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A STUDY ON NUTRITIONAL KNOWLEDGE AND FOOD BEHAVIOR OF OSTEOPOROSIS AMONG WOMEN IN SHARKIA GOVERNORATE, EGYPT

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ABSTRACT: The current study was conducted in order to assess nutritional knowledge and food behavior of osteoporosis among women in Sharkia Governorate, Egypt. Sources of information about osteoporosis and dietary intake of participants were also evaluated. This research was a descriptive-analytical study. Data was collected using a questionnaire that was distributed to 300 women from Sharkia Governorate (150 healthy women and 150 patients diagnosed with osteoporosis). Results estimated that the most of healthy women (39.33%) were between 24 < 40 years old. While (38.70%) were between 40 – 55 years old in patients. The highest percentage of educational level for healthy women was 44% (secondary school), whereas, in patients was 43.3% (bachelor). The largest proportion of healthy women and patients had family income from 2000 < 4000 LE per month. 66% of healthy women hadn't relative suffering from osteoporosis. 48% of patients had fractions. Also, the results indicated that there were statistically significant differences in healthy women and patients and their age, education, job, marital status, history of osteoporosis in the family, menstruation, fractures, calcium and vitamin D supplements and physical exercises. Television appear to play the main role for osteoporosis information for respondents. The highest percentage of participants had average level of general knowledge, knowledge of rick factors and knowledge of protective factors about osteoporosis. The majority of healthy women and patients (68 and 71.3%), respectively, had average level about food behavior. There were statically significant differences between participants (healthy women and patients) and levels of knowledge about general knowledge, protective factors and total knowledge for osteoporosis. Most of respondents who had average level of knowledge have high education level. Healthy women (30.3%) and patients (45.5%) who had average level of knowledge have fractures and this association is statically significant. The results showed that most of participants who had average level of food behavior, were from average level of total knowledge about osteoporosis and this association is statically significant. The results illustrated that the highest percentage of patients took less than recommended dietary allowance of macronutrients and micronutrients which are important to prevent osteoporosis. It can be concluded that the most of subjects had average level of knowledge and food behavior about osteoporosis, while, low percentage had high level. Therefore, the recommendions are the use of television programs to raise awareness for all people about the prevention of osteoporosis, more effort from doctors and healthcare providers to inform patients about preventing and treating from osteoporosis and attention the government to this subject in its health policies and make more efforts to inform people especially women about osteoporosis.

Key words: Osteoporosis, knowledge, women, protective factors, risk factors and food behavior.

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INTRODUCTION

Osteoporosis has become a real common health problem. Its propagation is on the rise because of a considerable increase in life expectancy (**Wright *et al.,* 2017**). It leads to low-shock or fragility fractures that can cause pain, disability and premature death. Almost 50% of women over the age of 50 experience a fracture mainly as a result of osteoporosis (**National Osteoporosis Society, 2016**). Osteoporosis is a systemic disease featured by decrease in skeletal bone mass. Osteoporosis makes the bones weak and susceptible to fractures specially the bodies of the vertebrae (**Heaney, 2000**). Reasons of osteoporosis are deficient calcium or vitamin D consumption; intake of alcohol too much, caffeinated drinks and fibers (**Anderson, 2008**). Nutrition is a modifiable agent in the prevention and treatment of osteoporosis (**Morgan, 2008**). Nutrition plays an important role in protecting against osteoporosis with approximately 80%-90% of bone mineral content being involved of calcium and phosphorus. There are other food components required for normal bone metabolism such as vitamins (D, K, A and C), protein and minerals (zinc, copper, iron, fluoride, and magnesium) (**Morgan, 2008**). **Mohamed and Tayel (2012)** estimated that low total knowledge of osteoporosis was found in 52.7% of women through poor knowledge of risk factors of osteoporosis. High percentage of women (69.1%) had low food behavior due to low consumption of foods containing calcium and high consumption of foods and drinks that inhibit calcium absorption for the women in Alexandria. Female's knowledge about osteoporosis remains low, especially in less-developed countries. Raising consciousness about the burden of osteoporosis and its risk factors is an essential step in modifying behaviors related to this disease (**Syed-Atiqul, 2008**). Osteoporosis prevalence has arrived to endemic proportions (**Ribeiro *et al.,* 2000**). Although, Osteoporosis is more common among Caucasians, it has been estimated that by 2050, more than 50% of all osteoporotic fractures will occur in Asia (**Lau, 2009**). Osteoporosis is considered a major health problem in Egypt as 6.5% of females aged 20 years and above experience from osteopenia and 12.6% of women in the same age group suffer of osteoporosis (**Hassan *et al.,* 2006**). Women in Egypt have lower bone mineral density compared to women in western countries. The most prevalent form of osteoporosis is primary osteoporosis. Primary osteoporosis isn't caused by specific disorders; it is primarily a disease of the elderly and is also referred to as age-related osteoporosis (**Seeman, 2003**). It characteristically starts early in life when corrective action may slow down disease progression. Women are at two to three time's higher risk than men for primary osteoporosis. The rapid phase of bone loss at menopause due to loss of estrogen is the rationale behind the difference in priority among genders (**Riggs *et al.,* 2002**). So, the current study aimed to investigate the nutritional knowledge and food behavior about osteoporosis among women in Sharkia Governorate, Egypt. Sources of information about osteoporosis and dietary intake of participants were also a goal of the study.

SUBJECTS AND METHODS

The present study was conducted throughout questionnaire for healthy women and patients diagnosed with osteoporosis in Sharkia Governorate, Egypt. This research is descriptive-analytical study done on 300 women (150 healthy women and 150 patients). The questionnaire was done directly in targeted communities during the period from January to July, 2017.

The questionnaire was comprised of six parts as follows: Part (1) included personal and socio-demographic characteristics of respondents (age, job, educational level …*etc*.) and sources of information about osteoporosis. Part (2) included general knowledge about osteoporosis (34 items). Part (3) included risk factors for osteoporosis (21 items). Part (4) included protective factors of osteoporosis (11 items). For parts 2, 3 and 4 the items were scored as follows, (I know) answer was scored (2), (To some extent) answer was scored (1) and (I don't know) answer was scored (0). Part (5) included food behavior of participants (18 items). The items were scored as follows, from (1 to 10 items) (always) answer was scored (2), (sometimes) answer was scored (1) and (rarely)

answer was scored (0). While, from (11 to 18 items) were scored as follows, (always) answer was scored (0), (sometimes) answer was scored (1) and (rarely) answer was scored (2). Part (6) included dietary intake for participants, dietary intake data were assessed by 24 hour dietary recall survey. The data were the number of meals, type of foods and methods of preparation and the quantities eaten by the women during the previous 24 hours. Nutrients intake were calculated using food analysis program and compare with recommended dietary allowance (RDA) (**WHO, 1989**).

Statistical Analysis

Statistical Package for Social Sciences (SPSS, version 20) was used to analyze the collected questionnaire data. The data were presented in the form of frequencies, percentages and analytical tests including T-test & Chi-square. For all tests, a p-value of less than 0.05 was considered significant.

RESULTS AND DISCUSSION

Personal and Socio-demographic Characteristics of Respondents

Table 1 shows personal and socio-demographic characteristics of the participants. The highest percentage of respondents were overweight. The most of healthy women (39.33%) were between 24 < 40 years old, while, (38.70%) were between 40 – 55 years old in patients. **Edmonds (2009)** showed that the most of sample (77.7%) in age 19-24 years old in Tuscaloosa, USA. The highest percentage of educational level for healthy women was 44% (secondary school) followed by 38.7% (bachelor), whereas, in patients was 43.3% (bachelor) followed by 34.7% (secondary school). Only, 2% of healthy women had (M.Sc./Ph.D.) degree. **Mohammed *et al.* (2014)** reported that about one third of female nursing (35%) were read and write, followed by (29%) preparatory education and (26.7%) illiterate in Menofia Governorate, Egypt. Approximately more than half of the participants were housewife. The majority of the respondents were married. More than half of the healthy women and patients were from rural areas. The largest proportion of healthy women (44%) and patients (51.3%) had family income from 2000 < 4000 L.E per month. **Mohamed and Tayel (2012)** estimated that low family income, low educational level and poor nutritional knowledge are main reasons for unawareness of osteoporosis problem in Alexandria, Egypt. Most of healthy women (26.7%) had two children. While, most of patients (36.7%) had three children. 66% of healthy women hadn't relative suffering from osteoporosis. While, most of patients (53.3%) had relative suffering from osteoporosis. The majority of healthy women (76%) had menstruation. On the other hand, most of patients 45.3% hadn't menstruation. Almost all of respondents don't smoking. The highest percentage of healthy women 70.70% hadn't fractions, but, almost half of the patients (48%) had fractions. The largest proportion of patients 80.7% don't practice exercises. The results revealed that most of healthy women 58.00% exposed to sunshine. Also, the results showed that 90.70% and 74.7% from patients take calcium and vitamin D supplements, respectively. The results estimated that there were statistically significant differences in healthy women and patients and their age, education, job, marital status, relatives, menstruation, fractures, calcium and vitamin D supplements and practiced exercises.

Sources of Information About Osteoporosis of Respondents

Fig. 1 illustrates sources of information about osteoporosis for respondents. Television appear to play the main role for osteoporosis information (96 and 94%) for healthy women and patients, respectively. Relatives and friends (74% and 74.7%) prove to be the second source of information of osteoporosis for healthy women and patients, respectively. These results disagree with **Ruth (2007)** who found that the most important source of information about osteoporosis for nursing female in Hong Kong, China was newspaper (95%). **Elsabagh *et al.* (2015)** noticed that the core source of information regarding osteoporosis was TV and mass media (56.50%) of respondents at Tanta University.

Table 1. Personal and socio- demographic characteristics of participants

Personal and socio-demographic characteristics	Health women		Patients		Total		Chi-Square
	No.	(%)	No.	(%)	No.	(%)	
Body Mass Index (BMI)							
Underweight <18.5	0	0.00	2	1.30	2	0.70	
Normal weight 18.5-24.9	39	26.00	28	18.70	67	22.30	
Over weight 25-29.9	88	58.60	90	60.00	178	59.30	6.059
Obese 30≤	22	14.70	30	20.00	52	17.30	
Morbidly obese 40≤	1	0.70	0	0.00	1	0.40	
Age							
16 < 19	14	9.33	6	4.00	20	6.70	
19 < 24	29	19.33	17	11.30	46	15.30	
24 < 40	59	39.33	33	22.00	92	30.70	30.162***
40 - 55	35	23.31	58	38.70	93	31.00	
More than 55	13	8.70	36	24.00	49	16.30	
Level of education							
Illiterate	20	13.30	20	13.30	40	13.30	
Reads and writes	2	1.30	9	6.00	11	3.70	
primary school	1	0.70	4	2.70	5	1.70	11.314*
Secondary school	66	44.00	52	34.70	118	39.30	
Bachelor	58	38.70	65	43.30	123	41.00	
(M.Sc. / Ph.D.) degree	3	2.00	0	0.00	3	1.00	
Job							
Student	29	19.30	8	5.30	37	12.33	
Employee	43	28.70	63	42.00	106	35.33	15.699***
Housewife	78	52.00	79	52.70	157	52.34	
Marital status							
Married	120	80.00	138	92.00	258	86.00	8.970***
Single	30	20.00	12	8.00	42	14.00	
Residence area							
Rural	87	58.00	85	56.70	172	57.30	0.055
Urban	63	42.00	65	43.30	128	42.70	
Monthly family income (LE)							
< 2000 LE	31	20.70	14	9.30	45	15.00	
2000 < 4000 LE	66	44.00	77	51.30	143	47.70	7.697
4000 - 6000 LE	39	26.00	45	30.10	84	28.00	
More than 6000 LE	14	9.30	14	9.30	28	9.30	
Number of children							
One child	16	10.70	11	7.30	27	9.00	
Two children	40	26.70	30	20.00	70	23.30	
Three children	37	24.70	55	36.70	92	30.70	9.184
More than three	23	15.30	31	20.70	54	18.00	
Single or women haven't children	34	22.60	23	15.30	57	19.00	
History of osteoporosis in the family							
No	99	66.00	70	46.70	169	56.30	11.396***
Yes	51	34.00	80	53.30	131	43.70	
No	36	24.00	68	45.30	104	34.70	15.071***
Yes	114	76.00	82	54.70	196	65.30	
Smoking							
No	149	99.30	150	100.0	299	99.70	1.003
Yes	1	0.70	0	0.00	1	0.30	
Fractures							
No	106	70.70	78	52.00	184	61.30	11.019***
Yes	44	29.30	72	48.00	116	38.70	
Practiced exercises							
No	105	70.00	121	80.70	226	75.30	4.592*
Yes	45	30.00	29	19.30	74	24.70	
Exposed to sunshine							
No	63	42.00	78	52.00	141	47.00	3.011
Yes	87	58.00	72	48.00	159	53.00	
Calcium supplements							
No	143	95.30	14	9.30	157	52.30	222.364***
Yes	7	4.70	136	90.70	143	47.70	
Vitamin D supplements							
No	143	95.30	38	25.30	181	60.30	153.559***
Yes	7	4.70	112	74.70	119	39.70	
Total	**150**	**100.0**	**150**	**100.0**	**300**	**100.0**	

*p<0.05 ** p<0.01 *** p<0.001

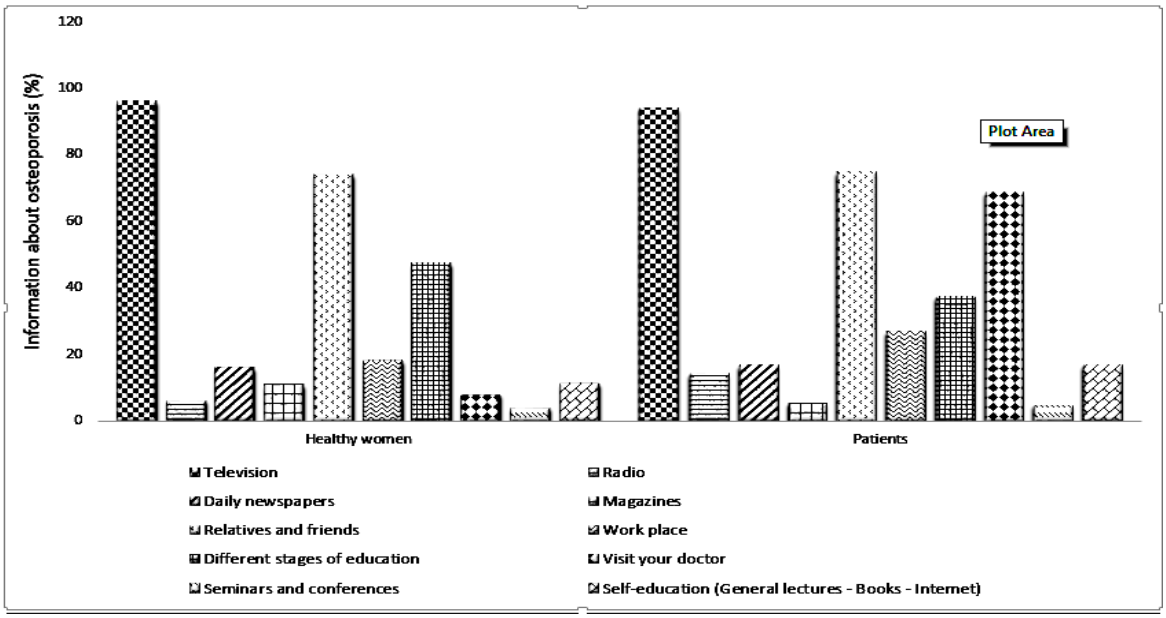

Fig. 1. Sources of information about osteoporosis of respondents

General Knowledge of Osteoporosis

Table 2 shows per cent distribution of participants according to their general knowledge about osteoporosis. More than half of the respondents (healthy women and patients) were aware about osteoporosis leads to bone weakness. The same Table evidenced women's knowledge percentage about "osteoporosis increases the risk of bone fractures", it was for healthy women (40%) higher than patients (34.7%). **Mohamed and Tayel (2012)** reported that 81.8% of sample know osteoporosis is a cause of bone fracture in Alexandria, Egypt. Healthy women (22%) were aware about "osteoporosis is a condition of low bone density" more than patients (14.7%). The results indicated that 82% of healthy women knew that women are more prone to osteoporosis, while, 76% from patients knew that. **Kahnamouei-aghdam *et al.* (2015)** showed that 69.3% of sample said that men are not at risk of osteoporosis more than women in Iran. Approximately, more one-third of patients and healthy women were aware of the impact of menopause on osteoporosis (items 5, 6 and 7). **Aghaei *et al.* (2006)** demonstrated that only (28.8%) of female aware about that. Also, the results of the present study showed that 78.7% of the patients were aware about osteoporosis often affects older people and it was 72% of healthy women were aware about this. The percentage of women's knowledge about "Osteoporosis is a hereditary disease" is higher in patients than healthy women and it was 29.3% and 26.7%, respectively. Most of participants knew that osteoporosis is not a contagious disease and can occur without symptoms in the long term. **Mohamed and Tayel (2012)** reported that 78.2% of subjects know osteoporosis is not a contagious disease and 4.5% know osteoporosis is a hereditary disease in Alexandria.

Only, 26 and 14.7% of healthy women were aware about some symptom of osteoporosis (items 12 and 13), respectively, while, it was 38.7 and 24.7% of patients were aware about this. **Safizadeh *et al.* (2015)** indicated that less than half of the respondents knew that shortening of height in old ages as a symptom of osteoporosis in Iran. Low percentage from respondents knew that hyperthyroidism may increase the risk of osteoporosis and lack of estrogen is a common cause of osteoporosis in women. Whereas, high percentage of subjects were aware about sedentary lifestyle may increase the risk of osteoporosis and smoking is harmful to bone health. In addition, 48.7 and 42.6% of healthy women were aware about inadequate of calcium and vitamin D in meals causes osteoporosis, respectively, while, they were 57.3 and 52.6% of

Table 2. Percent distribution of the participants according to their general knowledge about osteoporosis

No.	Item	Response	Healthy women		Patients		Total		Chi-Square
			No.	(%)	No.	(%)	No.	(%)	
1	**Osteoporosis leads to bone weakness**	I know	76	50.70	79	52.70	155	51.60	
		To some extent	32	21.30	33	22.00	65	21.70	0.273
		I don't know	42	28.00	38	25.30	80	26.70	
2	**Osteoporosis increases the risk of bone fractures**	I know	60	40.00	52	34.70	112	37.30	
		To some extent	53	35.30	63	42.00	116	38.70	1.489
		I don't know	37	24.70	35	23.30	72	24.00	
3	**Osteoporosis is a condition of low bone density**	I know	33	22.00	22	14.70	55	18.40	
		To some extent	34	22.70	33	22.00	67	22.30	3.024
		I don't know	83	55.30	95	63.30	178	59.30	
4	**Women are more prone to develop osteoporosis**	I know	123	82.00	114	76.00	237	79.00	
		To some extent	20	13.30	32	21.30	52	17.30	3.929
		I don't know	7	4.70	4	2.70	11	3.70	
5	**Women are more likely to develop osteoporosis after menopause**	I know	56	37.30	46	30.70	102	34.00	
		To some extent	48	32.00	78	52.00	126	42.00	13.679***
		I don't know	46	30.70	26	17.30	72	24.00	
6	**Early menopause (before the age of 45) in women makes them more susceptible to osteoporosis**	I know	48	32.00	40	26.70	88	29.30	
		To some extent	49	32.70	79	52.60	128	42.70	13.520***
		I don't know	53	35.30	31	20.70	84	28.00	
7	**The speed of bone loss occurs after menopause**	I know	41	27.40	54	36.00	95	31.70	
		To some extent	56	37.30	64	42.70	120	40.00	7.501*
		I don't know	53	35.30	32	21.30	85	28.30	
8	**Osteoporosis often affects older people**	I know	108	72.00	118	78.70	226	75.30	
		To some extent	32	21.30	23	15.30	55	18.30	1.968
		I don't know	10	6.70	9	6.00	19	6.40	
9	**Osteoporosis is a hereditary disease**	I know	40	26.70	44	29.30	84	28.00	
		To some extent	51	34.00	34	22.70	85	28.30	4.881
		I don't know	59	39.30	72	48.00	131	43.70	
10	**Osteoporosis is not a contagious disease**	I know	118	78.70	100	66.70	218	72.60	
		To some extent	14	9.30	24	16.00	38	12.70	5.572
		I don't know	18	12.00	26	17.30	44	14.70	
11	**Osteoporosis can occur without symptoms in the long term**	I know	55	36.70	73	48.60	128	42.70	
		To some extent	54	36.00	43	28.70	97	32.30	4.432
		I don't know	41	27.30	34	22.70	75	25.00	
12	**Spinal curvature is a symptom of osteoporosis**	I know	39	26.00	58	38.70	97	32.30	
		To some extent	56	37.30	64	42.60	120	40.00	13.038***
		I don't know	55	36.70	28	18.70	83	27.70	
13	**Osteoporosis can lead to the shortening of height**	I know	22	14.70	37	24.70	59	19.70	
		To some extent	61	40.60	80	53.30	141	47.00	17.934***
		I don't know	67	44.70	33	22.00	100	33.30	
14	**Hyperthyroidism may increase the risk of osteoporosis**	I know	16	10.70	13	8.70	29	9.70	
		To some extent	17	11.30	14	9.30	31	10.30	0.751
		I don't know	117	78.00	123	82.00	240	80.00	
15	**Sedentary lifestyle may increase the risk of osteoporosis**	I know	88	58.70	78	52.00	166	55.30	
		To some extent	45	30.00	53	35.30	98	32.70	1.367
		I don't know	17	11.30	19	12.70	36	12.00	

Table 2. Cont.

No.	Item	Response	Healthy women		Patients		Total		Chi-Square
			No.	(%)	No.	(%)	No.	(%)	
16	Lack of estrogen is a common cause of osteoporosis in women	I know	34	22.70	16	10.70	50	16.70	17.224***
		To some extent	44	29.30	77	51.30	121	40.30	
		I don't know	72	48.00	57	38.00	129	43.00	
17	Smoking is harmful to bone health	I know	121	80.70	116	77.30	237	79.00	2.378
		To some extent	26	17.30	26	17.30	52	17.30	
		I don't know	3	2.00	8	5.40	11	3.70	
18	Deficiency of calcium in meals causes osteoporosis	I know	73	48.70	86	57.30	159	53.00	16.186***
		To some extent	35	23.30	49	32.70	84	28.00	
		I don't know	42	28.00	15	10.00	57	19.00	
19	Inadequate vitamin D in meals causes osteoporosis	I know	64	42.60	79	52.60	143	47.60	15.399***
		To some extent	43	28.70	55	36.70	98	32.70	
		I don't know	43	28.70	16	10.70	59	19.70	
20	A meat-rich diet causes osteoporosis	I know	43	28.70	73	48.70	116	38.70	12.848**
		To some extent	66	44.00	50	33.30	116	38.70	
		I don't know	41	27.30	27	18.00	68	22.60	
21	Bone density testing should be done until the age of 65 years old for women	I know	6	4.00	9	6.00	15	5.00	0.689
		To some extent	23	15.30	24	16.00	47	15.70	
		I don't know	121	80.70	117	78.00	238	79.30	
22	Osteoporosis can be prevented	I know	111	74.00	99	66.00	210	70.00	2.354
		To some extent	30	20.00	38	25.30	68	22.70	
		I don't know	9	6.00	13	8.70	22	7.30	
23	Exposure to sunlight in the early morning or before sunset is beneficial for bones	I know	86	57.30	74	49.30	160	53.30	2.005
		To some extent	46	30.70	53	35.30	99	33.00	
		I don't know	18	12.00	23	15.40	41	13.70	
24	Exercise improves bone health	I know	69	46.00	49	32.70	118	39.30	10.765**
		To some extent	66	44.00	67	44.60	133	44.30	
		I don't know	15	10.00	34	22.70	49	16.40	
25	There is relationship between food habits and osteoporosis	I know	76	50.70	58	38.70	134	44.70	5.658
		To some extent	41	27.30	59	39.30	100	33.30	
		I don't know	33	22.00	33	22.00	66	22.00	
26	Women need to increase the amount of calcium intake after menopause	I know	45	30.00	66	44.00	111	37.00	14.355***
		To some extent	30	20.00	41	27.30	71	23.70	
		I don't know	75	50.00	43	28.70	118	39.30	
27	Women need to increase the amount of vitamin D intake as they age advanced	I know	64	42.70	95	63.30	159	53.00	31.366***
		To some extent	33	22.00	42	28.00	75	25.00	
		I don't know	53	35.30	13	8.70	66	22.00	
28	Dietary sources rich in calcium is milk, yoghurt, cheese and eggs	I know	142	94.70	141	94.00	283	94.30	2.070
		To some extent	8	5.30	7	4.70	15	5.00	
		I don't know	0	0.00	2	1.30	2	0.70	
29	Dietary sources rich in vitamin D is egg yolks and fortified milk with vitamin D	I know	122	81.30	140	93.30	262	87.30	11.737**
		To some extent	22	14.70	10	6.70	32	10.70	
		I don't know	6	4.00	0	0.00	6	2.00	
30	Sardines are rich sources of calcium and vitamin D	I know	28	18.70	44	29.30	72	24.00	4.915
		To some extent	31	20.70	24	16.00	55	18.30	
		I don't know	91	60.60	82	54.70	173	57.7	

Table 2. Cont.

No.	Item	Response	Healthy women		Patients		Total		Chi-Square
			No.	(%)	No.	(%)	No.	(%)	
31	**Increase the proportion of salt in foods is harmful to bone health**	I know	104	69.30	99	66.00	203	67.60	0.393
		To some extent	32	21.30	36	24.00	68	22.70	
		I don't know	14	9.40	15	10.00	29	9.70	
32	**Minerals elements such as magnesium, manganese, zinc and potassium maintain bone health**	I know	13	8.70	6	4.00	19	6.30	4.797
		To some extent	35	23.30	48	32.00	83	27.70	
		I don't know	102	68.00	96	64.00	198	66.00	
33	**Vitamins C, K and A which some their dietary sources is citrus, green leafy vegetables and carrots help maintain bone health**	I know	30	20.00	33	22.00	63	21.00	5.644
		To some extent	61	40.70	77	51.30	138	46.00	
		I don't know	59	39.30	40	26.70	99	33.00	
34	**Pregnant women who don't take adequate amount of calcium and vitamin C lead to weakness of bone health**	I know	65	43.30	69	46.00	134	44.70	4.425
		To some extent	49	32.70	59	39.30	108	36.00	
		I don't know	36	24.00	22	14.70	58	19.30	
	Total		**150**	**100.0**	**150**	**100.0**	**300**	**100.0**	

*p<0.05 ** p<0.01 *** p<0.001

patients were aware about this. About 48.7% of patients were aware about "a meat-rich diet causes osteoporosis", while, 28.7% of healthy women knew that. The majority of the respondents didn't know that bone density testing should be done until the age of 65 years for women. Most of participants were aware about osteoporosis can be prevented. About 57.3% of healthy women were aware about "exposure to sunlight in the early morning or before sunset is beneficial for bones" and 49.3% of patients were aware that. Most of healthy women (46 and 50.7%) were aware about exercise improves bone health and there is relationship between food habits and osteoporosis, respectively. While, 32.7 and 38.7% of patients were aware about this. Furthermore, 44% of patients were aware about women need to increase the amount of calcium intake after menopause and it was 30% of healthy women were aware about this. On other hand, 63.3% of patients knew that women need to increase the amount of vitamin D intake as they age advanced, followed by 42.7% from healthy women were knew that. The majority of the respondents were aware about dietary sources rich in calcium and vitamin D. Most of participants didn't know that sardines are rich sources of calcium and vitamin D. Approximately two-thirds of respondents were aware about increase the proportion of salt in foods is harmful to bone health. Low percentage of participants knew that some minerals and vitamins help maintain bone health. Finally, 46% of patients were aware about pregnant women who do not take adequate amount of calcium and vitamin C lead to weakness of bone health, followed by 43.3% of healthy women were knew that. It is obvious from the present study that there were statistically significant differences in some knowledge items number (5, 6, 7, 12, 13, 16, 18, 19, 20, 24, 26, 27 and 29) regarding general knowledge about osteoporosis among all studies subjects (healthy women and patients).

Risk Factors of Osteoporosis

Table 3 illustrates per cent distribution of the participants according to their knowledge about risk factors of osteoporosis. The results showed that the highest percentage 90.7 and 88.7% of patients and healthy women, respectively knew that low or no consumption of milk and dairy products as risk factor of osteoporosis. More than half of participants didn't know consumption of salty foods frequently as risk factor of osteoporosis. Most of respondents were aware about drink tea & coffee and soft drinks frequently considered as dietary risk factors for osteoporosis. More than one-third of healthy women and more than forty percentage of patients knew that low dietary intake of calcium and vitamin D as risk factor of osteoporosis. The majority of subjects didn't know low dietary intake of magnesium, potassium, copper, zinc

Table 3. Percent distribution of the respondents according to their knowledge about risk factors of osteoporosis

No.	Item	Response	Healthy women		Patients		Total		Chi-Square
			No.	(%)	No.	(%)	No.	(%)	
1	Low or no consumption of milk and dairy products	I know	133	88.70	136	90.70	269	89.70	0.462
		To some extent	12	8.00	9	6.00	21	7.00	
		I don't know	5	3.30	5	3.30	10	3.30	
2	Consumption of salty foods frequently	I know	24	16.00	13	8.70	37	12.40	4.129
		To some extent	44	29.30	53	35.30	97	32.30	
		I don't know	82	54.70	84	56.00	166	55.30	
3	Drink tea and coffee frequently	I know	99	66.00	102	68.00	201	67.00	1.375
		To some extent	33	22.00	36	24.00	69	23.00	
		I don't know	18	12.00	12	8.00	30	10.00	
4	Consumption of soft drinks frequently	I know	107	71.30	106	70.70	213	71.00	1.117
		To some extent	30	20.00	35	23.30	65	21.70	
		I don't know	13	8.70	9	6.00	22	7.30	
5	Low dietary intake of calcium	I know	59	39.30	65	43.30	124	41.30	12.000**
		To some extent	51	34.00	68	45.30	119	39.70	
		I don't know	40	26.70	17	11.40	57	19.00	
6	Low dietary intake of vitamin D	I know	52	34.70	67	44.70	119	39.60	25.572***
		To some extent	44	29.30	66	44.00	110	36.70	
		I don't know	54	36.00	17	11.30	71	23.70	
7	Low dietary intake of magnesium, potassium, copper and zinc	I know	6	4.00	3	2.00	9	3.00	1.037
		To some extent	24	16.00	25	16.70	49	16.30	
		I don't know	120	80.00	122	81.30	242	80.70	
8	Low dietary intake of vitamin K	I know	10	6.70	7	4.70	17	5.70	3.528
		To some extent	29	19.30	43	28.70	72	24.00	
		I don't know	111	74.00	100	66.60	211	70.30	
9	Excessive foods intake rich in phosphorus such as red meat and dairy products	I know	11	7.30	7	4.70	18	6.00	1.185
		To some extent	25	16.70	29	19.30	54	18.00	
		I don't know	114	76.00	114	76.00	228	76.00	
10	Excessive foods intake rich in protein such as meat	I know	52	34.70	68	45.30	120	40.00	3.676
		To some extent	82	54.60	67	44.70	149	49.70	
		I don't know	16	10.70	15	10.00	31	10.30	
11	Low or no consumption of green leafy vegetables	I know	103	68.60	115	76.70	218	72.70	2.491
		To some extent	40	26.70	29	19.30	69	23.00	
		I don't know	7	4.70	6	4.00	13	4.30	
12	High consumption of bran	I know	28	18.70	22	14.70	50	16.70	2.339
		To some extent	54	36.00	47	31.30	101	33.70	
		I don't know	68	45.30	81	54.00	149	49.60	
13	Lack of exposed to sunlight in the early morning or at sunset	I know	91	60.70	89	59.30	180	60.00	0.176
		To some extent	47	31.30	47	31.30	94	31.30	
		I don't know	12	8.00	14	9.40	26	8.70	
14	Low or no consumption of canned fish with bones	I know	29	19.30	22	14.70	51	17.00	3.897
		To some extent	48	32.00	38	25.30	86	28.70	
		I don't know	73	48.70	90	60.00	163	54.30	
15	Low weight	I know	95	63.30	110	73.30	205	68.30	5.251
		To some extent	34	22.70	30	20.00	64	21.30	
		I don't know	21	14.00	10	6.70	31	10.40	

Table 3. Cont.

No.	Item	Response	Healthy women		Patients		Total		Chi-Square
			No.	(%)	No.	(%)	No.	(%)	
16	**Use cortisone for a long time**	I know	17	11.30	91	12.70	36	12.00	
		To some extent	27	18.00	40	26.70	67	22.30	3.776
		I don't know	106	70.70	81	60.60	197	65.70	
17	**Smoking**	I know	130	86.60	118	78.70	248	82.70	
		To some extent	10	6.70	27	18.00	37	12.30	10.058**
		I don't know	10	6.70	5	3.30	15	5.00	
18	**Old age**	I know	128	85.30	114	76.00	242	80.70	
		To some extent	18	12.00	31	20.70	49	16.30	4.370
		I don't know	4	2.70	5	3.30	9	3.00	
19	**Positive family history of osteoporosis**	I know	30	20.00	40	26.70	70	23.30	
		To some extent	85	56.70	83	55.30	168	56.00	2.485
		I don't know	35	23.30	27	18.00	62	20.70	
20	**Consumption of alcohols**	I know	30	20.00	45	30.00	75	25.00	
		To some extent	31	20.70	31	20.70	62	20.70	4.380
		I don't know	89	59.30	74	49.30	163	54.30	
21	**Lack of exercise**	I know	77	51.30	56	37.30	133	44.30	
		To some extent	52	34.70	72	48.00	124	41.30	6.565*
		I don't know	21	14.00	22	14.70	43	14.40	
	Total		**150**	**100.0**	**150**	**100.0**	**300**	**100.0**	

*p<0.05 ** p<0.01 *** p<0.001

and vitamin K and excessive foods intake rich in phosphorus are risk factors of osteoporosis. Also, the results indicated that the most percentage of patients (45.3%) knew that excessive foods intake rich in protein such as meat is risk factor, while, there were 34.70% of healthy women were knew that. Furthermore, 68.6 and 76.7% of healthy women and patients, respectively, were aware about low or no consumption of green leafy vegetables considered as dietary risk factor. On the other hand, most of healthy women and patients (45.3 and 54%), respectively, didn't know high consumption of bran as risk factor for osteoporosis. Almost (60%) of respondents were aware about lack of exposed to sunlight is risk factor for osteoporosis. Most of participants didn't know that low or no consumption of canned fish with bones considered as dietary risk factor. The majority of respondents were aware about low weight, smoking and old age are risk factors for osteoporosis. The highest percentage (70.7% and 60.6%) of healthy women and patients, respectively, didn't know that use cortisone for a long time considered as risk factor. Only 20 and 26.7% of healthy women and patients, respectively, were aware about positive family history of osteoporosis is risk factor for osteoporosis. 59.3 and 49.3% of healthy women and patients, respectively, didn't know that consumption of alcohols is risk factor. Approximately half of healthy women knew that lack of exercise is risk factor, while, it was 37.3% of patients were knew that. It is specific from the present study there were statistically significant differences in some knowledge items number (5, 6, 17 and 21) regarding risk factors of osteoporosis among all studied subjects (healthy women and patients). **Hossien *et al.* (2014)** reported that low percentage of female adolescents students knew that advanced age (29.8%), low calcium intake (5.7%) and excess

in drinking of soft drinks (1.8%) as risk factors of osteoporosis in El-Minia, Egypt. **Tayel *et al.* (2013)** found that most of the university female students knew that excessive dietary intake of protein (99.3%), sodium (99%) and phosphorous (93.3%), low consumption of milk (91.7%) and green leafy vegetables (62%) are risk factors of osteoporosis in Alexandria University. **Mohamed and Tayel (2012)** noticed that women considered some factors as rick factors of osteoporosis such as old age (23.6%), low body weight (41.8%), smoking (25.5%) in Alexandria.

Protective Factors of Osteoporosis

As illustrated in the Table 4, most of subjects didn't know that consumption of fish with bones such as sardines, decrease consumption of dark bread and low consumption of salty foods such as pickles are protective factors for osteoporosis. About 42 and 40% of healthy women and patients, respectively, were aware about consumption dark green leafy vegetables is protective factor. Moreover, 57.3% of healthy women and 74% of patients knew that adequate consumption of meat and poultry considered as protective factor. The majority of participants were aware of the benefits of consumption of foods rich in calcium and vitamin D in preventing osteoporosis. Meanwhile, only 17.3% of healthy women and 29.3% of patients knew that calcium supplementation as preventive measures for osteoporosis. Whereas, 60.7% of respondents were aware of the benefits of exposure sunlight in the early morning or before sunset in preventing osteoporosis. In addition, the highest percentage of healthy women (52%) knew that adequate physical activity is protective factor, while it was 32.7% of patients were knew that. Furthermore, half of patients and 35.3% of healthy women were aware about consumption of food rich in vitamin C, such as citrus, considered as protective factor. It is clear from the present study that there were statistically significant differences in some knowledge items number (2, 3, 5, 8, 10 and 11) regarding protective factors of osteoporosis among all studied subjects (healthy women and patients). **Hossien *et al.* (2014)** showed that most of samples knew that exercise and exposure to sunlight are preventive factors for osteoporosis (94.6 and 90.2% respectively), while, only 7.1% knew that eating diet rich in calcium and vitamin (D) are preventive factors in El-Minia, Egypt.

Food Behavior of Participants

Table 5 describes food behavior of participants. For the healthy behavior, the highest percentage of participants sometimes consume milk, cheese and yoghurt, fresh juices and dark leafy vegetables. The majority of the healthy women and patients (83.3 and 77.3%), respectively rarely consume canned fish with bones. Also, 64.6 and 62% of healthy women and patients rarely consume soy-fortified foods. Most of respondents always consume foods fortified with vitamin D and foods rich in vitamin C. About 48 and 41.3% of healthy women and patients, respectively, eat magnesium-rich foods. Furthermore. 92.7 and 80.7% of healthy women and patients, respectively, always used a moderate amount of salt when preparing foods. For the unhealthy behavior, low percentage of participants always consume dark bread, pickles alternative to green salad and salty fish. Meanwhile, most of respondents sometimes eat meat and poultry. The majority of the healthy women and patients (72 and 73.3%), respectively always drink tea. While, most of respondents rarely drink coffee. About 46% from healthy women and 60% of patients sometimes drink soft drinks instead of fresh juices and water. There were statistically significant differences in some food behavior items number (1, 2, 5, 7, 10 and 15) among all studied subjects (healthy women and patients). **Mohamed and Tayel (2012)** showed that 68.2% of women consume dairy products, 86.4% green leafy vegetables, 22.7% fish with bones, 10% nuts, 98.1% dark bread, 69.15 meat and/or poultry, 45.5% salted foods, 80.9% tea and/or coffee and 28.2% soft drinks in Alexandria, Egypt.

Level of Knowledge About Osteoporosis

As shown in Table 6, the results illustrated that the highest percentage of participants had average level of general knowledge, knowledge of rick factors and knowledge of protective factors about osteoporosis. Thus, the majority of

Table 4. Percent distribution of the respondents according to their knowledge about protective factors of osteoporosis

No.	Item	Response	Healthy women		Patients		Total		Chi-Square
			No.	(%)	No.	(%)	No.	(%)	
1	**Consumption of fish with bones such as sardines**	I know	28	18.70	31	20.70	59	19.70	5.984
		To some extent	45	30.00	27	18.00	72	24.00	
		I don't know	77	51.30	92	61.30	169	56.30	
2	**Consumption dark green leafy vegetables**	I know	63	42.00	60	40.00	123	41.00	7.859*
		To some extent	63	42.00	80	53.30	143	47.70	
		I don't know	24	16.00	10	6.70	34	11.30	
3	**Adequate consumption of meat and poultry**	I know	86	57.30	111	74.00	197	65.70	12.680**
		To some extent	55	36.70	38	25.30	93	31.00	
		I don't know	9	6.00	1	0.70	10	3.30	
4	**Decrease consumption of dark bread**	I know	19	12.70	8	5.30	27	9.00	5.310
		To some extent	49	32.70	48	32.00	97	32.30	
		I don't know	82	54.60	94	62.70	176	58.70	
5	**Low consumption of salty foods such as pickles**	I know	15	10.00	31	20.70	46	15.30	10.148**
		To some extent	34	22.70	43	28.70	77	25.70	
		I don't know	101	67.30	76	50.60	177	59.00	
6	**Consumption of foods rich in calcium, such as milk and dairy products**	I know	133	88.60	124	82.60	257	85.60	5.905
		To some extent	13	8.70	25	16.70	38	12.70	
		I don't know	4	2.70	1	0.70	5	1.70	
7	**Consumption of food rich in vitamin D such as egg yolks and fortified foods with vitamin D**	I know	130	86.60	127	84.70	257	85.70	3.120
		To some extent	13	8.70	20	13.30	33	11.00	
		I don't know	7	4.70	3	2.00	10	3.30	
8	**Calcium supplementation**	I know	26	17.30	44	29.30	70	23.30	10.165**
		To some extent	57	38.00	63	42.00	120	40.00	
		I don't know	67	44.70	43	28.70	110	36.70	
9	**Exposure to sunlight in the early morning or before sunset**	I know	91	60.70	91	60.70	182	60.70	2.011
		To some extent	51	34.00	45	30.00	96	32.00	
		I don't know	8	5.30	14	9.30	22	7.30	
10	**Adequate physical activity**	I know	78	52.00	49	32.70	127	42.30	12.769**
		To some extent	50	33.30	78	52.00	128	42.70	
		I don't know	22	14.70	23	15.30	45	15.00	
11	**Consumption of food rich in vitamin C, such as citrus**	I know	53	35.30	75	50.00	128	42.70	7.238*
		To some extent	47	31.40	41	27.30	88	29.30	
		I don't know	50	33.30	34	22.70	84	28.00	
	Total		**150**	**100.0**	**150**	**100.0**	**300**	**100.0**	

*p<0.05 ** p<0.01

Table 5. Percent distribution of the participants according to their food behavior

No.	Item	Response	Healthy women		Patients		Total		Chi-Square
			No.	(%)	No.	(%)	No.	(%)	
1	I drink milk constantly	Always	31	20.70	36	24.00	67	22.30	
		Sometimes	84	56.00	102	68.00	186	62.00	13.370***
		Rarely	35	23.30	12	8.00	47	15.70	
2	I always eat cheese and yoghurt	Always	36	24.00	26	17.30	62	20.70	
		Sometimes	89	59.30	111	74.00	200	66.60	7.822*
		Rarely	25	16.70	13	8.70	38	12.70	
3	I always consume fresh juices	Always	56	37.30	59	39.30	115	38.30	
		Sometimes	78	52.00	75	50.00	153	51.00	0.137
		Rarely	16	10.70	16	10.70	32	10.70	
4	I eat dark leafy vegetables constantly	Always	37	24.70	51	34.00	88	29.30	
		Sometimes	74	49.30	55	36.70	129	43.00	5.327
		Rarely	39	26.00	44	29.30	83	27.70	
5	I consume canned fish with bones such as salmon frequently	Always	12	8.00	6	4.00	18	6.00	
		Sometimes	13	8.70	28	18.70	41	13.70	7.824**
		Rarely	125	83.30	116	77.30	241	80.30	
6	I eat soy-fortified foods	Always	13	8.70	9	6.00	22	7.40	
		Sometimes	40	26.70	48	32.00	88	29.30	1.539
		Rarely	97	64.60	93	62.00	190	63.30	
7	I consume foods fortified with vitamin D	Always	81	54.00	93	62.00	174	58.00	
		Sometimes	39	26.00	44	29.30	83	27.70	7.850*
		Rarely	30	20.00	13	8.70	43	14.30	
8	I eat magnesium-rich foods such as green vegetables, nuts and dried beans & peas	Always	72	48.00	62	41.30	134	44.60	
		Sometimes	57	38.00	68	45.30	125	41.70	1.739
		Rarely	21	14.00	20	13.40	41	13.70	
9	I eat foods rich in vitamin C such as citrus	Always	88	58.70	85	56.70	173	57.60	
		Sometimes	50	33.30	45	30.00	95	31.70	2.315
		Rarely	12	8.00	20	13.30	32	10.70	
10	I am using a moderate amount of salt when preparing foods	Always	139	92.70	121	80.70	260	86.70	
		Sometimes	8	5.30	23	15.30	31	10.30	9.504**
		Rarely	3	2.00	6	4.00	9	3.00	
11	I consume dark bread constantly	Always	18	12.00	13	8.70	31	10.30	
		Sometimes	33	22.00	35	23.30	68	22.70	0.910
		Rarely	99	66.00	102	68.00	201	67.00	
12	I consume pickles alternative to green salad	Always	26	17.30	21	14.00	47	15.70	
		Sometimes	75	50.00	73	48.70	148	49.30	1.026
		Rarely	49	32.70	56	37.30	105	35.00	
13	I consume salty fish constantly	Always	10	6.70	6	4.00	16	5.40	
		Sometimes	34	22.70	27	18.00	61	20.30	2.346
		Rarely	106	70.60	117	78.00	223	74.30	
14	I eat meat frequently	Always	33	22.00	26	17.40	59	19.70	
		Sometimes	66	44.00	86	57.30	152	50.60	5.361
		Rarely	51	34.00	38	25.30	89	29.70	
15	I eat poultry frequently	Always	39	26.00	23	15.30	62	20.70	
		Sometimes	92	61.30	112	74.70	204	68.00	6.560*
		Rarely	19	12.70	15	10.00	34	11.30	

Table 5. Cont.

No.	Item	Response	Healthy women		Patients		Total		Chi-Square
			No.	(%)	No.	(%)	No.	(%)	
16	**I drink tea frequently**	Always	108	72.00	110	73.30	218	72.60	
		Sometimes	20	13.30	24	16.00	44	14.70	1.329
		Rarely	22	14.70	16	10.70	38	12.70	
17	**I drink coffee frequently**	Always	45	30.00	33	22.00	78	26.00	
		Sometimes	42	28.00	37	24.70	79	26.30	4.184
		Rarely	63	42.00	80	53.30	143	47.70	
18	**I drink soft drinks such as Pepsi and Coca Cola instead of fresh juices and water**	Always	41	27.30	29	19.30	70	23.30	
		Sometimes	69	46.00	90	60.00	159	53.00	5.972
		Rarely	40	26.70	31	20.70	71	23.70	
	Total		**150**	**100.0**	**150**	**100.0**	**300**	**100.0**	

*p<0.05 ** p<0.01 *** p<0.001

Table 6. Percent distribution of participants according to level of knowledge about osteoporosis

Knowledge level	Healthy women		Patients		Total		T-Test
	No.	(%)	No.	(%)	No.	(%)	
General knowledge of osteoporosis							
Low (23-36 Degree)	64	42.70	34	22.70	98	32.70	
Average (37-50 Degree)	78	52.00	107	71.30	185	61.60	-2.775**
High (51-64 Degree)	8	5.30	9	6.00	17	5.70	
Risk factors							
Low (14-21 Degree)	59	39.30	37	24.70	96	32.00	
Average (22-30 Degree)	82	54.70	108	72.00	190	63.30	-1.587
High (31-39 Degree)	9	6.00	5	3.30	14	4.70	
Protective factors							
Low (6-10 Degree)	29	19.30	12	8.00	41	13.70	
Average (11-15 Degree)	87	58.00	117	78.00	204	68.00	2.011*
High (16-21 Degree)	34	22.70	21	14.00	55	18.30	
Total knowledge							
Low (47-70 Degree)	63	42.00	35	23.30	98	32.70	
Average (71-94 Degree)	75	50.00	110	73.30	185	61.70	-2.587**
High (95-118 Degree)	12	8.00	5	3.40	17	5.60	
Total	**150**	**100.00**	**150**	**100.00**	**300**	**100.00**	

*p<0.05 ** p<0.01

subjects (50 and 73.3%) of healthy women and patients, respectively, had average level of total knowledge about osteoporosis (71-94 degree). While, 42% and 23.3% had low level of total knowledge (47-70 degree) of healthy women and patients, respectively. This results may be due to the highest percentage of educational level for healthy women was 44% (secondary school), whereas, in patients was 43.3% (bachelor). It is obvious from the present study there were significant differences between subjects (healthy women and patients) and levels of knowledge (general knowledge, the knowledge of protective factors and the knowledge) about osteoporosis. **Kahnamouei-aghdam *et al.* (2015)** reported that about 10.7% of female students had a good, 60.7% had moderate and 28.7% had a poor awareness about osteoporosis. **Tayel *et al.* (2013)** showed that knowledge of general information about osteoporosis was fair (57.7%), whereas, risk factors knowledge and preventive behaviors towards osteoporosis was poor (59% and 58.3%, respectively) in Alexandria University.

Food Behavior Level of Respondents About Osteoporosis

As shown in Table 7, the majority of healthy women and patients (68 and 71.3%), respectively, had average level about food behavior (17-22 degree). While, 16 and 21.3% of healthy women and patients had high level (23-28 degree), respectively. This results may be due to most of patients has high level of education as well as they has information about osteoporosis from the caring doctor. There are no significant differences between subjects and levels of food behavior about osteoporosis.

Association Between Personal And Socio-Demographic Characteristics of Respondents and Total Knowledge Level About Osteoporosis

As illustrated in the Table 8, the highest percentage of healthy women and patients from low knowledge about osteoporosis (63.5 and 62.9%), respectively, was found among overweight group. Most of healthy women (50.7%) who had average level of knowledge were found among the group aged 24 < 40 years old, and this association is statically significant. Also, 40% of patients who had high level of knowledge were found in the same group age. **Elsabagh *et al.* (2015)** reported that there was significantly higher knowledge level (54.9%) was found towards the group aged 35-50 years old whereas, the frequency of poor knowledge towards those above 50 years old was 43.70% in Tanta University.

Most of participants who had average level of knowledge have high education level (bachelor). About 66.7% of healthy women who had low level of knowledge were found in housewife group. While, 48.2% of patients who had average level of knowledge were found in the same group, and this association is statically significant. The majority of subjects who had average level of knowledge were found in married group. The highest percentage of respondents from low level of knowledge was lived in rural and has family income 2000 < 4000 LE per month. 41.67 and 60% of healthy women and patients, respectively, who had high level of knowledge have someone suffering from osteoporosis. About 84% of healthy women and 60.9% of patients who had average level of knowledge have menstruation and this association is statically significant. The majority of participants for all levels of knowledge were nonsmokers. Healthy women (30.7%) and patients (45.5%) who had average level of knowledge have fractures and this association is statically significant. Only 32% of healthy women and 23.6% of patients who had average level of knowledge do practiced exercises. 61.3 and 49.1% of healthy women and patients, respectively, who had average level of knowledge were found exposed to sunshine. The majority of healthy women for all knowledge levels don't take calcium and vitamin D supplements, on the contrary, patients take this micronutrients, and this association is statically significant.

Association Between Food Behavior and General Knowledge, Protective Factors, Risk Factors and Total Knowledge of Osteoporosis

The results defined that the highest percentage of healthy women and patients from high level of food behavior about osteoporosis was 58.3 and 68.8%, respectively, had average

Table 7. Percent distribution of respondents according to level of food behavior about osteoporosis

Knowledge level	Health women		patients		Total		T-Test
	No.	(%)	No.	(%)	No.	(%)	
Low (12-16 degree)	24	16.00	11	7.40	35	11.70	
Average (17-22 degree)	102	68.00	107	71.30	209	69.70	1.871
High (23-28 degree)	24	16.00	32	21.30	56	18.60	
Total	**150**	**100.00**	**150**	**100.00**	**300**	**100.00**	

Table 8. Association between personal and socio- demographic characteristics of respondents and total knowledge level about osteoporosis

Personal and socioeconomic factors	Healthy women						Patients						Total	
	Knowledge level													
	Low		Average		High		Low		Average		High			
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Body Mass Index (BMI)														
Underweight <18.5	0	0.00	0	0.00	0	0.00	1	2.90	1	0.90	0	0.00	2	0.70
Normal weight 18.5-24.9	13	20.60	20	26.70	6	50.00	6	17.10	21	19.10	1	20.00	67	22.30
Over weight 25-29.9	40	63.50	45	60.00	3	25.00	22	62.90	65	59.10	3	60.00	178	59.30
Obese 30≤	9	14.30	10	13.30	3	25.00	6	17.10	23	20.90	1	20.00	52	17.30
Morbidly obese 40≤	1	1.60	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	0.40
Chi-Square	Low level (2.619) – Sig. (0.624)						Average level (3.278) – Sig. (0.351)						High level (2.035) – Sig. (0.362)	
Age														
16 < 19	9	14.30	3	4.00	2	16.70	3	8.60	3	2.70	0	0.00	20	6.70
19 < 24	14	22.20	14	18.70	1	8.30	3	8.60	14	12.70	0	0.00	46	15.30
24 < 40	15	23.80	38	50.70	6	50.00	2	5.70	29	26.40	2	40.00	92	30.70
40 - 55	17	27.00	16	21.30	2	16.70	13	37.10	43	39.10	2	40.00	93	31.00
More than 55	8	12.70	4	5.30	1	8.30	14	40.00	21	19.10	1	20.00	49	16.30
Chi-Square	Low level (15.493) – Sig. (0.004)						Average level (19.190) – Sig. (0.001)						High level (2.550) – Sig. (0.636)	
Education level														
Illiterate	20	31.70	0	0.00	0	0.00	17	48.60	3	2.70	0	0.00	40	13.30
Reads and writes	1	1.60	1	1.30	0	0.00	2	5.70	7	6.40	0	0.00	11	3.70
primary school	1	1.60	0	0.00	0	0.00	0	0.00	4	3.60	0	0.00	5	1.70
Secondary school	37	58.70	27	36.00	2	16.70	12	34.30	40	36.40	0	0.00	118	39.30
Bachelor	4	6.40	45	60.00	9	75.00	4	11.40	56	50.90	5	100.0	123	41.00
(M.Sc. / Ph.D.) degree	0	0.00	2	2.70	1	8.30	0	0.00	0	0.00	0	0.00	3	1.00
Chi-Square	Low level (6.894) – Sig. (0.142)						Average level (10.992) – Sig. (0.052)						High level (1.518) – Sig. (0.468)	
Job														
Student	13	20.60	12	16.00	4	33.40	3	8.60	5	4.50	0	0.00	37	12.40
Employee	8	12.70	28	37.30	7	58.30	6	17.10	52	47.30	5	100.0	106	35.30
Housewife	42	66.70	35	46.70	1	8.30	26	74.30	53	48.20	0	0.00	157	52.30
Chi-Square	Low level (2.505) – Sig. (0.286)						Average level (7.408) – Sig. (0.025)						High level (2.951) – Sig. (0.229)	
Marital status														
Married	51	81.00	62	82.70	7	58.30	33	94.30	100	90.90	5	100.0	258	86.00
Single	12	19.00	13	17.30	5	41.70	2	5.70	10	9.10	0	0.00	42	14.00
Chi-Square	Low level (3.267) – Sig. (0.071)						Average level (2.783) – Sig. (0.095)						High level (2.951) – Sig. (0.086)	
Residence area														
Rural	45	71.40	37	49.30	5	41.70	21	60.00	62	56.40	2	40.00	172	57.30
Urban	18	28.60	38	50.70	7	58.30	14	40.00	48	43.60	3	60.00	128	42.70
Chi-Square	Low level (1.336) – Sig. (0.248)						Average level (0.886) – Sig. (0.347)						High level (0.004) – Sig. (0.949)	

Table 8. Cont.

Personal and socioeconomic factors	Healthy women						Patients						Total	
	Knowledge level													
	Low		Average		High		Low		Average		High			
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Monthly family income (LE)														
< 2000 LE	19	30.10	12	16.00	0	0.00	7	20.00	7	6.40	0	0.00	45	15.00
2000 < 4000 LE	26	41.30	36	48.00	4	33.30	27	77.10	49	44.50	1	20.00	143	47.70
4000 - 6000 LE	18	28.60	20	26.70	1	8.40	1	2.90	41	37.30	3	60.00	84	28.00
More than 6000 LE	0	0.00	7	9.30	7	58.30	0	0.00	13	11.80	1	20	28	9.30
Chi-Square	Low level (13.903) – Sig. (0.001)						Average level (5.924) – Sig. (0.115)						High level (5.320) – Sig. (0.70)	
History of osteoporosis in the family														
No	44	69.84	48	64.00	7	58.33	12	34.29	56	50.91	2	40.00	169	56.30
Yes	19	30.16	27	36.90	5	41.67	23	65.71	54	49.09	3	60.00	131	43.70
Chi-Square	Low level (11.615) – Sig. (0.001)						Average level (3.105) – Sig. (0.078)						High level(0.476) – Sig. (0.490)	
Menstruation condition														
No	21	33.30	12	16.00	3	25.00	22	62.90	43	39.10	3	60.00	104	34.70
Yes	42	66.70	63	84.00	9	75.00	13	37.10	67	60.90	2	40.00	196	65.30
Chi-Square	Low level (7.964) – Sig. (0.005)						Average level (11.382) – Sig. (0.001)						High level (1.893) – Sig. (0.169)	
Smoking														
No	62	98.40	75	100.0	12	100.0	35	100.0	110	100.0	5	100.0	299	99.70
Yes	1	1.60	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	0.30
Chi-Square	Low level (0.561) – Sig. (0.454)													
Fractures														
No	43	68.30	52	69.30	11	91.70	16	45.70	60	54.50	2	40.00	184	61.30
Yes	20	31.70	23	30.70	1	8.30	19	54.30	50	45.50	3	60.00	116	38.70
Chi-Square	Low level (4.771) – Sig. (0.029)						Average level (4.082) – Sig. (0.043)						High level (5.236) – Sig. (0.022)	
Practiced exercises														
No	51	81.00	51	68.00	3	25.00	34	97.10	84	76.40	3	60.00	226	75.30
Yes	12	19.00	24	32.00	9	75.00	1	2.90	26	23.60	2	40.00	74	24.70
Chi-Square	Low level (5.126) – Sig. (0.024)						Average level (1.582) – Sig. (0.209)						High level (1.893) – Sig. (0.169)	
Exposed to sunshine														
No	31	49.20	29	38.70	3	25.00	22	62.90	56	50.90	0	0.00	141	47.00
Yes	32	50.80	46	61.30	9	75.00	13	37.10	54	49.10	5	100.0	159	53.00
Chi-Square	Low level (1.688) – Sig. (0.194)						Average level (2.691) – Sig. (0.101)						High level (1.518) – Sig. (0.218)	
Calcium supplements														
No	60	95.20	72	96.00	11	91.70	5	14.30	9	8.20	0	0.00	157	52.30
Yes	3	4.80	3	4.00	1	8.30	30	85.70	101	91.80	5	100.0	143	47.70
Chi-Square	Low level (66.019) – Sig. (0.000)						Average level (139.726) – Sig. (0.000)						High level(12.986) – Sig. (0.000)	
Vitamin D supplements														
No	61	96.80	71	94.70	11	91.70	10	28.60	28	25.50	0	0.00	181	60.30
Yes	2	3.20	4	5.30	1	8.30	25	71.40	82	74.50	5	100.0	119	39.70
Chi-Square	Low level (52.513) – Sig. (0.000)						Average level (85.873) – Sig. (0.000)						High level(12.986) – Sig. (0.000)	
Total	**150**		**100.00**				**150**		**100.00**				**300**	**100.00**

level of general knowledge about osteoporosis (Table 9). In the same Table, the results indicated that the highest percentage of healthy women (66.7%) from high level of food behavior had average level from knowledge about protective factors of osteoporosis. While, the highest percentage of patients (90.9%) from low level of food behavior had average level from knowledge about protective factors of osteoporosis. The majority of healthy women and patients from average level of food behavior about osteoporosis were 58 and 83 women, respectively, had average level from knowledge about risk factors of osteoporosis and this association is statically significant. Finally, the results showed that most of participants who had average level of food behavior were from average level of total knowledge about osteoporosis and this association is statically significant.

Dietary Intake

Two categories (24 < 40 and 40-55 years old) from age were chosen to assess dietary intake because most of participants in this groups. Table 10 shows per cent distribution of participants (aged 24 < 40 years old) according to their dietary intake. The results illustrated that all of patients (100%) take less than recommended dietary allowance (RDA) of protein, while, the highest percentage (89.8%) of healthy women take nutritional requirements. These results may be due to low knowledge of patients about the importance of protein to maintain bone health. The highest percentage of patients don't take nutritional requirements from other macronutrients, whereas, healthy women take nutritional requirements. 87.9% of patients take less than recommended dietary allowance of vitamin D. Whereas, all healthy women (100%) take nutritional requirements of vitamin D. This results probably due to the majority of healthy women knew that dietary sources rich in vitamin D is egg yolks and fortified milk with vitamin D. Also, healthy women were aware about exposure to sunshine is beneficial for bones and most of them consume foods fortified with vitamin D. Almost all of healthy women take recommended dietary allowance from vitamin A, B6, C and K, whereas, patients take less than nutritional requirements. These results may be due to most of healthy women always consume foods rich in vitamin C such as citrus. All patients (100%) take less than recommended dietary allowance from calcium, whereas, the highest percentage of healthy women (91.5%) take nutritional requirements. These results probably due to the majority of healthy women were aware of the benefits of consumption of foods rich in calcium such as milk and dairy products in preventing osteoporosis. **Enright and Bai (2013)** found that the average calcium intake of the adult women exceeds the RDA for women ages 19-40. The highest percentage of healthy women take recommended dietary allowance from magnesium, manganese, phosphorus, potassium and zinc, meanwhile, patients don't take nutritional requirements. This results may be due to the majority of patients didn't know low dietary intake of magnesium, potassium and zinc are risk factors of osteoporosis. **Morgan (2008)** reported that there were some dietary components required for normal bone metabolism such as vitamins (D, K, A and C) and minerals (zinc, copper and magnesium). **Heaney (1993)** found that the potassium intake reduction is associated with an increased risk of osteoporotic fractures.

Table 11 presented the results of dietary intake for women who aged from 40 - 55 years old. The majority of patients (84.5%) take less than recommended dietary allowance (RDA) of protein. These results may be due to most of patients sometime consume meat and poultry. Meanwhile, 57.1% of healthy women take nutritional requirements from protein and 40% take more than nutritional requirements. **Devine *et al.* (2005)** suggested that protein intake of elderly women above current recommendations may be necessary to optimize bone mass. The highest percentage of patients take less than nutritional requirements from other macronutrients. Whereas, most of healthy women take recommended dietary allowance from this macronutrients. In the current study, results presented that all of patients take less than nutritional requirements from vitamin D, B6 and A. This results probably due to low consumption of foods containing vitamin D. While, 62.9% of healthy women take nutritional requirements from vitamin D and 25.7% take more than nutritional requirements. **Schild *et al.* (2015)**

Table 9. Association between food behavior and general knowledge, protective factors, risk factors and total knowledge of osteoporosis

Food behavior level	Healthy women						Patients						Chi-Square
	Knowledge level												
	Low		Average		High		Low		Average		High		
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	Value
General knowledge of osteoporosis													
Low	15	62.50	9	37.50	0	0.00	2	18.20	8	72.70	1	9.10	7.159*
Average	41	40.20	55	53.90	6	5.90	23	21.50	77	72.00	7	6.50	8.691**
High	8	33.30	14	58.30	2	8.40	9	28.10	22	68.80	1	3.10	1.048
Protective factors													
Low	5	20.80	13	54.20	6	25.00	1	9.10	10	90.90	0	0.00	4.906
Average	21	20.60	58	56.90	23	22.50	9	8.40	79	73.80	19	17.80	8.285**
High	3	12.50	16	66.70	5	20.80	2	6.30	28	87.40	2	6.30	3.691
Risk factors													
Low	11	45.80	12	50.00	1	4.20	2	18.20	9	81.80	0	0.00	3.284
Average	39	38.20	58	56.90	5	4.90	20	18.70	83	77.60	4	3.70	10.549***
High	9	37.50	12	50.00	3	12.50	15	46.90	16	50.00	1	3.10	1.969
Total knowledge of osteoporosis													
Low	13	54.20	9	37.50	2	8.30	3	27.30	8	72.70	0	0.00	4.037
Average	44	43.10	51	50.00	7	6.90	23	21.50	80	74.80	4	3.70	13.708***
High	6	25.00	15	62.50	3	12.50	9	28.10	22	68.80	1	3.10	1.819

** p<0.01 *** p<0.001

Table 10. Percent distribution of participants (aged 24 < 40 years) according to their dietary intake (N=92)

	Healthy women (N=59)						Patients (N=33)					
	Less than allowed		Allowed		More than allowed		Less than allowed		Allowed		More than allowed	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Basic Components												
Calories	10	16.90	49	83.10	-	-	33	100.0	-	-	-	-
Protein (g)	6	10.20	53	89.80	-	-	33	100.0	-	-	-	-
Carbohydrates (g)	7	11.90	52	88.10	-	-	33	100.0	-	-	-	-
Dietary fiber (g)	6	10.20	44	74.60	9	15.30	31	93.9	2	6.1	-	-
Fat (g)	8	13.60	45	76.30	6	10.20	32	97.0	1	3	-	-
Water (ml)	3	5.10	55	93.20	1	1.70	33	100.0	-	-	-	-
Vitamins												
Vitamin A (RAE)	-	-	59	100.0	-	-	22	66.70	11	33.30	-	-
Vitamin B6 (mg)	-	-	59	100.0	-	-	32	97.00	1	3.00	-	-
Vitamin C (mg)	-	-	59	100.0	-	-	27	81.80	5	15.20	1	3.00
Vitamin D (mcg)	-	-	59	100.0	-	-	29	87.90	3	9.10	1	3.00
Vitamin K (mcg)	3	5.10	56	94.90	-	-	19	57.60	10	30.30	4	12.10
Minerals												
Calcium (mg)	2	3.40	54	91.50	3	5.1	33	100.0	-	-	-	-
Magnesium (mg)	-	-	59	100.0	-	-	18	54.5	5	15.2	10	30.3
Manganese (mg)	-	-	59	100.0	-	-	33	100.0	-	-	-	-
Phosphorus (mg)	10	16.90	49	83.10	-	-	33	100.0	-	-	-	-
Potassium (mg)	9	15.30	50	84.70	-	-	32	97.0	1	3.0	-	-
Zinc (mg)	-	-	59	100.0	-	-	33	100.0	-	-	-	-

Table 11. Percent distribution of respondents (aged 40-55 years) according to their dietary intake (N=93)

	Healthy women (N=35)						Patients (N=58)					
	Less than allowed		Allowed		More than allowed		Less than allowed		Allowed		More than allowed	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Basic Components												
Calories	3	8.60	30	85.70	2	5.70	50	86.20	8	13.80	-	-
Protein (g)	1	2.90	20	57.10	14	40.00	49	84.50	9	15.50	-	-
Carbohydrates (g)	-	-	29	82.90	6	17.10	47	81.00	11	19.00	-	-
Dietary fiber (g)	5	14.30	28	80.00	2	5.70	58	100.0	-	-	-	-
Fat (g)	2	5.70	29	82.90	4	11.40	57	98.30	1	1.70	-	-
Water (ml)	-	-	35	100.0	-	-	44	75.90	14	24.10	-	-
Vitamins												
Vitamin A (RAE)	-	-	35	100.0	-	-	58	100.0	-	-	-	-
Vitamin B6 (mg)	5	14.30	30	85.70	-	-	58	100.0	-	-	-	-
Vitamin C (mg)	1	2.90	27	77.10	7	20.00	39	67.20	9	15.50	10	17.20
Vitamin D (mcg)	4	11.40	22	62.90	9	25.70	58	100.0	-	-	-	-
Vitamin K (mcg)	-	-	35	100.0	-	-	39	67.20	18	31.00	1	1.70
Minerals												
Calcium (mg)	5	14.30	29	82.90	1	2.90	58	100.0	-	-	-	-
Magnesium (mg)	-	-	35	100.0	-	-	57	98.30	1	1.70	-	-
Manganese (mg)	-	-	35	100.0	-	-	55	94.80	3	5.20	-	-
Phosphorus (mg)	-	-	35	100.0	-	-	57	98.30	1	1.70	-	-
Potassium (mg)	-	-	35	100.0	-	-	53	91.40	4	6.90	1	1.70
Zinc (mg)	-	-	35	100.0	-	-	57	98.30	1	1.70	-	-

reported that elderly women should consume more vitamin D than previously recommended particularly in the wintertime for maintain bone health. In addition, 67.2% of patients take less than nutritional requirements from vitamin C and K. This results probably due to low percentage of patients knew that some vitamin such as A, K and C help maintain bone health. Furthermore, the highest percentage of healthy women take recommended dietary allowance from all vitamin in (Table 11). All patients (100%) take less than recommended dietary allowance of calcium. This results may be due to low consumption of foods containing calcium such as canned fish and high consumption of foods and drinks that inhibit calcium absorption such as tea and soft drinks. Whereas, the highest percentage 82.90% of healthy women in same age take nutritional requirements of calcium. **Hacker-Thompson *et al.* (2009) and Mangano *et al.* (2011)** estimated that the average daily calcium intake for female was below the RDA. The majority of patients take less than nutritional requirements from magnesium, manganese, phosphorus, potassium and zinc. Whereas, all of healthy women take nutritional requirements from this minerals. This results may be due to almost half of patients

sometimes consume magnesium-rich foods and 13.4% rarely consume, while, almost half of healthy women always consume this foods, also, low percentage of patients (4%) knew that some minerals such as magnesium, manganese, potassium and zinc help maintain bone health.

Conclusion and Recommendations

The current study concluded that the highest percentage of respondents had average level of general knowledge, knowledge of rick factors and knowledge of protective factors about osteoporosis. The majority of healthy women and patients had average level about food behavior. Furthermore, the results showed that the highest percentage of patients take less than recommended dietary allowance of macronutrients and micronutrients which are important to prevent osteoporosis. Meanwhile, the majority of healthy women take nutritional requirements from this nutrients (for two groups of age). Moreover, television appear to play the main role for osteoporosis information for respondents. So, the recommendations are the use of television programs to raise awareness for all people about the prevention of osteoporosis and focus in these programs on a healthy diet and change the lifestyle to the best and appropriate physical activity. In addition, encourage the providers of these programs. More effort from doctors and healthcare providers to inform patients about preventing and treating from osteoporosis. Also, the government close attention to this subject in its health policies and make more efforts to inform people especially women about osteoporosis.

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دراسة عن المعرفة الغذائية والسلوك الغذائي بين السيدات عن هشاشة العظام في محافظة الشرقية بمصر

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أجريت الدراسة الحالية لتقييم المعرفة الغذائية والسلوك الغذائي لهشاشة العظام بين النساء في محافظة الشرقية بمصر، كما أهتمت الدراسة أيضاً بتقييم مصادر المعلومات عن هشاشة العظام والمتناول الغذائي للسيدات، وتُعتبر هذه الدراسة دراسة وصفية تحليلية، تم جمع البيانات باستخدام استبيان تم توزيعه على ٣٠٠ سيدة من محافظة الشرقية (١٥٠ سيدة معافاه و١٥٠ سيدة تم تشخيص إصابتهن بهشاشة العظام)، وتشير النتائج إلى أن معظم السيدات الأصحاء (٣٩,٣٣%) تتراوح أعمارهن من ٢٤ إلي أقل من٤٠ سنة، في حين أن ٣٨,٧٠% من المرضى كانت تتراوح أعمارهن بين ٤٠ - ٥٥ سنة وكانت أعلى نسبه من السيدات الأصحاء ٤٤% حاصلات على المدرسة الثانوية، في حين كان ٤٣,٣%، من المرضى حاصلات على البكالوريوس وكانت أكبر نسبة من الدخل الشهري للاسرة للسيدات الأصحاء والمرضى من ٢٠٠٠ <٤٠٠٠ جنيهاً شهرياً و٦٦% من السيدات الأصحاء ليس لديهم اقارب يعانين من هشاشة العظام وكانت نصف السيدات المرضى تقريباً مصابة بالكسور، كما بينت النتائج وجود فروق ذات دلالة إحصائية بين السيدات الاصحاء والمرضى والعمر ومستوى التعليم والوظيفة والحالة الاجتماعية والتاريخ المرضى عن هشاشة العظام في العائلة وحالة الطمث والكسور والمكملات الغذائية المحتوية على الكالسيوم وفيتامين (د) وممارسة التمارين الرياضية، وتُشير النتائج إلي أن التليفزيون هو المصدر الاساسي للمعلومات عن هشاشة العظام في عينة الدراسة، وتوضح النتائج إن أعلى نسبه من عينة الدراسة كانت ذات مستوى متوسط من المعرفة العامة والمعرفة حول عوامل الخطورة والوقاية من هشاشة العظام وكانت غالبية النساء الأصحاء والمرضى (٦٨% و ٧١,٣%) على التوالي، لديهم مستوى متوسط من السلوك الغذائى وكانت هناك فروق ذات دلالة إحصائية بين عينة الدراسة من السيدات الاصحاء والمرضى ومستويات المعرفة حول المعرفة العامة وعوامل الوقاية والمعرفة الكلية عن هشاشة العظام، تُوضح النتائج أن معظم أفراد العينة الذين لديهم مستوى متوسط من المعرفة لديهم مستوى مرتفع من التعليم و٣٠,٣% من السيدات الاصحاء و٤٥,٥% من المرضى الذين لديهم مستوى متوسط من المعرفة لديهم كسور وهذه العلاقة ذات دلالة إحصائية، وأظهرت النتائج أن معظم المشاركين الذين لديهم مستوى متوسط من السلوك الغذائي كانت من المستوى المتوسط من المعرفة الكلية حول هشاشة العظام وهذه العلاقة ذات دلالة إحصائية وتوضح النتائج أن أعلى نسبة من المرضى تأخذ أقل من المقررات الغذائية اليومية الموصى بها من المغذيات الكبرى والصغرى والتي تُعتبر مهمة للوقاية من هشاشة العظام، ويمكن استنتاج أن معظم عينة الدراسة كانت ذات مستوى متوسط من المعرفة والسلوك الغذائي حول هشاشة العظام، في حين كانت نسبه منخفضة ذات مستوى مرتفع من المعرفة والسلوك الغذائي، ولذلك فإن التوصيات هي استخدام البرامج التلفزيونية لرفع مستوى الوعي لجميع الناس حول الوقاية من هشاشة العظام، ومزيد من الجهود من الأطباء ومقدمي الرعاية الصحية لإبلاغ المرضى حول الوقاية والعلاج من هشاشة العظام واهتمام الحكومة بهذا الموضوع في سياساتها الصحية و بذل المزيد من الجهود لإعلام الناس وخاصة النساء حول هشاشة العظام.

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