

Awareness of Osteoporosis among 368 Residents in China: A Cross-Sectional Study

Oumer Kemal

Jilin University School of Public Health

Yawen Liu

Jilin University School of Public Health

Qiong Yu

Jilin University School of Public Health

Fan Wu

Jilin University School of Public Health

Shuman Yang (✉ shumanyang@jlu.edu.cn)

Jilin University School of Public Health

Research article

Keywords: Osteoporosis, Awareness, Knowledge, China

Posted Date: November 13th, 2019

DOI: <https://doi.org/10.21203/rs.2.17256/v1>

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Version of Record: A version of this preprint was published at BMC Musculoskeletal Disorders on March 30th, 2020. See the published version at <https://doi.org/10.1186/s12891-020-03217-1>.

Abstract

Background: Studies on osteoporosis awareness among general population in China are still limited. We examined the level of osteoporosis awareness among residents in China, determined the risk factors associated with lower level of osteoporosis awareness, and assessed the sources of their knowledge about osteoporosis.

Methods: We conducted a cross-sectional study among 368 general residents aged 30 years or older from 19 provinces during January-March 2018 in China. All participants were identified and interviewed face-to-face by medical students in Jilin University using a structured questionnaire. Osteoporosis awareness scores (percent of correct answer) was determined across several domains, including definition, diagnosis, risk factors, and prevention of osteoporosis. We used multiple linear regression models to test the relationship between risk factors and overall awareness scores.

Results: The mean age of participants was 52.9 ± 10.2 years, and 53% of them were male. Osteoporosis awareness score for definition was 77.7%, diagnosis 49.6%, risk factors 49.2%, treatment 60.5%, and prevention 69.9%. The overall awareness score was 67.8%. Lower family income and education level were significantly associated with lower overall awareness score (all $p < 0.05$). Television or radio health program was reported to be their main source of knowledge about osteoporosis.

Conclusion: The awareness level for osteoporosis is moderate; lower family income and education level were risk factors for lower awareness. Television or radio health program had the greatest contribution to osteoporosis awareness.

Background

Osteoporosis characterized as low bone mass and micro-architectural deterioration is a major public health problem. It is estimated to affect 200 million women worldwide and causes more than 8.9 million fractures annually [1]. By 50 years of age, one in three women and one in five men will suffer a fracture in their remaining lifetime [2]. It is projected that by 2050, 50% of hip fractures will occur in Asia, with the majority occurring in China [3]. Osteoporosis affects almost 7.0 million Chinese over the age of 50 and causes about 687,000 hip fractures in China each year [4].

Improving osteoporosis awareness is useful for controlling this problem. Past studies have shown relatively low levels of osteoporosis awareness within the general population in China [5–10]. However, studies on osteoporosis awareness among general population in China are still limited. In addition, there is no studies have ever addressed the way of source of knowledge about osteoporosis. We examined the level of osteoporosis awareness among residents in China, determined the risk factors associated with lower level of osteoporosis awareness, and assessed the sources of their knowledge about osteoporosis.

Methods

Study setting and population

This cross-sectional survey was conducted on residents aged 30 years or older from 19 provinces during January-March 2018 in China. The participants were identified and interviewed face-to-face by medical students in Jilin University (Enrolment year: 2017; Specialty: Preventive Medicine) using a structured questionnaire. This study was approved by the Ethical Committee Board at School of Public Health, Jilin University. Each participant also provided written-informed consent to this study.

A total of 372 surveys were recorded; each student returned an average of six survey questionnaires. The participants included the relatives, friends and neighbours of the students. After excluding participants with missing data on osteoporosis awareness measures, we finally included 368 men and women aged 30 years or older in our analysis.

Study measures

Socio-demographics (sex, age, body weight, height, residence, education level, and family annual income), lifestyle information (smoking, alcohol use), prior fracture and prior bone mineral density test were collected using a structured questionnaire. Body mass index (BMI) was calculated as body weight (kg) divided by squaring of body height (m²).

We assessed osteoporosis awareness level using the following domains, including by definition, diagnosis, signs/symptoms, treatment, complications, prognosis, causes, risk factors, and prevention of osteoporosis; these questions were same as a previous research [11]. A test of the questionnaire was conducted to confirm its reliability and validity. The knowledge instrument demonstrated good internal consistency (Cronbach's $\alpha = .746$). The items were submitted to principal component analysis. Ten components were extracted using eigenvalue >1 criteria and scree plot inspection, with the components explaining a cumulative 60% of the variance in awareness scores. The Kaiser-Meyer-Olkin measure of sampling adequacy and Bartlett's test of sphericity showed that the results were suitable for factor analysis. Response options included "agree," "disagree," or "unsure." Awareness scores were created by assigning a "1" to each correct response and a "0" to each incorrect or "unsure" response. The items were summed for a possible range of 0 to 29, with higher scores reflecting greater awareness. Awareness score was defined as percent of correct answer. Information was also collected regarding the sources (e.g., newspapers and magazines, advertising leaflets, television or radio health program) from the participants acquired their existing knowledge on osteoporosis.

Statistical analysis

We used descriptive statistics to describe the characteristics of the study population and main variables. Continuous variables were shown as mean \pm standard deviation (SD); categorical variables were shown as percentages.

To test the relationship between risk factors and overall awareness score we used multiple linear regression models. It was used to assess the association between overall awareness score and risk factors, with for all covariates such as sex, age, body mass index, residence, educational level, family annual income, prior bone mineral density test, prior fracture, smoking, and alcohol use. Covariates are selected based on their significant in the univariate test.

All statistical analyses were performed by using SPSS software (version: 25.0; SPSS Inc, Chicago, IL).

Results

A total of 368 participants were included in this study (Table 1). The mean age of participants was 52.9 ± 10.2 years; 53% were males. The average BMI was 23.7 ± 3.3 kg/m². Approximately, 18.5% and 36% of participants reported to be current smokers and alcohol users, respectively.

Osteoporosis awareness level

Table 2 presents descriptive data onto osteoporosis awareness scores by domain. Osteoporosis awareness score for definition was 77.7%, diagnosis 49.6%, risk factors 49.2%, treatment 60.5%, and prevention 69.9%. The overall awareness score was 67.8%.

Table 3 indicates that lower family income and education level were significantly associated with lower overall awareness scores (all $p < 0.05$). However, all the other variables were not significantly associated with overall scores of osteoporosis awareness.

With regard to sources of knowledge about osteoporosis, television or radio health program was reported to be their main source of knowledge about osteoporosis (Table 4).

Discussion

Osteoporosis is a significant health problem, which with a growing ageing population is increasing in size. Raising the levels of awareness toward osteoporosis among general population are fundamental factors that ensure success of osteoporosis prevention and control programs [12]. This study examined the level of osteoporosis awareness among residents China, determined the risk factors associated with lower level of osteoporosis awareness, and assessed the sources of their knowledge about osteoporosis.

In this study, overall osteoporosis awareness score was 67.8%, a result comparable with the studies in other places like the Iran and Turkey [13, 14]. However, awareness level was still lower than that reported among most studies from the Malaysia, and Canada that were conducted primarily among the respondents [15, 16]. This result may be explained by their higher education status.

Although it was revealed that even if the population is aware about osteoporosis definition, is not aware the same degree about osteoporosis risk factors and osteoporosis diagnosis. One in every two

participants did not know the risk factors and the diagnosis. In a similar study also carried out in Puerto Rico, 1 in every 10 participants did not know the risk factors [17], 64% of the respondents knew that osteoporosis diagnosis using X-ray of the bone in Vietnamese [11]. It was remarkable that their knowledge on osteoporosis is low especially about the risk factors and diagnosis.

It is generally believed that awareness of the risks associated with osteoporosis is greater in women than in men; the fact that in this study gender does not seem to matter on osteoporosis awareness. It is not consistent with what has previously been reported [10]. Our results showed higher level of education was associated with better awareness of osteoporosis; this was found in other studies to [10, 18]. It seems that well-educated individuals have more access to information and show more willingness to obtain information on health issues.

In our study, 55.7% of participants reported television or radio health program as their main source of osteoporosis knowledge. The main source of knowledge was also television for the Canadian, Singaporean, and American women with the rates of 76.4, 31.1, and 53%, respectively [15, 18, 19]. As the main source of knowledge on osteoporosis was television, reliable health education messages on osteoporosis should be given via television.

Conclusions

The awareness level for osteoporosis is moderate; lower family income and education level were risk factors for lower awareness. Television or radio health program had the greatest contribution to osteoporosis awareness. The findings of this study provide directions for further studies in this area and will be useful for the design of related public health strategies.

Abbreviations

BMD: Bone mineral density; BMI: Body mass index; SD: Standard deviation; SPSS: Statistical Package for the Social Sciences

Declarations

Ethics approval and consent to participate

This study was approved by the Ethical Committee Board at School of Public Health, Jilin University (Approval No: 2018–03–05). Each participant also provided written-informed consent to this study.

Consent for publication

Consent for publication obtained from participants.

Availability of data and materials

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Competing interests

The authors declare that they have no competing interests.

Funding

No funding was obtained for this study.

Authors' contribution

The authors made the following contributions: O. K., S. Y., and Y.L made the conception for this research. O. K. analysed the data and drafted the article. Q. Y., F. W., and S. Y. reviewed/ edited the manuscript. All the authors critically revised the article for important intellectual content. S. Y. contributed to the study design and managed the overall project.

Acknowledgements

Not applicable.

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Tables

Table 1 Characteristics of study (N = 368)

Characteristics	Values
Male (n, %)	195 (53)
Age group (years)	
30-49 (n, %)	208 (56.5)
50-59 (n, %)	76 (20.7)
60-69 (n, %)	55 (14.3)
Above 70 (n, %)	29 (7.9)
Body mass index (kg/m ²)	23.7 (3.3)
Residence	
Urban (n, %)	166 (45.1)
Rural (n, %)	113 (30.7)
Cross region (n, %)	89 (24.2)
Education	
Primary and below (n, %)	69 (18.8)
Junior (n, %)	113 (30.7)
Senior (n, %)	84 (22.8)
Graduate (n, %)	102 (27.7)
Family annual income (yuan)	
<10,000 (n, %)	41 (11.1)
10,000-49,999 (n, %)	128 (34.8)
50,000-99,999 (n, %)	97 (26.4)
100,000 (n, %)	102 (27.7)
Prior bone mineral density test (n, %)	68 (18.5)
Prior fracture (n, %)	48 (13)
Smoker	
Current (n, %)	68 (18.5)
Past (n, %)	45 (12.2)
Never (n, %)	255 (69.3)
Alcohol user (n, %)	133 (36.3)

Values are means (SD), unless otherwise specified.

Table 2 Frequencies and percents of correct response by domain (N=368)

Domain	Domain score (%) (Correct response: T = True, F = False)	Correct response, N (%)
Definition of Osteoporosis	Osteoporosis is a condition of easy joint dislocation (F)	222 (60.3)
	Osteoporosis is a condition of low bone mineral density (T)	296 (80.4)
	Osteoporosis is a condition of high bone mineral density (F)	340 (92.4)
	Domain score = 77.7%	
Diagnosis of Osteoporosis	Osteoporosis is diagnosed using X-ray of the bone (T)	192 (52.2)
	Osteoporosis is diagnosed with physical exam (F)	173 (47.0)
	Domain score = 49.6%	
Common signs/symptoms of osteoporosis	Headache is a common sign/symptom of osteoporosis (F)	310 (84.2)
	Frequent fractures is a common sign/symptom of osteoporosis (T)	312 (84.8)
	Mood change is a common sign/symptom of osteoporosis (F)	313 (85.1)
	Domain score = 84.7%	
Treatment of osteoporosis	Osteoporosis can be treated with calcium and vitamin D (T)	321 (87.2)
	Osteoporosis can be treated with surgical correction (F)	273 (74.2)
	Osteoporosis can be treated with hormone replacement (T)	74 (20.1)
	Domain score = 60.5%	
Complications of osteoporosis	Diabetes is a complication of osteoporosis (F)	313 (85.1)
	Hypertension is a complication of osteoporosis (F)	310 (84.2)
	Hip fracture is a complication of osteoporosis (T)	311 (84.5)
	Domain score = 84.6%	
Prognosis for Osteoporosis	Osteoporosis can lead to joint swelling and morning stiffness (F)	162 (44.0)
	Osteoporosis can lead to hip fractures and subsequent complications (T)	286 (77.7)
	Domain score = 60.8%	
Common causes of Osteoporosis	Overweight is a common cause of osteoporosis in women (F)	225 (61.1)
	Lack of estrogen is a common cause of osteoporosis in women (T)	156 (42.4)
	High protein diet is a common cause of osteoporosis in women (F)	263 (71.5)
	Domain score = 58.3%	
Risk factors for Osteoporosis	Low rice intake is a risk factor for osteoporosis in women (F)	233 (63.3)
	Post menopause is a risk factor for osteoporosis in women (T)	158 (42.9)
	Smoking is a risk factor for osteoporosis (T)	152 (41.3)
	Domain score = 49.2%	
Risk of	Women are at highest risk for osteoporosis at	315 (85.6)

osteoporosis over a woman's lifetime	puberty (F) Women are at highest risk for osteoporosis during their childbearing ages (F) Women are at highest risk for osteoporosis after menopause (T) Domain score = 73.1%	244 (66.3) 248 (67.4)
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(Continued)

Table 2 (Continued)

Domain	Domain score (%) (Correct response: T = True, F = False)	Correct response, (%)	N
Prevention of Osteoporosis	Moderate physical exercise can reduce the risk of osteoporosis (T) Increased rice consumption can reduce the risk of developing osteoporosis (F) A diet rich in calcium and vitamin D can reduce the risk of developing osteoporosis (T) Cigarette smoking cessation can reduce the risk of developing osteoporosis (T) Domain score = 69.9%	272 (73.9) 276 (75.0) 306 (83.2) 175 (47.6)	

Table 3 The associations between risk factors and overall awareness score in the multivariable linear regression models

Variables	P value		
Male vs Female	-0.598	0.464	0.198
Age in year	0.008	0.019	0.676
Body mass index (kg/m ²)	0.108	0.057	0.060
Residence			
Urban vs Rural	0.651	0.543	0.231
Cross vs Rural	-0.292	0.547	0.595
Education level			
Junior vs Primary and below	1.551	0.568	0.007
Senior vs Primary and below	2.333	0.644	0.000
Graduate vs Primary and below	1.857	0.693	0.008
Family annual income (yuan)			
<10,000 vs ≥100,000	-1.171	0.549	0.039
10,000-49,999 vs ≥100,000	-1.243	0.537	0.021
50,000-99,999 vs ≥100,000	-1.136	0.532	0.033
Prior BMD test vs No prior BMD test	0.555	0.498	0.266
Prior fracture vs No prior fracture	-0.850	0.560	0.130
Smoker			
Current vs Never	-1.067	.703	0.130
Past vs Never	-0.581	0.659	0.378
Alcohol user vs No alcohol user	1.021	0.535	0.057

Abbreviations: β= regression coefficient; SE= standard error; BMD = bone mineral density

P significant at ≤ 0.05

Table 4 Percent for each source for obtaining existing osteoporosis knowledge

Source	Percent
Newspapers and magazines	29.1
Advertising leaflets	11.1
Community public paper material	15.2
Community health knowledge lecture	15.8
Television or radio health program	55.7
Internet	22.6
Wechat group	29.1
Chatting with friends and family members	40.5
None	10.1