critically. All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

There are no conflicts of interest.

References

1. Lane NE. Epidemiology, etiology, and diagnosis of osteoporosis. *Am J Obstet Gynecol*. 2006;194(2 Suppl):S3–11. PMID: 16448873. doi:10.1016/j.ajog.2005.08.047
2. Yu F, Xia W. The epidemiology of osteoporosis, associated fragility fractures, and management gap in China. *Arch Osteoporos*. 2019;14(1):32. PMID: 30848398. doi:10.1007/s11657-018-0549-y
3. Kanis JA, McCloskey EV, Johansson H, 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 Committee of Scientific Advisors of the International Osteoporosis Foundation (IOF). European guidance for the diagnosis and management of osteoporosis in postmenopausal women. *Osteoporos Int*. 2013;24(1):23–57. doi:10.1007/s00198-012-2074-y
4. Szamatowicz M. How can gynaecologists cope with the silent killer - osteoporosis? *Prz Menopauzalny*. 2016;15(4):189–192. PMID: 28250721; PMCID: PMC5327627. doi:10.5114/pm.2016.65682
5. Mevius A, Heidbrede T, Gille P, Pannen HD, Wilke T. Real-world treatment and fracture incidence in postmenopausal women with severe osteoporosis at high risk of fracture: a retrospective claims data analysis. *Ger Med Sci*. 2021;19:Doc15. PMID: 35110980; PMCID: PMC8778936. doi:10.3205/000302
6. Choong DS, Tan NC, Koh YLE, Leong CK, Sankari U, Koh KH. Osteoporosis management by primary care physicians in Singapore: a survey on osteoporosis guidelines utilisation and barriers to care. *Arch Osteoporos*. 2023;18(1):72. PMID: 37209254; PMCID: PMC10198784. doi:10.1007/s11657-023-01283-1
7. Qi BB, Resnick B, Nahm ES. Reliability and validity of the revised osteoporosis knowledge test. *J Nurs Meas*. 2014;22(2):342–356. PMID: 25255683. doi:10.1891/1061-3749.22.2.342
8. Resnick B, Wehren L, Orwig D. Reliability and validity of the self-efficacy and outcome expectations for osteoporosis medication adherence scales. *Orthop Nurs*. 2003;22(2):139–147. PMID: 12703398. doi:10.1097/00006416-200303000-00012
9. Costa MF. Health belief model for coronavirus infection risk determinants. *Rev Saude Publica*. 2020;54:47. PMID: 32491096; PMCID: PMC7190095. doi:10.11606/s1518-8787.2020054002494
10. Mahdaviazad H, Keshtkar V, Emami MJ. Osteoporosis guideline awareness among Iranian family physicians: results of a knowledge, attitudes, and practices survey. *Prim Health Care Res Dev*. 2018;19(5):485–491. PMID: 29380714; PMCID: PMC6452934. doi:10.1017/S1463423618000014

11. Eslami-Mahmoodabadi A, Foroughameri G, Maazallahi M, Farokhzadian J. Nurses' knowledge, attitude, and practice regarding osteoporosis prevention and its correlation with their nutritional behaviors. *J Prev Med Hyg*. 2024;64(4):E429–E437. PMID: 38379736; PMCID: PMC10876026. doi:10.15167/2421-4248/jpmh2023.64.4.2709
12. Xu J, Sun M, Wang Z, et al. Awareness of osteoporosis and its relationship with calcaneus quantitative ultrasound in a large Chinese community population. *Clin Interv Aging*. 2013;8:789–796. PMID: 23836969; PMCID: PMC3699130. doi:10.2147/CIA.S45874
13. Juby AG, Davis P. A prospective evaluation of the awareness, knowledge, risk factors and current treatment of osteoporosis in a cohort of elderly subjects. *Osteoporos Int*. 2001;12(8):617–622. PMID: 11580074. doi:10.1007/s001980170060
14. Manoj P, Derwin R, George S. What is the impact of daily oral supplementation of vitamin D3 (cholecalciferol) plus calcium on the incidence of Hip fracture in older people? A systematic review and meta-analysis. *Int J Older People Nurs*. 2023;18(1):e12492. PMID: 35842938; PMCID: PMC10078370. doi:10.1111/opn.12492
15. Wu MC, Nfor ON, Ho CC, Lu WY, Liaw YP. The association between different impact exercises and osteoporosis: an analysis of data from the Taiwan biobank. *BMC Public Health*. 2024;24(1):1881. PMID: 39010045; PMCID: PMC11247905. doi:10.1186/s12889-024-19403-y
16. Lee HY, Hwang J, Ball JG, Lee J, Yu Y, Albright DL. Mental health literacy affects mental health attitude: is there a gender difference? *Am J Health Behav*. 2020;44(3):282–291. PMID: 32295676. doi:10.5993/AJHB.44.3.1
17. Dimovski V, Vukojević K, Pecotić R, Colnar S. Editorial: age and health management practices: impact on modern organizations. *Front Psychol*. 2024;15:1401398. PMID: 38686083; PMCID: PMC11056508. doi:10.3389/fpsyg.2024.1401398
18. Dos Santos VR, Silva BSA, Agostinete RR, Batista VC, Gobbo LA. Older adults physically inactive in occupational and commuting domains have a higher risk for osteopenia and osteoporosis: a 12-month prospective study. *Arch Osteoporos*. 2023;18(1):80. PMID: 37280379. doi:10.1007/s11657-023-01294-y
19. Huang WJ, Zhang MW, Li BY, Wang XH, Zhang CH, Yu JG. 5S management improves the service quality in the outpatient-emergency pharmacy: from management process optimisation to staff capacity enhancement. *Eur J Hosp Pharm*. 2024;31(3):259–266. PMID: 36424124; PMCID: PMC11042446. doi:10.1136/ejhpharm-2022-003449
20. Hallit S, El Hage C, Hajj A, et al. Construction and validation of the Lebanese osteoporosis knowledge scale among a representative sample of Lebanese women. *Osteoporos Int*. 2020;31(2):379–389. PMID: 31664476. doi:10.1007/s00198-019-05192-3