

## Dietary Behavior toward Osteoporosis among Women in a Slum Area Influenced by Nutritional Knowledge and Stages of Precaution Adoption Model

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**Abstract:** The cross sectional study aiming to assess the effect of Precaution adoption process model (PAPM) and nutritional knowledge concerning osteoporosis on dietary behavior of women. Two hundred and twenty women aged 21 years and above living in slum area in Alexandria, Egypt were randomly selected and asked about their nutritional knowledge, dietary behaviors and PAPM stages related to osteoporosis. Poor total knowledge about osteoporosis was found among 52.7% of women specially knowledge concerning nutritional risk factors of osteoporosis. More than two thirds of women (69.1%) had bad dietary behavior due to low consumption of food containing calcium and high consumption of food and drinks that inhibit calcium absorption. Using PAPM, 56.4% of women were unaware of osteoporosis problem, 13.6% have heard about the problem but were unengaged, only 5.5 % were concerned about the problem and were deciding to act and 24.5% of women were planning to take protective measures within the next 6 months. Poor nutritional knowledge, low educational level and low family income are main reasons for unawareness of osteoporosis problem as the first stage of PAPM. PAPM stages are associated with poor dietary preventive behavior toward osteoporosis. Nutritional education program about osteoporosis ought to be developed and implemented for the women in slum area in Alexandria, Egypt.

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### 1. Introduction

Osteoporosis is a systemic disease characterized by decrease in skeletal bone mass. Osteoporosis makes the bones weak and liable to fractures specially the bodies of the vertebrae.<sup>(1)</sup> The main risk factors of osteoporosis are positive family history of osteoporosis, old age and post menopause. Poor nutritional behaviors have a major contribution in the development of osteoporosis as insufficient calcium or vitamin D consumption; excessive intake of alcohol, caffeinated drinks and fibers. Sedentary life style; smoking and the prolonged use of certain medications as steroids and anticonvulsants were proved to have a role in the development of osteoporosis.<sup>(2)</sup>

Osteoporosis is considered a major health problem in Egypt as 6.5% of females aged 20 years and above suffer from osteopenia and 12.6% of women in the same age group suffer from osteoporosis.<sup>(3)</sup> Egyptian women have generally lower bone mineral density compared to women in western countries.<sup>(4)</sup>

Females' knowledge of osteoporosis remains low, especially in less-developed countries. Improving knowledge and awareness and retaining the knowledge over time have been shown to be effective among females in different age groups.<sup>(5,6)</sup> Raising awareness about the burden of osteoporosis and its risk factors is an essential step in modifying behaviors related to this

disease.<sup>(7)</sup> However, knowledge is not the only factor that determines the change in behavior, behavior changes slowly over time following a series of stages.<sup>(8)</sup>

Precaution Adoption Process Model (PAPM) is one of the stage theories used to explain how persons adopt certain behaviors to protect themselves. It consists of seven cognitive and behavioral stages ranging from unaware of the problem to action and maintenance stage.<sup>(9)</sup>

Studies done in the field of the relationship between knowledge, PAPM and behavior concerning osteoporosis among women in Alexandria are quite scarce that is why the present study was aimed to assess the nutritional knowledge and stages of PAPM related to osteoporosis and evaluate their effect on dietary behavior among women specially in one of slum areas in Alexandria, Egypt.

### 2. Subjects and Methods

#### Sampling:

A cross sectional study was conducted in Alexandria, from April to August 2010. The study included 220 randomly selected women aged 21 years and above; from Ezbet Sekina -a slum area in East of Alexandria. Women participated in the study after taking their verbal consent.

**Data collection:**

The studied sample of women were interviewed according to a special pre-structured questionnaire which included data about socio-demographic characteristics (age, marital status, education level, working status, family income and the presence of bone disease), nutritional knowledge, dietary behavior related to osteoporosis in addition to stages of PAPM.

Education levels were classified into three levels, low level including those who can read and write or having primary school education, middle level including those with preparatory and secondary school education and high level including those with university and post graduated education. Poverty level was determined so that family income equal or above 12 L.E./day (two dollars a day).<sup>(10)</sup>

Knowledge section of the questionnaire included: seven questions assessing general information about osteoporosis (prevalence among both sexes, signs and symptoms of osteoporosis, risk of fracture and presence of treatment); ten questions assessing risk factors of osteoporosis (including menopause, old age, smoking, consumption of soft, tea and coffee drinks and consumption of high protein and salted foods); and six questions assessing osteoprotective practices (taking calcium supplements, consumption of dairy products and green vegetables, sun exposure and exercise). Questions were scored so that wrong answer was scored (0), don't know (1) and correct answer (2) with a total maximum score of 46 were distributed as 14 for section of general information about osteoporosis, 20 for risk factors section and 12 for osteoprotective factors section. Knowledge was categorized so that < 60% of the total score was considered as poor knowledge, 60%-80% fair knowledge and > 80% good knowledge.

Frequency of consumption (daily, more than one a week, weekly or monthly) of certain foods related to bone health was assessed during the past month using food frequency questionnaire to measure the dietary behavior concerning osteoporosis. These healthy protective food items for bone that containing calcium or enhance its absorption included dairy products, fish with bones, green leafy vegetables and nuts. Unhealthy food items for bone health that inhibit absorption of calcium or increase its excretion included dark bread, meat and poultry, salted foods and caffeinated and soft drinks. The dietary behavior was scored for healthy foods the highest score was given to daily consumption and the lowest for monthly. In the contrary, the scoring for unhealthy foods was the lowest score for daily consumption and the highest for monthly consumption. The highest score of each item was (4) and the lowest was (0) with a total maximum score of 36 was distributed as 16 for section of healthy dietary behavior and 20 for unhealthy dietary behavior section. Dietary behaviors were classified so that < 60% of the total score was considered as bad behavior, 60%-80%

moderate behavior and > 80% good behavior. Women were also asked about their physical activity (walking at least three times /week for 30 minutes were considered physically active) and the use of calcium supplements as protective dietary behavior related to bone health.

Questions assessing the stages of PAPM were adapted from the study of Weinstein on Radon with some modifications.<sup>(9)</sup> The stages are classified into: unaware of osteoporosis problem, have heard about the problem but unengaged, concerned about the problem and decided to act, and maintenance, and planning to take protective measures within the next 6 months.

**Statistical analysis:**

Data was presented as frequencies, percentages, mean and standard error of mean (SEM) using SPSS version "16" software. Significance level of 5% was adopted. Data were analyzed using Pearson's correlation to verify significant associations between the different variables.

**3. Results**

A total of 220 women participated in the present study, 114 were living in slum area and 106 were living in urban area. Mean age of participated women was  $43.7 \pm 1.3$  years as shown in table (1). Most of women were married (67.3%) compared to only 6.4% were divorced. Regarding educational level, 36.4% of women had middle education, 32.7% had high and 30.9% had low level of education. Most of the studied sample was working (51.8%). The majority of participants (80.9%) were above poverty line. There was 26.4% of women were suffering from bone diseases.

Results in table (2) demonstrate that women had generally poor nutritional knowledge regarding all aspects of osteoporosis as the total mean score of knowledge was  $26.9 \pm 0.4$  from a total maximum score of 46 (58.5%). Mean score of knowledge about general information of osteoporosis and osteoprotective factors were  $8.9 \pm 1.2$  from a maximum score of 14 (63.6%) and  $7.1 \pm 0.2$  from a maximum score of 12 (59.2%), respectively. While, mean score of knowledge about nutritional risk factors of osteoporosis was  $11.1 \pm 0.2$  from a maximum score of 20 (55.5%). The lowest percent of correct answers was about: osteoporosis is a hereditary disease (4.5%), osteoporosis may be asymptomatic (5.5%), prolonged use of corticosteroid and frequent consumption of bran are among risk factors (10.9% and 11.8%, respectively), and frequent consumption of fish with bones decreases the risk of osteoporosis (13.6%).

Concerning dietary behaviours, table (3) reveals that women had generally bad dietary behaviour toward osteoporosis as the total mean score of dietary behaviour was  $20.3 \pm 0.3$  from a total maximum score of 36 (56.4%). Mean score of healthy dietary behaviour was  $9.5 \pm 0.2$  from a maximum score of 16 (59.4%).

While, mean score of unhealthy dietary behaviour was  $10.8 \pm 0.2$  from a maximum score of 20 (54%). Low dietary behaviour score was caused through a low consumption of nuts and fish containing bones (10% and 22.7%, respectively) and a moderate consumption of dairy products (68.2%). On the other hand, a frequent consumption of dark bread and tea and coffee drinks (98.1% and 80.9%, respectively) were the main cause of lowering dietary behaviour score. Table (3) also shows that exercise was among only 43.6 % of the studied sample of women. Exercise was limited to walking to the near market and using steps inside houses. There were 8.2% of women already diagnosed with osteoporosis used calcium supplements for treatment not protective reasons.

Results in table (4) demonstrates that 52.7% of women had poor nutritional knowledge about osteoporosis and 43.6% had fair knowledge; while only (3.6%) of them had good knowledge. Regarding dietary behaviours, results show that 69.1% of women had bad dietary behavior compared to only 0.9% had good dietary behavior. Concerning the stages of PAPM, more than half of participated women were unaware of osteoporosis problem (56.4%) and 13.6% have heard about the problem but were unengaged. While only 5.5% were concerned about the problem and were deciding to act. On the other hand, 24.5% of women were planning to take protective measures within the next 6 months.

Table (5) shows that there was a significant positive correlation between score of total nutritional knowledge and both educational level and family income ( $r = 0.45$ , and  $r = 0.21$ , respectively). While, there was a significant positive correlation between PAPM stages and educational level, family income and nutritional knowledge ( $r = 0.41$ ,  $r = 0.21$  and  $r = 0.21$ , respectively). Score of total dietary behaviour was highly significantly correlated with PAPM stages among the studied sample of women ( $r = 0.27$ ).

#### 4. Discussion

Previous studies conducted about osteoporosis in Egypt focused on knowledge and behaviors of females in urban areas.<sup>(11,12)</sup> The present study was aimed to investigate nutritional knowledge and dietary behaviors related to osteoporosis and stages of PAPM theory among females in both slum area and urban area without different.

Knowledge of women was considered poor which goes with the results of studies conducted in Egypt.<sup>(11,12)</sup> Middle East<sup>(13)</sup> and many other countries<sup>(14)</sup> reporting poor knowledge about osteoporosis among females. This poor knowledge among women may be due to difference in the level of education. Nutritional knowledge was correlated positively with educational level in the present study. Level of education was found to be a predictor of osteoporosis knowledge in previous studies.<sup>(14-16)</sup> Low level of education is accompanied

with inadequate health literacy and low comprehension of medical information.<sup>(17)</sup>

Family income may also be a factor in the determination of knowledge level. The results of the present study agreed with the results of previous studies which demonstrated that income was strongly correlated with knowledge about osteoporosis.<sup>(14,18)</sup>

There was low level of knowledge about risk factors even among educated women which was consistent with the results of a study conducted in Cairo among students.<sup>(11)</sup> Knowledge about risk factors is an integral part of health education about osteoporosis as if women do not consider those factors as serious threats; they will not look for prevention and treatment.<sup>(19)</sup>

Concerning protective dietary behaviors against osteoporosis, the lower consumption of dairy products among the studied sample of women can be explained by the lower level of family income preventing women from consumption of dairy products at regular basis. Similar results were reported in Bangladesh where low income women had a much lower intake of dairy products.<sup>(20)</sup>

Regarding unhealthy dietary behaviors related to osteoporosis, the high consumption of tea and coffee drinks among the studied sample may be due to the habit of consuming large amount of tea among all Egyptians. Women had low level of physical activity compared to women in western countries,<sup>(21)</sup> this may be related to cultural factors as women in Egypt are not generally encouraged to perform sports and there are few places for women for exercising.

As regard the stages of PAPM, a higher percent of women were unaware of the problem and a lower percent were deciding to take an action to protect them from osteoporosis. This can be explained by the difference in knowledge level between the two groups specially knowledge about nutritional risk factors of osteoporosis. It is to be noted that the percent of women unaware of the problem was higher than found in studies conducted in USA and Canada.<sup>(22,23)</sup> It is worth mentioning that 8.2% of women reported using calcium supplements according to a physician prescription as a treatment for osteoporosis but none of them was taking it as a protective behavior so they were not categorized as in action or maintenance stage.

Nutritional knowledge was associated with the stages of PAPM and there was significant correlation between the stages of PAPM and dietary behavior. The relation between knowledge and osteoprotective behaviors varied between studies.<sup>(24)</sup> An intervention study in USA has demonstrated that increase in knowledge was accompanied by improvement in osteoporosis preventive behaviors,<sup>(25)</sup> while other study in Taiwan didn't find a relation between knowledge and behaviors.<sup>(26)</sup> This difference between communities is expected as behavior change depends not only on knowledge but other determinants such as enabling and social factors. Among women dietary behavior was

only related to the stages of PAMP. These findings reflect the need to tailor different nutritional education interventions about osteoporosis. Women especially in slum areas need to raise their awareness about the problem and increase their knowledge about risk factors and osteoprotective behaviors and also need strategies that help them to move to the stage of action and maintenance toward osteoporosis.

### 5. Conclusion and Recommendations

Poor total knowledge of osteoporosis was among 52.7% of women through poor knowledge of nutritional risk factors of osteoporosis. Most of women (69.1%) had bad dietary behavior due to low consumption of foods containing calcium and high consumption of foods and drinks that inhibit calcium absorption. Using PAMP, 56.4% of women were unaware of osteoporosis problem, 13.6% have heard about the problem but were unengaged, only 5.5% were

concerned about the problem and were deciding to act and 24.5% of women were planning to take protective measures within the next 6 months. Poor nutritional knowledge, low educational level and low family income are main reasons for unawareness of osteoporosis problem as the first stage of PAMP. PAMP stages are associated with poor dietary preventive behaviour toward osteoporosis. Women in the slum area need to raise their awareness about the impact of osteoporosis; dietary risk factors specially foods that containing inhibitors of calcium absorption, and also preventive dietary practices that protect from osteoporosis. Although some women had generally a better level of knowledge but they need nutritional educational programs helping them to translate this knowledge into behaviors. For that nutritional education program about the problem of osteoporosis ought to be developed and implemented for the women in slum areas in Alexandria, Egypt.

**Table (1) Socio-demographic characteristics and presence of bone disease of the studied sample of women (n=220)**

Variable	No (%)
<i>Age in years (Mean± SEM)</i>	43.7 ± 1.3
<b>Marital status</b>	
Single	34 (15.5)
Married	148 (67.3)
Widowed	24 (10.9)
Divorced	14 (6.4)
<b>Education level</b>	
Low	68 (30.9)
Middle	80 (36.4)
High	72 (32.7)
<b>Working Status</b>	
Housewives	106 (48.2)
Working	114 (51.8)
<b>Family Income</b>	
Above poverty line	178 (80.9)
Below poverty line	42 (19.1)
<b>Presence of bone disease</b>	
Diseased	58 (26.4)
Not-diseased	162 (73.6)

**Table (2) Correct answers percentages for nutritional knowledge among the studied sample of women concerning osteoporosis (n=220)**

Item	No (%)
<b>General information of osteoporosis:</b>	
Osteoporosis is a cause of bone fracture	180 (81.8)
Osteoporosis is not a contagious disease	172 (78.2)
Women are more prone to osteoporosis	144 (65.5)
Osteoporosis is a hereditary disease	10 (4.5)
Osteoporosis can be treated	126 (57.3)
Osteoporosis may be asymptomatic	12 (5.5)
Dowager's hump is one of signs of osteoporosis.	78 (35.5)
<b>Score (Mean ± SEM)</b>	<b>8.9 ± 1.2</b>
<b>Risk factors of osteoporosis:</b>	
Old age	52 (23.6)
Menopause	140 (63.6)
Low body weight	92 (41.8)
Smoking	56 (25.5)
Frequent consumption of salted food	100 (45.5)
Frequent consumption of meat and poultry	114 (51.8)
Frequent consumption of tea and coffee drinks	80 (36.4)
Frequent consumption soft drinks	182 (82.7)
Frequent consumption of bran	26 (11.8)
Prolonged use of corticosteroids	24 (10.9)
<b>Score (Mean ± SEM)</b>	<b>11.1 ± 0.2</b>

**Osteoprotective factors:**

Calcium supplements use	88 (40.0)
Frequent consumption of green vegetables	112 (50.9)
Two glasses of milk gives an adult his calcium daily requirements	154 (70.0)
Frequent consumption of fish with bones	30 (13.6)
Regular sun exposure	152 (69.1)
Adequate exercise	76 (34.5)
<b>Score (Mean ± SEM)</b>	<b>7.1 ± 0.2</b>
<b>Total Nutritional knowledge (Mean ± SEM)</b>	<b>26.9 ± 0.4</b>

**Table (3) Dietary behaviors and protective practices related to osteoporosis among the studies sample of women (n=220)**

Item	No (%)
<b>Healthy dietary behaviors:</b>	
Frequent consumption of dairy products	150 (68.2)
Frequent consumption of green leafy vegetables	190 (86.4)
Frequent consumption of fish with bones	16 (22.7)
Frequent consumption of nuts	22 (10.0)
<b>Score (Mean ± SEM)</b>	<b>9.5 ± 0.2</b>
<b>Unhealthy dietary behaviors:</b>	
Frequent consumption of dark bread	216 (98.1)
Frequent consumption of meat and/or poultry	152 (69.1)
Frequent consumption of salted foods	100 (45.5)
Frequent consumption of tea and/or coffee	178 (80.9)
Frequent consumption of soft drinks	62 (28.2)
<b>Score (Mean ± SEM)</b>	<b>10.8 ± 0.2</b>
<b>Total dietary behaviors (Mean ± SEM)</b>	<b>20.3 ± 0.3</b>
Physically active	96 (43.6)
Calcium supplement users	18 (8.2)

**Table (4) Levels of nutritional knowledge, dietary behaviors and stages of PAMP toward osteoporosis among the studies sample of women (n=110)**

Item	No (%)
<b>Nutritional knowledge:</b>	
Poor knowledge (<60%)	116 (52.7)
Fair knowledge (60-80%)	96 (43.6)
Good knowledge (>80%)	8 (3.6)
<b>Dietary behaviors:</b>	
Bad behavior (<60%)	152 (69.1)
Moderate behavior (60-80%)	66 (30.0)
Good behavior (>80%)	2 (0.9)
<b>PAMP stages</b>	
Unaware	124 (56.4)
Unengaged	30 (13.6)
Deciding to act	12 (5.5)
Planning to act	54 (24.5)

**Table (5) Pearson's correlation coefficient (r) between some parameters**

Variables	Educational level	Family income	Nutritional knowledge	PAMP stages	Dietary behavior
Educational level	1				
Family income	0.27**	1			
Nutritional knowledge	0.45**	0.21*	1		
PAMP stages	0.41**	0.21*	0.21*	1	
Dietary behavior	0.18	0.01	0.10	0.27**	1

\*  $P < 0.05$ , \*\*  $P < 0.01$ **Correspondence author:****Dalia Ibrahim Tayel**

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