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Predictors of Calcium Intake in order to Identify Osteoporosis Preventive Behavior in Women Aged 30-50 in Khorramabad: A Study Based on the Trans-theoretical Model

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Abstract

Aim: Recently, prevention of osteoporosis has become the goal of many health professionals. Behavior change is one of the most powerful strategies for osteoporosis prevention. This study aimed to determine calcium intake in order to identify osteoporosis preventive behavior in women aged 30-50 years in Khorramabad city, Iran.

Methods: This descriptive cross-sectional study included 269 women aged 30-50 years who were selected from all the health centers of Khorramabad city according to the inclusion criteria of the study and by cluster and systematic sampling. The tools for data collection were valid and reliable questionnaires of demographic information, stages of change, decisional balance, self-efficacy, and calcium intake. Chi-square test and logistic regression were applied to analyze the data.

Findings: The mean age of the subjects was 38.72±7.003, and the mean total calcium weekly intake was 3191.03±3869.24. The results also showed that self-efficacy among the constructs of the Trans-theoretical Model (TTM) was a significant predictive of dietary calcium intake for the behavior.

Conclusion: The results showed that the weekly intake calcium in women was low. Self-efficacy among the constructs of the TTM was the only significant predictive for osteoporosis prevention behavior. Therefore, the findings of this study can be considered when designing educational interventions for prevention of osteoporosis by health authorities.

Keywords: Osteoporosis, Prevention, Behavior, Trans-theoretical Model

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Introduction

Osteoporosis is a progressive systemic skeletal disease [1] That proceeds silently without any significant symptoms [2], and is a serious disease or major health problem all over the world [3]. National Osteoporosis Foundation (2010) has estimated that two million fractures result from osteoporosis in 2005 and $19 billion in costs. By 2025 [4], there will be three million osteoporotic fractures and $25.3 billion in costs each year. The prevalence of osteoporosis varies among countries [5]. Previous studies have shown that the prevalence of osteoporosis in Iran is mostly in the age of 50 and over, 22.2% in females, and 11% in males [6, 7]. It is reported that females are more at risk of osteoporosis; it affects 28 million individuals in the USA, most of whom are women [8].

According to the WHO (2003), peak bone mass is achieved by the age of 30. One major concern is that many young adult women are not obtaining adequate amounts of calcium and vitamin D in their diets. Fragility fractures can occur throughout the skeleton. osteoporotic fractures are not only painful and inconvenient but significantly impact morbidity and mortality in the affected women [8]. The mortality of persons of the same age and gender with a hip fracture is 15%–20% higher than in those without hip fracture [9]. Prevention costs less than treatment of osteoporosis. Although dairy products are the main source of calcium in the diet, other foods such as supplemented orange juice, tofu, sardines, broccoli, spinach, soy products, and bread contribute to overall calcium intake [10]. Preventing osteoporosis is the objective of many healthcare professionals [11]. Studies have shown that calcium intake plays an important role in the osteoporosis prevention [10-17].

Moreover, since behavior change is the basis and foundation of preventing many health-associated risks [18]. Experts believe that the effectiveness of health education and behavior change programs depends largely on the use of models and theories of health education [19]. On the other hand, the prevention of behavioral factors influencing osteoporosis requires individuals' behavioral change [19, 20]. The models and theories of health education and health promotion can be effective in designing interventions in this field at three levels of prevention [20, 21]. A health educational model, which uses behavior change at individual level, is the TTM (Prochaska & DiClemente, 1983). The model has been used for a range of health behaviors since its introduction [22-25], and can predict the way and time of behavioral change [26]. The main constructs of the model are "stages of change", "decisional balance", and "self-efficacy". The construct of "stages of change" suggests that change occurs in five stages of "pre-

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contemplation", "contemplation", "preparation", "action", and "maintenance" [19, 21]. Individuals in each stage require different interventions, and this classification will enable us to make interventions appropriate to the stages. Another feature of this model is that it emphasizes an individual's assessment of the benefits (pros) and costs (cons) (decisional balance) of behavior change [27]; this is an important issue for development in the stages of behavioral change [28]. Another construct of the model is "self-efficacy", which is a state in which a person perceives ability and confidence to perform a task [29]. This construct has a central role in changing behavior and entering the higher stages of behavioral change [28].

The present study aimed to determine predictors of calcium intake in order to identify osteoporosis prevention behavior in women aged 30-50 years in Khorramabad city, Iran.

Methods

This cross-sectional study included 269 women aged 30-50 years admitted to the health care centers of Khorramabad city (west of Iran) in 2013. The sample size was determined based on the number of the constructs of the Trans-theoretical Model (TTM). Therefore, 90 samples were chosen for each construct [30]. Sampling was performed through the multi-stage cluster sampling. The city was divided into four areas of north, south, east, and west. Then one health care center was chosen randomly from each area, and the samples were selected randomly from the individuals admitted to the health care centers considering the inclusion criteria of the study. The inclusion criteria were: females aged 30-50 years with at least a fifth-grade primary school educational level, lack of rheumatoid disease and mental illness, lack of fractures, pregnancy, menopause and breast-feeding, and consent to participate in the study. Before entering the study, the participants were provided with the necessary information about the study, and those who showed their willingness to participate through verbal consent were included in the study. The Ethics Committees of Tarbiat Modares University, and Lorestan University of Medical Sciences approved the study.

To collect the data, the questionnaires of demographic information, stages of change, decisional balance (pros and cons), self-efficacy, and measurement of calcium intake were applied. To determine the stages of behavioral change, a standard questionnaire of stages of change was prepared and applied after its content validity index (>0.7), content validity ratio (0.59), and face validity (IF=5) were approved. The questionnaire put individuals in the stages of pre-contemplation (not thinking about behavioral change in osteoporosis prevention in the next 6 months),

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contemplation (thinking about behavioral change in osteoporosis prevention in the next 6 months), preparation (thinking about behavioral change in osteoporosis prevention in the next month), action (taking action to change in osteoporosis prevention in the previous day to 6 months), and maintenance (sustaining action in osteoporosis prevention for more than 6 months) [26]. Since the questionnaire was dynamic in nature, it had one question at five levels. Therefore, the common methods for determining reliability were not appropriate for the questionnaire [19]. However, since the process of validity confirmation was performed carefully, we can say that the questionnaire had the necessary reliability and validity. The questionnaire put the individuals in one of the five stages. Therefore, a score from 1 to 5 was assigned to each stage. The preventive behavior in this study was defined as calcium intake 1000 mg/per day. The questionnaire of decisional balance (pros and cons) included 7 questions for each variable, and was prepared based on reliable references [31]. Each question was scored based on a 5-point Likert scale ranging from 1 (extremely important) to 5 (completely unimportant). The total scores of the questionnaire ranged from 14 to 70. The content validity for the pros (CVI=0.99, CVR=0.8), and the content validity for the cons (CVI=0.88, CVR=0.70) were approved. The reliability of these two questionnaires was approved with a Cronbach's alpha of 0.88. The self-efficacy questionnaire included six questions, and was prepared based on the theory of Bandura's self-efficacy. The content validity (CVI=0.94, CVR=0.71) and the reliability of the questionnaire (Cronbach's alpha=0.82) were approved. The answers of this tool were on a Likert scale ("I'm completely sure" to "I'm not sure") with a range of 6 to 24 scores [31].

The data were collected from the samples in one step, and were analyzed with SPSS 16 using descriptive and inferential statistics (Chi-square test, and Mann-Whitney's correlation coefficients). Logistic regression was performed to evaluate the predictive power of the model constructs in adopting the behaviors of osteoporosis prevention so that the individuals in the stages of "pre-contemplation", "contemplation" and "preparation" were put in the "non-action" group (those without healthy behaviors), and those in the "action" and "maintenance" stages were included in the "action" group (those with healthy behaviors). The data were analyzed considering the significance level of 0.05.

Results

Table 1 shows the results of the demographic data of women under study.

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Table 1: Frequency distribution of the demographic data of women under study

Data demographic	Mean/Percentage
Age group (30-35y)	41%
Mean age	38.72±7.003
Diploma	36.8%
Status marital (married)	75.1%
Job status (housewives)	75.1%
Income status (less than 5000,000 RIAL monthly)	46.5%
Mean age of menarche	13.84±1.9
Menstrual abnormalities	23.4%

The table further shows the mean and standard deviation of non-diary, diary and total calcium intake weekly as 252/8 (145/1), 2937/3 (3846/7) and 3190(3869) milligram, respectively. Table 2 shows the results of the Beta weights of constructs of stages of change related to calcium intake in the women.

Table 2: Frequency distribution of the stages of change related to the variable of calcium intake in the studied women

Stages of change	Calcium intake	
	Frequency	Percentage
Pre-contemplation	111	41.3
Contemplation	61	22.7
Preparation	43	16
Action	18	6.7
Maintenance	36	13.4

Table 3 indicates the results of the Beta weights of constructs of stages of change related to calcium intake based on action and non-action. Logistic regression was applied to determine the predictors of calcium intake behavior (Table 4).

Table 3: Frequency distribution of the stages of change based on action and non-action related to calcium intake

Ranking of the stages of change	Calcium intake	
	Frequency	Percentage
Non-action	215	79/9
Action	54	20/1

Table 4: Predictive variables of stages of change related to calcium intake behavior based on the Trans-theoretical Model constructs

Variable	Confidence interval		Odds ratio	P-value	
	Upper	Lower			
Icome	000	1. 000	1	0/137	0/0
Educational level	2.046	0.971	1.409	0/199	0/034
Self-efficacy of calcium intake*	1.264	1.083	1.170	0/009	0/016
Pros of total calcium intake	1.025	0.933	1.046	0/741	0/04
Cons of total calcium intake	1.109	0.988	0.978	0/014	-0/02
Occupation	3.482	0.55	1.384	0/138	0/32

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The results of Mann-Whitney's test revealed a significant relationship between the constructs of stages of change and income (<0.006), educational level (p<0.043) and occupation (p<0.014).

Discussion

The research findings indicated that about half of the total participants were at pre-contemplation level (41/3%), about a fifth were at contemplation level (22.7%), and 6/7% were at action level. This finding is supported by the other studies [32, 33]. The mean calcium total intake weekly in the women was 3191±3869/3 that was than the lower amount recommended by the WHO. Numerous clinical trials of calcium supplementation showed that it can reduce bone loss and the risk of bone fractures [34, 16]. In other words, sufficient calcium intake is necessary to replace obligatory losses. Milk is a good source of both calcium and vitamin D, which are consumed inadequately by studied women.

So the findings showed that only the construct of "self-efficacy" was a significant predictor of the TTM. Schwarze et al. reported that self-efficacy could have a higher predictive power in health behaviors than the other constructs [35]. The findings ofBerry et al. and Kim on exercise behavior, Swain et al. on the relationship between physical activity, self-efficacy and physical activity behavior, and Araban et al. on the relationship between air pollution reported self-efficacy as the most important predictor of behavior [36-38, 19]. It seems that adopting preventive behaviors for osteoporosis is also more dependent on self-efficacy. Bandura, as the developer of the theory of self-efficacy, believes that self-efficacy is specific to a specific behavior. A person may have high self-efficacy in one behavior and low self-efficacy in another one [26, 29]. Bandura mentions four factors of success in performance, succession experiences, verbal encouragement, and physiological and emotional arousal as the sources of self-efficacy [29]. Therefore, self-efficacy is an important component of success, which falls in the field of positive psychology [39]. The construct of self-efficacy, or belief in "I can", refers to a person's ability to perform tasks in certain circumstances. Additionally, another type of self-efficacy refers to the person's overall belief about his/her own abilities and capabilities [40].

Based on the results of our study, 79.9% of the women were in the no-action stage (pre-contemplation, contemplation, and preparation), and 20.1% were in the action stage (action and maintenance) through adopting calcium intake. Also most of the women (41.3%) were in the pre-contemplation stage and the lowest number (6.7%) was in the action stage, while in Nigg et al.'s study, most of the subjects (49.3%) were in the maintenance, the lowest number (2.1%) was

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in the pre-contemplation stage, and 3.8% in the action stage [41]. In Mazloumi et al.'s study in 2010, 20% of the subjects were in the pre-contemplation stage, 40% in the contemplation stage, 13.6% in the preparation stage, 7.3% in the action stage, and 19% in the maintenance stage [40]. Therefore, calcium intake according to 1000 mg/daily and specific patterns should be part of an overall strategy to prevent osteoporosis in women so that an individual can change his/her behavior intentionally [42].

Therefore, calcium intake, like fruit and vegetable intake, as well as intake of diary foods such as milk, is a dietary behavior that needs to be increased. The comparison of this study with other studies on fruit and vegetable intake revealed similar results. These studies found that consumption of both fruits and vegetables was significantly higher in the action stage than the pre-action stage [43]. The results of our study did not show significant differences in the scores of the constructs in terms of marital status. However, Tol et al.'s study indicated that self-efficacy was associated with marital status [44]. This contrast might be justified according to the cultural and social contexts of the studies. However, this interpretation is not always correct.

Based on the TTM, individuals can go through the stages of change by gaining experience and skills. Returning to previous stages may even happen, which is justifiable considering the circular nature of the model. The results of study on decisional balance showed that the central components of and cons in this construct are very important in making decisions on behavior change.

The results showed no significant relationship between the construct of decisional balance and calcium intake. This result is consistent with the results of Moeini et al. and Araban et al, but inconsistent with the studies conducted by Kidd et al. and Omar-Fauzee et al. [19, 45-47]. Therefore, these results suggest that the construct did not have the power to predict the behavior of calcium intake. This predictive inability of the pros and cons constructs can be attributed to the high points of these two constructs in the studied population in our study. It is emphasized by Pawlak et al. [48] that high scores of pros and low scores of cons cannot predict health behaviors.

Conclusion

The results of the present study suggest that the TTM is effective in predicting calcium intake behavior in preventing osteoporosis in women. Therefore, educational interventions based on the model are needed to train women in bone health and osteoporosis prevention.

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