

## Patterns of Dietary Intake and Levels of Physical Activities of Female Patients with Osteoporosis: A Retrospective study

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### Abstract

**Overview:** In recent years, the prevalence of osteoporosis has raised particularly in adult females. Meanwhile, a healthy diet and physical activities were considered as supportive care for the prevention of osteoporosis. **The study aimed to:** assess the past patterns of dietary intake and the level of physical activities of females with osteoporosis. **Methods:** This retrospective study was conducted on 100 adult females with primary osteoporosis visited at Rheumatology Outpatient Clinic at Alexandria Main University Hospital, Alexandria, Egypt. Dietary patterns were assessed by a dietary patterns structured interview schedule while the physical activities were assessed by using a modified Godin-Shephard leisure-time physical activity questionnaire. **Results:** The finding showed, the majority of females have unsatisfactory intake of both milk and its products, dark green vegetable and fish. The majority preferred to consume tea while half of them consumed coffee. Moreover, the majority of the studied females were less active/sedentary. There was a statistical significant relationship between the level of physical activity with the place of residence and education of the females ( $p = <0.001^*$  and  $0.015^*$  respectively). **Conclusion:** There was an unsatisfactory intake of diet important for the prevention of osteoporosis together with the increase of sedentary life to most females at pre-menopause. **Recommendation:** A healthy diet and physical activities must be encouraged for all pre-menopausal females to reduce the risk of osteoporosis.

**Keywords:** Bone mineral density, Dietary pattern, Osteoporosis, Physical activity

### Introduction

Osteoporosis is the most commonly encountered bone disease among adult females. It was documented as a serious health problem, with about 200 million people being affected worldwide. It is believed that one in every two women and one in every four men over age the age of 50 will have osteoporosis and its related fracture in their lifetime (Vijayakumar & Büsselberg, 2016). Since in the Middle East and African region it is estimated that 8 – 20% of its population is currently over 50 years. Therefore these increases in life expectancy are linked to osteoporosis and become major health concerns in these regions. Based on the data from several studies, in Egypt, the statistics show that 53.9% of postmenopausal have osteopenia while 28.4% have osteoporosis (Gheita & Hammam, 2018; Mowafy, 2019).

The first Conference of the new millennium for Consensus on Osteoporosis defined osteoporosis as a skeletal disorder characterized

by compromised bone strength predisposing to an increased risk of fracture. However, the term osteopenia is commonly used in a clinical setting to describe a decrease in bone mineral density (BMD) below normal values (Bartl & Bartl, 2017, 2019). According to WHO, osteoporosis in postmenopausal is diagnosed based on bone mineral density (BMD). The gold standard for diagnosing osteoporosis is a dual-energy x-ray absorptiometry test (DXA). This is the only test that can rule out osteoporosis before a broken bone occurs (Kim, Jeong, Yang, & Yang, 2018). A T-score of -1.0 or above is considered normal bone density. Whereas, between the T-score -1 and -2.5 means osteopenia while a T- score of values with a less than -2.5 patient is reported to have osteoporosis (Varacallo, Seaman, Jandu, & Pizzutillo, 2021).

Osteoporosis could be primary or secondary. Primary osteoporosis is related to aging and decreased gonadal function, while secondary results from conditions apart from age and

menopause such as medications like glucocorticoids and diseases such as hyperparathyroidism and renal failure. On top of that, a healthy diet rich in calcium and vitamin D plus physical activities is an important modifiable factor that affects bone health (Ashcroft-Hands, 2019; Sozen et al., 2017).

Since calcium is the main bone-forming mineral that is required at maximum during the entire life to maintain and achieve peak bone mass and reduce the incidence of osteoporosis together with its related fracture. Its insufficiency may lead to an increase in the secretion of parathyroid hormone (PTH) which in turn, stimulates the resorption of bone to raise the serum calcium level (Langdahl, Ferrari, & Dempster, 2016; Siddiqui & Partridge, 2016).

Research also discovered that physical activity (PA) can favorably influence the development and maintenance of bone mass and delay the progression of osteoporosis. Thus, PA and exercise are considered primary or adjunctive therapies for the prevention and treatment of osteoporosis by stimulating bone osteogenesis. Physical activities and exercise including; resistance training, low and high-impact weight-bearing activities, and whole-body vibration therapy help in osteoporosis prevention (Benedetti, Furlini, Zati, & Mauro, 2018; McMillan, Zengin, Ebeling, & Scott, 2017).

Most people with osteoporosis are unaware of it until a fragility fracture occurs, however, symptoms like back pain, loss of height over time, stooped posture are among the early warning signs of osteoporosis. Low bone mass is an essential component of the risk of fracture while the most frequent fractures due to osteoporosis occur in the hip, lumbar spine, proximal femur, and distal radius. Usually, osteoporotic fractures result from low energy trauma such as falls from a standing height. Proper lifestyle by considering osteoporosis prevention strategies, dietary calcium and physical activity is very essential (Elbossaty, 2017; Watts, 2018).

Osteoporosis has a major impact on the population as a whole but also affect the individual patient and their families. The public health impact of osteoporotic are fractures that

result in increased mortality, functional capacity. It leads to an increased financial burden on health care systems. A patient can suffer from pain and deformity but fractures can also damage self-esteem, body image, and mood, which may lead to psychological consequences (Carlson et al., 2019; Curtis, Moon, Harvey, & Cooper, 2017).

While the prevalence of osteoporosis increased, the prevention of osteoporosis through dietary means and physical activity, appeared to be challenging in a developing country. However, few studies described the dietary patterns and physical activities among adult females, but still, evidence was not sufficient since those studies had never been done in the African country.

Hence the study findings will highlight the problem, therefore it will help the nurses to plan for the osteoporosis prevention program.

#### **The aim of this study is to:**

Assess patterns of dietary intake and the level of physical activities of female patients with osteoporosis in the past.

#### **Research questions**

1. What was the pattern of dietary intake of female patients with osteoporosis?
2. What was the level of physical activity that was carried out by female patients with osteoporosis in the past?

#### **Materials and Method**

##### **Materials**

##### **Research design:**

A retrospective descriptive research design was utilized.

##### **Setting:**

The study was conducted at Alexandria Main University Hospital at the Rheumatology Outpatient Clinic. This is one of the specialized clinics that serve the population of Alexandria, Beheira and Matrouh governorates. The clinic runs once per week (on Tuesday) from 9:00 am up to 1:00 pm with approximately 15 up to 20 patients being visited per day.

##### **Subjects:**

A convenience sample of 100 female adult patients with primary osteoporosis was

included in the study from the above-mentioned setting.

The study sample was selected based on the Epi info-7 program to estimate the sample size

#### Inclusions criteria:

1. Female adult patients (age range from 40-60years).
2. Dual-energy X-ray absorptiometry scan to confirm the diagnosis.

**Tools of the study:** Three tools were used for data collection

#### Tool (I): Socio-demographic and Clinical data

**Part I: Socio-demographic characteristics;** as age, education, occupation, marital status, place of residence.

**Part II: Clinical data;** Patient's menopausal age, previous history of fracture, history of smoking, previous history of major surgery, previous history of chronic illness, medication taken, states of exposure to sunlight and family history of osteoporosis.

#### Tool II: Dietary pattern structured interview schedule

This tool was developed by the researcher based on a review of relevant literature (Yekefallah, Dehghankar, Aliakbari & Mafi, 2019). It was composed of 7 groups of food items important for bone health. The consumption of food and nutrients was measured using a household measurement like a cup, spoon, slice and bowl. The patient was asked about the pattern of dietary intake in their past years prior to menopause.

From each of the following items, the patient was supposed to state how often she consumed this diet per week (never, less than twice a week, 3 to 4 times a week, more than 4 times per week, or daily consumed).

1. Milk: example; whole milk.
2. Milk products: example; Cheese, yogurts, ice cream, pudding, cheddar.
3. Fish: example; sardines, salmon or any other types of fish.

4. Shellfish: example; prawns, oysters, crabs, mussels

5. Vegetables: example; broccoli, cabbage, okra and other green vegetables.

6. Bread: example; white bread, dark bread.

7. Beverage intake: examples tea, coffee and soft drinks

#### Scoring System:

The patient's response to the patterns of dietary intake was scored as follow; (0) mark was given to never, (1) mark was given to less than twice per week, (2) mark was given to 3 to 4 times per week, (3) mark was given to more than 4 times per week and (4) mark was given to daily consumed. The total score was summed up then converted into numbers and percentages.

Patients' pattern of dietary intake was evaluated as the following;

- A score of 60% or more was considered satisfactory.
- Less than 60% score was considered unsatisfactory.

#### Tool (III): The modified Godin-Shephard leisure-time physical activity questionnaire

This tool was developed by (Godin, 2011). It was adapted by the researcher to assess the level of physical activities that were performed in the past prior to menopause. It consisted of 3 items. The activities were measured against frequency, duration and intensity and classified into;

1. **Strenuous activities:** activities that result in increased rapid heart rate and respiration rate like; running, jogging, swimming, skipping with a rope, playing tennis, lifting weights and exercise like push-ups and sit-ups, etc.
2. **Moderate activities:** example; fast walking and climbing stairs, etc.
3. **Mild activities:** example; slowly walking and household activities like; sweeping floors, mopping, gardening and cooking.

#### Scoring system:

The scores corresponding to the energy expenditure (metabolic equivalent of a task

(MET)) was obtained for the above physical activities. Since the numbers represent the MET intensity values (strenuous activities = 9 METs, moderate activities = 5 METs, and mild activities = 3 METs), calculating individuals' level of physical activity score was; Total score = strenuous (9 METs × times/week) + moderate (5 METs × times/week) + light (3 METs × times/week). Patients' level of physical activities was evaluated as follows; 24 units or more = Active, 14 – 23 units = Moderately Active while less than 14 units = Less active/Sedentary.

### Method

1. Approval from the Research Ethical Committee, Faculty of Nursing, Alexandria University and Alexandria Main University hospital was obtained.
2. Study tool I and tool II was developed by the researcher based on a review of the recent relevant literature then translated into a simple Arabic language.
3. Tool III was adapted from Godin, (2011) then translated into a simple Arabic language.
4. All tools were tested for their content validity by three experts in the field of Medical-Surgical nursing and two Rheumatology specialists.
5. The reliability of all tools was ascertained using the Cronbach's Alpha test.
6. A pilot study on 10 patients (10%) of the sample was conducted to test the applicability and feasibility of the tool. The necessary modifications were done and those patients who were subjected to the pilot study were excluded from the study.
7. The female adult patients with primary osteoporosis were enrolled conveniently under the consideration of inclusion criteria.
8. Patients were interviewed individually using tools I, II and III to assess the past pattern of dietary intake and the level of physical activities of female patients with osteoporosis.
9. Data was collected over a period of two months and a half, starting from the middle of February 2021 till the end of April 2021.

### Statistical analysis of the data

- Data were fed to the computer and analyzed using IBM SPSS software package version 20.

- Qualitative data were described using numbers and percentages. Quantitative data were described using range (minimum and maximum), mean, and standard deviation.
- Chi-square test was used for categorical variables, to compare between different groups and Monte Carlo correction was used for correction of chi-square when more than 20% of the cells have expected count less than 5
- The significance of the obtained results was judged at the 5% level.

### Ethical Considerations:

Informed written consent was obtained from the patients participating in the study after the aim of the study was explained. Female patients have had the right to withdraw at any time from the study. Patient anonymity was respected. The confidentiality of the data was adequately maintained.

### Results

#### **Table (1): Illustrate the percentage distribution of the studied females according to their socio-demographic characteristics (n = 100)**

The table shows that more than three-quarters of females were aged above 45 years, which described as follow; above 45 to 50 years were (20.0%), (15.0%) were more than 50 to 55 years and (57.0%) were, above 55 of age up to 60 years. Less than one quarter (8.0%) of the patients had 40 to 45 age. Moreover, considering their current place of residence, more than half of the studied females (65.0%) lived in urban while only (35.0%) lived in rural. Regarding their occupation, (30.0%) were working, while (70.0%) were housewives. As regards their marital status, the majority were married (71.0%), while (12.0%) were divorced, and (13.0%) were widowed while only 4(4.0%) were single.

#### **Table (2): illustrates the percentage distribution of the studied females according to levels of dietary patterns in the past (n = 100)**

The table shows that the majority of the females their dietary patterns for milk intake

were unsatisfactory (99.0%), with only (1.0%) of satisfactory. Regarding the dietary intake for milk products, more than three quarters (97.0%) were unsatisfactory while (3.0%) were satisfactory. Moreover, both fish and shellfish intake were unsatisfactory (100.0%) among all the female osteoporotic patients. Concerning dark green vegetables, the majority (99.0%) had an unsatisfactory result, whereas (1.0%) had a satisfactory result. In addition to that, nearly three quarters (74.0%) of the females had unsatisfactory with the bread intake while the rest (26.0%) of had a satisfactory result, which was opposite to beverage intake whereas more than half of the osteoporotic female (62.0%) had satisfactory result while few of them 38(38.0%) had the unsatisfactory result.

**Table (3): Distribution of the studied females according to a modified Godin-Shephard leisure-time physical activity assessment in the past (n = 100).**

This table shows that among studied females, according to a modified Godin-Shephard leisure-time physical activity assessment, the majority of females 45(45.0%) were less active/sedentary, while 42(42.0%) were moderately active and only 13(13.0%) were active. Additionally, the total mean score was  $(17.11 \pm 6.70)$  with a range (9.0 – 42.0).

**Table (4): Illustrate the distribution of the studied females according to physical activity in the past (n = 100).**

The table shows that among studied females, the most performed physical activities were household activities like mopping and dusting with the mean and standard deviation of  $(2.75 \pm 1.43)$  and the range of (0.0 – 7.0) followed by slowly walking with the mean of

$(1.91 \pm 1.34)$  and range from (0.0 – 5.0) that fall under the physical activities that need a minimal effort. Also, the table illustrates that strenuous activities were the least performed physical activities among the studied females. The mean of exercises like push-up or sit-up was  $(0.03 \pm 0.17)$  with a range from (0.0 – 1.0), followed by running  $(0.01 \pm 0.10)$  with range from (0.0 – 1.0), followed by skipping with a rope  $(0.01 \pm 0.10 \text{ SD})$  with range from (0.0 – 1.0).

**Table (5): Illustrate the relation between the levels of physical activity of studied females and socio-demographic characteristics.**

The table shows that there is a statistical significant relation between the level of physical activity with a place of residence and education of the studied female, where ( $p = <0.001^*$  and  $0.015^*$  respectively). On the other hand, no statistical significant relation was found between the level of physical activities with age, occupation and marital status of the studied females where ( $p = 0.581, 0.750$  and  $0.622$ , respectively)

**Table (6): Illustrate the relation between the levels of physical activity of studied females and dietary patterns.**

This table shows that there was no statistical significant relation between the level of physical activities with both dietary intake of milk and its products among the females ( $p = 0.544$  and  $0.353$ ) respectively. Meanwhile, there is no statistical significant relation between the level of physical activities with dietary intake of dark green vegetables, bread and beverage of the females ( $p = 1.00, 0.570$  and  $0.451$ ) respectively.

**Table (1):** Percentage distribution of the studied females according to their socio-demographic characteristics

Social demographic data	Studied females (n=100)	
	No.	%
<b>Age</b>		
• 40	8	8.0
• 45–	20	20.0
• 50–	15	15.0
• >55 – 60	57	57.0
○ Min. – Max.	45.0 – 60.0	
○ Mean ± SD	54.35 ± 4.73	
<b>Place of residence</b>		
• Urban	65	65.0
• Rural	35	35.0
<b>Occupation</b>		
• Work	30	30.0
• Housewife	70	70.0
<b>Marital status</b>		
• Single	4	4.0
• Married	71	71.0
• Divorced	12	12.0
• Widowed	13	13.0
<b>Educational level</b>		
• Illiterate	18	18.0
• Read and write	61	61.0
• Diploma	16	16.0
• University graduate	5	5.0

**Table (2):** Percentage distribution of the studied females according to levels of dietary patterns in the past (n = 100)

Dietary patterns	Unsatisfactory <60%		Satisfactory ≥60%	
	No.	%	No.	%
• Milk	99	99.0	1	1.0
• Milk product	97	97.0	3	3.0
• Fish	100	100.0	0	0.0
• Shellfish	100	100.0	0	0.0
• Dark green vegetables	99	99.0	1	1.0
• Bread	74	74.0	26	26.0
• Beverage	38	38.0	62	62.0

**Table (3):** Distribution of the studied females according to a modified Godin-Shephard leisure-time physical activity assessment in the past (n = 100)

A modified Godin-Shephard leisure-time physical activity assessment	No.	%
• Less active/Sedentary	45	45.0
• Moderately Active	42	42.0
• Active	13	13.0
• Total Score	9.0 – 42.0	
• Min. – Max.	17.11 ± 6.70	
• Mean ± SD.		

**Table (4):** Distribution of the studied females according to physical activity in the past (n = 100)

Physical activity	Min. – Max.	Mean ± SD.
a) Strenuous activities (rapid heart rate and respiration rate)		
• Running	0.0 – 1.0	0.01 ± 0.10
• Skipping with a rope	0.0 – 1.0	0.01 ± 0.10
• Lifting weights	0.0 – 0.0	0.0 ± 0.0
• Exercise like push-up or sit-up	0.0 – 1.0	0.03 ± 0.17
b) Moderate Activities (Not Exhausting)		
• Fast walking	0.0 – 2.0	0.20 ± 0.47
• Vigorous housekeeping activities	0.0 – 3.0	0.21 ± 0.62
• Climbing stairs	0.0 – 2.0	0.09 ± 0.38
c) Mild Activities (Minimal Effort)		
• Slowly walking	0.0 – 5.0	1.91 ± 1.34
• Household activities like mopping and dusting	0.0 – 7.0	2.75 ± 1.43
• Gardening	0.0 – 2.0	0.06 ± 0.31

**Table (5):** Relation between the levels of physical activity of studied females and social demographic characteristics

Social demographic data	Level of physical activity						$\chi^2$	MC p
	Less active/ Sedentary (n = 45)		Moderately Active (n = 42)		Active (n = 13)			
	No.	%	No.	%	No.	%		
<b>Age</b>								
• 40 –	2	4.4	5	11.9	1	7.7	4.692	0.581
• 45 –	8	17.8	10	23.8	2	15.4		
• 50 –	6	13.3	8	19.0	1	7.7		
• >55	29	64.4	19	45.2	9	69.2		
<b>Place of residence</b>							16.633*	<0.001*
• Urban	38	84.4	18	42.9	9	69.2		
• Rural	7	15.6	24	57.1	4	30.8		
<b>Occupation</b>							0.576	0.750
• Work	15	33.3	12	28.6	3	23.1		
• Housewife	30	66.7	30	71.4	10	76.9		
<b>Marital status</b>							4.380	0.622
• Single	1	2.2	3	7.1	0	0.0		
• Married	32	71.1	27	64.3	12	92.3		
• Divorced	5	11.1	6	14.3	1	7.7		
• Widowed	7	15.6	6	14.3	0	0.0		
<b>Education</b>							14.319*	0.015*
• Illiterate	4	8.9	13	31.0	1	7.7		
• Read and write	32	71.1	21	50.0	8	61.5		
• Diploma	8	17.8	7	16.7	1	7.7		
• University level	1	2.2	1	2.4	3	23.1		

 $\chi^2$ : Chi square test

MC: Monte Carlo

\*: Statistically significant at  $p \leq 0.05$

**Table (6):** Relation between the levels of physical activity of studied females and dietary patterns.

Dietary patterns assessment	A modified Godin-Shephard leisure-time physical activity						$\chi^2$	MC <sub>p</sub>
	Less active/ Sedentary (n = 45)		Moderately Active (n = 42)		Active (n = 13)			
	No.	%	No.	%	No.	%		
Milk								
• Unsatisfactory	45	100.0	41	97.6	13	100.0	1.786	0.544
• Satisfactory	0	0.0	1	2.4	0	0.0		
Milk product								
• Unsatisfactory	42	93.3	42	100.0	13	100.0	2.761	0.353
• Satisfactory	3	6.7	0	0.0	0	0.0		
Fish								
• Unsatisfactory	45	100	42	100	13	100	-	-
• Satisfactory	-	-	-	-	-	-		
Shellfish								
• Unsatisfactory	45	100	42	100	13	100	-	-
• Satisfactory	-	-	-	-	-	-		
Dark green vegetables								
• Unsatisfactory	44	97.8	42	100.0	13	100.0	1.648	1.000
• Satisfactory	1	2.2	0	0.0	0	0.0		
Bread								
• Unsatisfactory	31	68.9	33	78.6	10	76.9	1.125	0.570
• Satisfactory	14	31.1	9	21.4	3	23.1		
Beverage								
• Unsatisfactory	16	35.6	15	35.7	7	53.8	1.593	0.451
• Satisfactory	29	64.4	27	64.3	6	46.2		

 $\chi^2$ : Chi square test

MC: Monte Carlo

## Discussion

Osteoporosis is an important public health problem, affecting millions of people worldwide. Although it is multifactorial, the importance of physical activities and dietary intake, specifically micronutrients, represent an important understudied area in osteoporosis research. In this retrospective study, the physical activities and dietary pattern, which is important for bone health, were assessed (Cauley, 2017).

The present study involves the adult females with osteoporosis attending at rheumatology outpatients department, with more than half of them were lived in urban and their mean age was 54.35, the majority of them were married. Many researchers have shown interest since female adults particularly postmenopausal are the most group that is commonly affected by osteoporosis (Rizzoli, 2018; Watts, 2018). Moreover, according to multiple logistic regression analyses, age seems to be a significant risk factor for having

osteoporosis in postmenopausal women. In postmenopausal women, menopause age and duration of menopause over 10 years, were correlated with osteoporosis (Tian et al., 2017).

Concerned with a dietary pattern for the milk and its product intake among the studied females. Milk and milk products are known to be the most dietary source for calcium that evidence suggested a beneficial effect on bone mineralization. According to recommended dietary guidelines, at least one glasses of milk or milk products should be consumed daily (Sharif et al., 2017; Van Den Heuvel & Steijns, 2018). The analysis of this study noted that there was unsatisfactory milk and milk product intake among the studied female patients with osteoporosis in their life prior to menopause. This finding is in line with (Ergin & Akçay, 2017), who assess the awareness of osteoporosis in postmenopausal women, their data showed the consumption of dairy products and particularly milk was very poor among Turkish women.



More studies revealed that a diet for a large part of the population is not well balanced which can cause abnormalities in obtaining appropriate bone mineralization. Balaji with his colleagues (2018) stressing that the usual diet of a studied population was not meeting the demand for nutrients and minerals particularly calcium resulting in a reduction in bone mineral density (Balaji, V, & Gayathri, 2018). Additionally, a study conducted in China reported inadequate consumption of dairy products among Chinese adults (Zhang et al., 2017). The results of the present study reflect the increase of risk for osteoporosis among postmenopausal women as a result of unsatisfied consumption of milk and its product as supported by several studies (Berriche et al., 2017; Feskanich, Meyer, Fung, Bischoff-Ferrari, & Willett, 2018). Meanwhile, the Egyptian study showed milk and cheese daily intake was significantly associated with a lower prevalence of osteoporosis (Farouk et al., 2017).

Regarding the intake of dark green vegetables among female osteoporotic patients. Despite the fact that green vegetables contain nutrients such as potassium, manganese, vitamins C, E, and K, that reported having a favorable impact on the BMD and prevention of osteoporosis. The present study illustrated that the uptake of dark green vegetables was unsatisfactory for the majority of female osteoporotic patients. Similar phenomena were observed in other studies, such as a study of females of reproductive age carried out in Pakistan reported poor eating habits whereas the majority of women reported low consumption of dark green vegetables (Idrees, Zakir, Khushdil, & Shehzadi, 2018). However the results of the present study were a little bit higher than that of Pakistan women, the reason behind this was the dissimilar study setting where the present study was done in a hospital where the majority of the patients attending are those with poor economic status.

A case control study done in Tunisia showed the consumption of fruits and vegetables was significantly lower in the osteoporotic group compared to controls as a consequence the average daily intake of several nutrients needed for osteoporosis prevention like magnesium, vitamin K and phosphorus become lower among the osteoporotic group

when compared with a controls group (Berriche et al., 2017).

Furthermore, seafood is very important for bone health. Out of calcium, magnesium and vitamin D that proved to have a favorable effect on bone health and prevention of osteoporosis for decades. Fish and seafood are rich in omega-3 polyunsaturated fatty acids that are reported to have an anti-inflammatory effect that improves bone quality (Lavado-García et al., 2018; Muñoz-garach & Garc, 2020) It was discovered that there was a positive correlation between the consumption of fish and shellfish and bone mineral density (BMD) of the total femur, femoral neck, and lumbar spine in Koreans (Choi & Park, 2016).

From the results of this study, the consumption of fish, in general, was unsatisfactory among all studied females. However, there was unsatisfactory intake of fish, the study listed tilapia as the most common type of fish eaten by the majority of females. The finding of this study goes inline study done on women in Sharkia governorate Egypt that showed more than three-quarters of female patients were not consumed fish. However the findings on fish consumption in this study were extremely low compared to a previous study of Sharkia, this could be due to the poor economic status of the studied population (El-sayed, Shehata, El-shewey, & Mashhour, 2018).

On the other hand, the result of the present study goes opposite with some studies that used to investigate changes in food consumption and nutrient intakes among adult females that showed the consumptions of fish was good among adult females, as a result, there was an adequate intake of vitamin D and other nutrients found in fish and fish product (Gose, Krems, Heuer, & Hoffmann, 2016; Ilesanmi-Oyelere, Coad, Roy, & Kruger, 2020; Suganthan, Kumanan, Kesavan, Aravinthan, & Rajeshkannan, 2020). These conflicts in results may be due to the differences in economic status between the countries of origin of the study participants.

Moreover, the intake of beverages including tea, coffee and carbonated drink among adult females is of particular interest and concern because biochemical and

nutritional studies since from as early in the 1990s, and again more recently, have shown that high intake of these beverages could potentially upset calcium balance and lead to bone loss and osteoporosis (Chen et al., 2020; De França et al., 2016; Guillán-Fresco et al., 2020), however, some studies declared no negative effect for the tea on bone mineral density (McAlpine, Gittings, MacNeil, & Ward, 2021).

In the current study, the results revealed that the majority of the female osteoporotic patients, their consumption of beverages including tea, coffee, and soft drinks was satisfactory. These results go together with some of the previous studies. The first study is that of women in Sharkia governorate Egypt where the majority of the healthy women and patients were always drinking tea. The same study reported more than half of patients were sometimes drink soft drinks instead of fresh juices and water (El-sayed et al., 2018). Secondly, a study was conducted in Pakistan that stated among women of reproductive age majority were drinking tea and caffeine (Idrees et al., 2018). Meanwhile, a longitudinal and nationwide study to assess changes in food consumption and nutrient intake in Germany reported the majority of women were increased their consumption of beverages including tea, caffeine and soft drinks over time (Gose et al., 2016). Also, a study done in Poland showed more than half of the female osteoporotic patients were drinking coffee several times a day (Mędreła-Kuderl & Szymura, 2018). Coffee and tea are caffeinated drinks and their excessive intake results in undermining BMD by decreasing calcium absorption and increasing the excretion of calcium (de França et al., 2016). Excessive coffee and tea intake are increased with cold weather.

An increase in plant food consumption including bread, either alone or mixed with white meat or sandwiches, is associated with improved bone mineralization markers. This happened because of the widespread of micronutrients and phytochemicals bundled within plants (Berg, Seyedsadjadi, & Grant, 2020). However bread contains 11–12% of energy but also 100g of white bread contains 155 mg of calcium and 22mg of magnesium while 100mg of brown bread contains 106 mg

of calcium and 66 g of magnesium that are for the prevention of osteoporosis (Lockyer & Spiro, 2020).

The present study showed the majority of female osteoporotic patients were unsatisfactory related to bread intake. This was comparable to that was observed by El-Sayed et al., (2018) who reported a few females who were always consumed dark bread. The consumption of bread in the UK has been decreased among its population compared to the previous year (Lockyer & Spiro, 2020). However, Mędreła-Kuderl & Szymura (2018) showed that the majority of females in Poland consumed dark bread. This variation among study results may reflect the increased availability and popularity of other starchy foods such as pasta and rice, together with potentially negative misconceptions around bread and health or sometimes due to cultural differences.

Concerned with the level of physical activities of the studied females. Physical activities or regular exercise protect individuals from developing osteoporosis. However, the real mechanism remains unclear. Some scholars, indicate this happening due to its action of regulating bone vascularization within the microenvironment employing modulating angiogenic mediators, which play a central role in maintaining skeletal health (Tong et al., 2019). Unfortunately, the present finding shows the majority of the studied females were less active (sedentary) prior to menopause. The same scenario was identified in a case-control study done in Egypt 2019 on osteoporosis risk prediction among a group of postmenopausal females that revealed that physical exercise was significantly less practiced by cases, and was stated as an independent risk factor for osteopenia and osteoporosis (Mowafy et al., 2019).

In the same context, in a study done to assess the effectiveness of the prevention program, it was found that only one-third of the female osteoporotic patients at El-Fayoum City, Egypt practiced regular physical activities (Hassanine, Hassan, & Alkotb, 2017). El-Sayed with her colleague was also showed the largest proportion of patients don't practice exercises (El-Sayed et al., 2018). Also, a study was done

by Panahi et al., (2021) supports the finding of the present study by emphasizing that the majority of females in Africa were sedentary. It has been stated that the low education level of the individuals and lack of awareness are effective factors in the adoption of osteoporosis preventive behaviors among Egyptian females (Paruk et al., 2021; Panahi et al., 2020).

Additionally, data of this study reported the highest mean score was seen in household activities like mopping, dusting and cleaning of cooking utensils and walking while of them it falls under the category of mild activities or sedentary that require only minimal effort to accomplish the activity. The results of the current study were the same as a previous study that showed walking was the most physical activity practiced by the studied female in both cases and controls among women (Mowafy et al., 2019). Also, it was reported that osteoporosis risk was decreased 2-1 times in those who reported walking outdoors, upstairs, uphill, or with a load less than once a day (Pinheiro et al., 2020). It is believed that, moderate to intense exercises, performed at a high speed during short intervals of time, in water, or on the ground, can be part of a program to prevent and treat postmenopausal osteoporosis (Armstrong et al., 2020; Pinheiro et al., 2020).

In contrarily with the finding of the present study, most female students of Assiut University in Egypt were either moderately or highly active and only a few were physically inactive. This could be due to the education level of the study participant. In the same study, being a female was listed as among the predictors for physical inactive (Attia, El, Rabie, & Amin, 2019). This result contradicts the present study because the prevalence of physical inactivity increased over time by aging.

In relation to socio-demographic characteristics, the present study detected that the most sedentary or less active group among the female osteoporosis patients were housewives, married women, urban residents and those with little education (read and write only). According to a study done on Armenian adults, sedentary behavior was experienced more common in people who were retired,

unemployed and adults aged above 45 years (Tcymbal et al., 2020). Also in agreement with the present result, reported that the Fayoum governorate community performs the physical activity of less than recommended by the WHO especially among females, adolescents, the elderly, and the low-income households population. Also, they demonstrated that insufficient physical activity levels among females who were housewives and the low-income (Naglaa & Asmaa, 2018).

Concerning the association between physical activities and social demographic data, the results of the present study revealed that there was a statistical significant relation between levels of physical activity of the female osteoporotic patients as regards their place of residence. The same scenario was observed by Naglaa & Asmaa, (2018) who reported there was a significant association between socio-demographic characteristics of the respondents with both the vigorous and moderate-intensity recreational activities. According to Mowafy et al., (2019), they reported urban residents was consistently associated with physical inactivity across women and combined group. Also a place of residence was mentioned as a factor that affects the average level of physical activity in a study conducted on female students from high educational institutions (Tsos, Kasarda, & Pantik, 2017).

Also, this study showed a statistical significant relation between levels of physical activity with the education status of the female osteoporotic patients. The result of the current study was almost the same as the Egyptian study done by Naglaa & Asmaa, (2018) who reported a positive association between physical activity and the educational level of study participants. A study done in Cairo, Egypt reported level of formal education of a studied woman was significantly associated with physical inactivity (Mowafy et al., 2019). However there was no significant correlation between the educational level and the level of daily activity among the studied female in Ukraine but it was reported university education demonstrated some positive changes in the level of physical activity (Tsos et al., 2017).

Hope that the results of the present study highlight the need for educating this group of people to prevent sedentary life and to look for a pattern of their dietary intake.

### Conclusion

According to the findings of the present study, it can be concluded that the majority of the female with osteoporosis their dietary pattern premenopause was unsatisfactory. The minority of them consumed milk or its product, dark green vegetables and fish in their regular diet. On the other hand, the majority of them consumed beverages like tea, coffee and soft drink in their regular diet that interfere with bone density. Pertaining to physical activities, the majority of the females were had sedentary life. Finally, this study declared that there is a statistical significant relation between the level of physical activity with a place of residence and education. Meanwhile, no statistical significant relation was found between the level of physical activities with age, occupation and marital status.

### Recommendations

Based on the findings of the present study, the following recommendations are suggested:

- All females pre and postmenopause should be encouraged to prevent sedentary life.
- Consumption of a diet rich in calcium and vitamin D like milk and its products be encouraged while high consumption of tea, coffee and cola to be discouraged.
- A colored booklet about diet and physical exercise to be formulated and distributed to all females in the pre-menopause.

Recommendations for future researches:

- Assess risk factors related to noncompliance to a healthy diet and physical activities among premenopausal females.
- The study can be replicated on a large probability sampling for generalizing the findings.

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