

# Association between Demographic Factors and Osteoporosis in Urban Iranian Postmenopausal Women

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## Abstract

Several demographic factors may be considered as barriers to osteoporosis prevention like high rate of illiteracy and low socioeconomic status in developing countries, there is lack of studies that assess the relationship between socioeconomic status and osteoporosis. This study was a case-control study and it was conducted in two bone mineral density centers in Tehran. Case group includes 163 osteoporotic menopausal women. Controls were selected from same bone mineral density center and matched to the case patients according to age groups. The odds ratios with 95% confidence interval for demographic risk factors of osteoporosis were as follow: illiteracy (no schooling) 2.31(1.06,5.06) in public center, 12.18(1.41,105.57) in private center, illiteracy of husband 3.76(1.04,13.69) in public center, occupation (being a housewife) 2.041(1.19,3.50) in public center. In this study we did not found a strong association between occupation and osteoporosis. High education level was shown as a protective factor of osteoporosis in both centers.

**Keywords:** *Osteoporosis, Risk factors, Demographic factors*

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## Introduction

Osteoporosis is a skeletal disorder characterized by compromised bone strength predisposing to an increased risk of fracture. Osteoporosis is the gradual decline in bone mass with age, leading to increased bone fragility and fractures (1-4). The majority of osteoporotic fractures occur in older women, due to a natural decline in bone density after the menopause. More than half of the total number of fractures worldwide is expected to occur in Asia and Latin America (5-7). It is also known that the prevalence of osteoporosis varies from country to country, and within countries (8). Differences in race, nutritional status, physical activity, and lifestyle and living conditions all contribute to its variability

(9). A number of factors increase the likelihood of developing osteoporosis. They include smoking, lack of physical activity, excess alcohol consumption, low calcium and vitamin D intake and thinness. Other factors, which predispose to osteoporosis, are a family history of the condition, premature menopause, some kind of cancers and long-term use of some drugs (10-2118-29). Among these factors socioeconomic and demographic characteristic seems to play an important role in increasing the likelihood of developing osteoporosis (22-2810-16). There is a lack of such information especially in developing countries. In this study we tried to assess the relationship between demographic, socioeconomic status and osteoporosis among

patients of two centers (one private and one public) in Tehran.

## Materials and Methods

The study was a case-control, case record and interview based study. It was conducted in two bone mineral density centers from Tehran, Capital of Iran, (Bone mineral densitometry center of Shariati hospital as public and Mahdad bone densitometry as private center).

BMD was measured by axial dual energy X-ray absorptiometry (DEXA) using a Lunar (DPX) machine in both centers. The T value was computed for definition of osteoporotic and normal groups in this study based on the WHO classification and Caucasian reference population data. The case group included postmenopausal osteoporotic women who were identified as patients with bone density higher than 2.5 SD below average of young normal bone density (in L1-L4 A-P spine region interest and/or total femoral neck region).

Controls were chosen from post-menopausal women with normal bone density (BMD lesser than 1 SD below average of young is in L1-L4 A-P spine and total femoral neck regions) in equal number and matched in age group with cases.

Sample selection was carried out from all of postmenopausal women (953 women) whose bone mineral density was measured in two selected public and private centers during Jun 2002 to July 2003. (bone mineral density of women were measured by order of their physicians and the most common indication included as follows: post menopausal checkup 47.66%, complaining of bone and joint pain and disability 34.27% and 20% other indications like endocrine disorders, steroid use and recent fracture and etc). Among this population 256 women were identified as osteoporotic patients, 274 were normal, and the remainders identified as osteopenic (excluded from study). All of the osteoporotic women were recalled and 163 volunteers participated to this study as case group.

Controls were selected on first come -first serve basis by recalling candidates from a list of non-osteoporotic non-osteopenic women created from center's database during the study.

All the study participants were interviewed in person based on a questionnaire prepared by researcher.

The questionnaire consisted of information about demographic characteristics of patients including age, type of residence, education of partner's occupation and marital status.

*Education* was assessed in five following levels: Illiterate, 1-5, 6-9, 10-11 and 12 years of schooling and more.

Occupation of husband was assessed in following groups: A) labor jobs (farmer, worker), B) service, C) self employed, D) others.

Women occupation was assessed in two following categories: housewife and service.

Questionnaire also covered some information about nutrition, exercise, menstrual status, obstetrical and drug history and medical conditions that may have an effect on osteoporosis.

*Nutrition* information included usual dietary intake, past and present dietary habit. The usual dietary intake (over the previous 12 months) was assessed by using a self made food-frequency questionnaire (FFQ). The present FFQ included far more detail on possible bone-related nutrients and other foods commonly consumed in Iran. For greater details on frequency of consumption, the variables "times per day" and "number of days per week and/or month" were included.

*Menstrual* history included menarche age, age of menopause, duration of postmenopausal period, irregularity and amenorrhia.

*Obstetrical history* included parity, gravity, abortion, gap between pregnancies and lactation.

*Drug history* was assessed with questions about use of HRT, calcium supplements, steroids and other drugs.

In addition the result of bone densitometry and other investigations were included in the questionnaire (Appendix).

Statistic analysis was carried out by using SPSS software. The association between risk factors and osteoporosis were calculated by Odds ratio, and Multinomial Logistic Regression Analysis (osteoporosis yes or no) was used in the different categories of socioeconomic factors for adjustment of the most relevant factors like age, weight, height, age of menopause and etc.

## **Results**

This study included a total of 327 women (163 osteoporotic women as case group and 164 women with normal bone density as controls). All of the subjects were interviewed from June 2002 to July 2003 from bone mineral density centers of Shariati hospital as a public center and Mahdad as private center. 76% of cases and 60% of controls were selected from public center. It was shown that mean age of osteoporotic women in public center (57.3, SD=8.7) was significantly lower than private center (61.1, SD=10) ( $P<0.05$ ). The percentage of low educated women (less than 6 years schooling) was shown significantly higher in public center (43.9%) compare to private center (27.9%) ( $P>0.05$ ). It also was seen that the percentage of husband's occupation in labor job was higher in public center (23.7%) comparing to private center (9.7%).

We assessed the association of three following demographic characteristics with osteoporosis: A: education of women and their husbands, B: occupation of women and their spouse) C: Marital status

**A: Education** There was significant relationship between education level of women and osteoporosis ( $P=0.000$ ).

We found significant relationship between husbands' education level and osteoporosis ( $P<0.05$ ). Osteoporosis was more frequent in women with low education (illiterate or less than 6 years schooling) husbands.

After assessing the data of private and public centers separately there was significant relationship between women's education and osteo-

porosis in both private (Mahdad) and public (Sharia) centers ( $P<0.05$ ). Also significant relationship was seen between the husbands' education and osteoporosis in both private (Mahdad) and public(Shariati)centers ( $P<0.05$ ). In the group with high-educated husbands there was not any significant relationship between education and osteoporosis. But among women with low education husbands we found significant relationship between education and osteoporosis ( $P=0.00$ ).

percentage of high educated women (12 class or more) among osteoporotic and normal women in both private (Mahdad) and public (Shariati) centers separately and totally have been shown in Fig. 1. In private center, 71.4% of normal and 22.2% of osteoporotic group was high educated. But in public center the percentage of high-educated women in normal and osteoporotic groups were 31.3% and 12.5%, respectively.

Among postmenopausal women who came for routine check up the prevalence of osteoporosis was significantly higher in low educated group ( $P=0.017$ ) (Table 1).

The prevalence of osteoporosis was significantly higher in low educated group (less than 6 years schooling) ( $P=0.017$ ).

In high-educated group (12 years schooling and more) there was not any significant relationship between the husband's education and osteoporosis.

Association of osteoporosis with education level, frequencies and estimated Odd ratio with 95% confidence interval, have been shown in Table 2.

Multiple logistic regression analysis also demonstrated a predictive role towards osteoporosis by age, age at menarche and menopause, hormone replacement therapy, dairy product consumption, physical activity, exercises, height, weight (separately) and low education remained significant as a risk factor for osteoporosis.

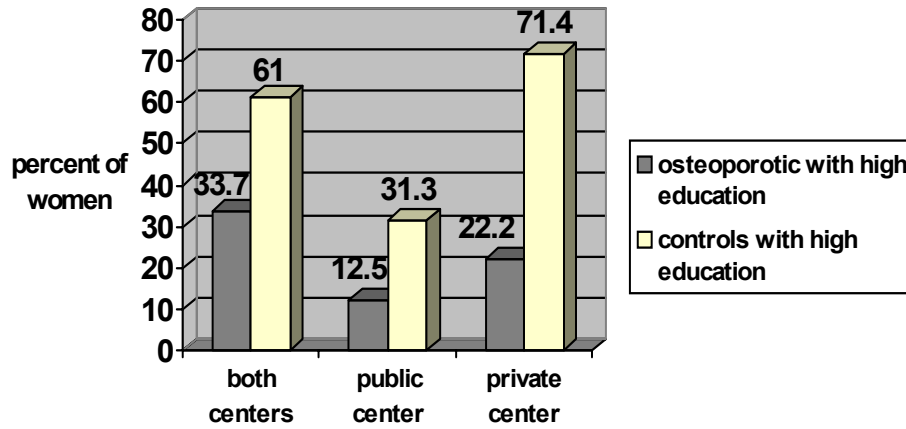
**B: Occupation and Marital status** About women's occupation and osteoporosis, the

prevalence of Osteoporosis among housewives (50.8%) was more, but it was not statistically significant.

In public center (Sharia), prevalence of osteoporosis among housewives was significantly higher than others, OR= 2.041(CI=1.19, 3.50). After adjustment with education level there was not any significant association between osteo-

porosis and women occupation (being a housewife) in public center.

In this study there was no significant relationship between husband's occupation and marital status of the women with osteoporosis. Although the prevalence of osteoporosis were higher in single women compared to married women.



**Fig. 1:** Percentage of high-educated women (12 years schooling and more) in osteoporotic and normal groups in base of centers.

**Table1:** Number and prevalence of osteoporotic and normal subjects, in based on education level. (Among postmenopausal ladies without other important risk factors)

Education	Osteoporosis		Normal		Total	
	Number	Percent	Number	Percent	Number	Percent
Less than 6 years schooling	19	56	15	44	34	100
More than 6 years schooling	30	33	61	67	91	100

**Table 2:** Association of osteoporosis with education level. Frequencies and estimated Odds ratio with 95% confidence interval

Risk factor	Schooling years	Odds Ratio	95% confidence interval
Education level	No schooling	3.4 **	(1.64,7.)
In both Centers	less than 6	3.17**	(1.98,5.04)
	less than 10	2.99**	(1.87,4.73)
	less than 12	3.06**	(1.95,4.81)
Education level	No schooling	2.31*	(1.06,5.06)
In Public center (Shariati)	less than 6	2.93**	(1.68, 5.13)
	less than 10	2.56**	(1.48,4.42)
	less than 12	2.21**	(1.28,3.82)
Education level	No schooling	12.18*	(1.41,105.57)
In Private center (Mahdad)	less than 6	2.96*	(1.22,7.19)
	less than 10	3.30*	(1.37,8.)
	less than 12	4.79**	(2.03,11.33)
Education level	No schooling	5.09 *	(1.43,18.12 )
Of husband	less than 6	3.41**	(1.78,6.51)
In both centers	less than 10	3.66**	(1.97,4.75)
	less than 12	2.32**	(1.38,3.93)
Education level	No schooling	3.76 *	(1.04,13.69)
Of husband	less than 6	2.90**	(1.46,4.74)
In Public center (Shariati)	less than 10	3.16 **	(1.32,4.25)
	less than 12	2.32**	(1.26,4.27)
Education level	No schooling	0.0	
Of husband	less than 6	6.50	(0.61,69.13)
Private center (Mahdad)	less than 10	6.50	(0.61,69.13)
	less than 12	9.45 *	(.94,94.48)

\*Significant with P<0.05 \*\* Significant with P<0.005

**Table 3:** Comparing association \*of education level and osteoporosis in present study with last studies

Education Years schooling	M.Verenna and et al		Present study	
	Odds ratio	95% CI	Odds ratio	95% CI
6-8 years	0.76	0.65-0.90	0.395	0.10-1.55
9 years and more	0.68	0.57-0.82	0.313	0.2-0.5

\*Using the lowest educational level as reference category, increases in educational status were associated with a significantly reduced risk for osteoporosis in both studies

## Discussion

According to WHO (1997), increasingly, health is influenced by social and economic circumstances over which the individual has little control and over which the conventional health sector also has little sway (2930).

There are also some reports about effect of socioeconomic status on osteoporosis, for example researchers found that women from low socioeconomic status, with sedentary habit and deprived of calcium supplementation during lactation develop osteoporosis at an early age (2210). A study in Korea showed that socio-

economic status and dietary habits are more likely to prevent osteoporosis than reproductive life styles (2513) and in another study in Turkey, it was suggested that socioeconomic status was an important determinant of cortical bone status (2715). Pearson and others assessed the relationship between social deprivation and osteoporosis by measuring heel BMD in 1187 women (mean age 70, range 60-94). They reported that women with lower social deprivation have higher heel BMD compared with the rest of the population (3031). In another study that was carried out by Sarah Jones and others in order to find the effect of socioeconomic deprivation on fracture incidence in the United Kingdom, it was suggested that socioeconomic factors clearly play a part in the causation of fracture in younger adults. Lifestyle influences are important in older age groups, but socioeconomic deprivation does not appear to be a risk factor for the development of osteoporotic fractures in elderly people (3132).

We carried out this study in two following bone densitometry centers: A) Shariati hospital that is a well-known public-research center, with cheap and sometimes free facilities. B) Mahdad a ordinary private bone densitometry center that offers facilities (with same bone densitometry machine -Lunar.DPX). After statistical assessment it was shown that, the samples from private center were significantly more educated than public center and also the percentage of husbands who had labor jobs were lower. Totally we can say that samples from private center were in better socioeconomic situation.

As measured by the Odds ratio in this study, it was seen that low education among postmenopausal women and their husband was associated with increased risk of osteoporosis. Osteoporosis was predominantly seen in postmenopausal women with lower level of education. It was seen more in private center than public center (Table 2). In a study differences in the prevalence of osteoporosis among educated classes and protective role increasing in formal education were shown (2614). In this study, Multiple

Logistic regression analysis demonstrated a predictive role toward osteoporosis by age, age at menarche and menopause, hormone replacement therapy, calcium intake physical activity and body mass index. Using the lowest educational level as reference category, increases in educational status were associated with a significantly reduced risk for osteoporosis (OR=0.76, (95% CI 0.65-0.90 for 6-8 years of schooling; OR=0.68, 95% CI 0.57-0.82 for 9 years or more). The same results have been found in present study (Table 3). Reverse effect of education level on osteoporosis has been reported in some other studies (27-28, 3215-17). In this study we found that when one of the spouses was well educated the, effect of illiteracy and low education of the other one on osteoporosis was lower. The effect of spouse education level and other demographic factors on their wife's health has been reported in other researches (23, 3311, 34).

Among postmenopausal women who came for routine check-up it was seen that low education level was associated with increasing risk of osteoporosis (the prevalence of osteoporosis were more in low educated groups). In addition when data were adjusted for the most relevant factors like age, weight, height, age of menopause, etc. low education remained significant as a risk factor of osteoporosis.

There was no significant difference between patients' awareness about osteoporosis in normal and osteoporotic groups. It is showed that only awareness about osteoporosis during recent years is not enough for preventing osteoporosis, but high education level probably because of its effect on knowledge about health and as a result, healthy lifestyle is an important protective factor for osteoporosis. In a study in Poland Drozdowska B, and coworkers assessed the influence of age, level of education and personal experience on knowledge about osteoporosis. They found that higher level of education and younger age improves the knowledge of osteoporosis with no systemic influence of personal experience with the disease (3433).

In a study that was carried out in Sweden, it was suggested that occupational affiliation among women ever employed, and education level, were not associated with hip fracture risk. It was concluded that employment, household income, type of housing and marital status seem to be risk indicators of hip fracture risk independent of known osteoporotic risk factors (3334). In our study, there was a significant relationship between occupation of patients and osteoporosis only in public center. The prevalence of osteoporosis was more in housewives compare to others. After adjustment for education there was not any significant association between women's occupation (being housewife) and osteoporosis. There was no significant relationship between husband occupation and marital status with osteoporosis. Although the prevalence of osteoporosis were higher in single women compare to married women. Results of this study show that the education level is one of the most important demographic factors that affect osteoporosis. The reason probably is the effect of education on lifestyle, nutrition and economic status. The other possibility is the effect of economic status on education level. People from well to do families have more facilities for continuing their education and they also have better nutritional and health status during childhood that affect bone mass. This information highlights the need for screening population-based studies to determine the exact effect of demographic factors on osteoporosis.

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