Assessing Health Beliefs, Knowledge and Practices of Adolescent Girls Regarding Osteoporosis

Prof. Dr. Magda Abd El Sattar Ahmed, Prof. Dr Hemat Abd Elmoneem Elsayied, Assist. Prof. Dr: Noha Ahmed Mohamed,Tasneem Ragab Ahmed Salama
Department of Community Health Nursing and Environment - Faculty of Nursing, Ain Shams University-Cairo-Egypt.

Abstract

Background: Osteoporosis is a growing health problem in developing countries, especially in the Middle East. It causes a significant personal and societal impact and increases the burden on health care services. **Aim of the Study**: assess health beliefs, knowledge and practices of adolescent girls regarding osteoporosis. **Subjects and Methods: Study design:** descriptive design was utilized in this study. **Setting:** The study was conducted at schools of Mrs. Aisha, Secondary Girls Alqadima (Mohamed Gaber Qusla) and Secondary Girls Alhaditha in Beni-Suef city. **Size:** the sample composed of 130 adolescent girls chosen randomly through multistage sampling. **Tools:** Two tools were used in the study including: **First tool**: interviewing Questionnaire that assesses socio-demographic data, knowledge and reported practices regarding osteoporosis. **Second tool:** Osteoporosis Health Belief model Scale to assess beliefs of adolescence girls about osteoporosis. **Results:** the current study clarified that minority of the adolescent girls had satisfactory knowledge about disease and only 26.2% of the adolescent girls had adequate practice regarding the disease. As regards health beliefs the current study depicts that, more than half of the girls had negative beliefs regarding the disease. The current study represents that, there was highly significant positive correlation between total adolescent girls' knowledge about osteoporosis and their practices. **Conclusions:** Adolescent girls in the current study had lacked appropriate knowledge and practices regarding osteoporosis. **Recommendation**: Conducting and disseminating educational programs at various settings to reach all female's age group to increase their knowledge and practices regarding osteoporosis. Further researches in the area of contributing factors of osteoporosis among young adults to improve understanding and management.

Keywords: Health beliefs, knowledge, practices, Adolescent girls, Osteoporosis.

Introduction:

Osteoporosis is characterized by reduced bone mass and deterioration in bone architecture, resulting in decreased bone strength, increased bone fragility and fracture risk. Fragility fractures are associated with acute and chronic pain, morbidity, deformity, disability and increased mortality for patients. This also means major costs to society ***(Sözen, 2017).***

Osteoporosis is considered a serious public health concern. Currently it is estimated that more than 200 million people are affected by osteoporosis. Nine million fractures annually are reported. Osteoporosis is common in both sexes and all parts of the World. About one in three women and one in five men over 50 years will suffer a fracture due to osteoporosis. Over 40% of women and 20% of men with osteoporosis are likely to have an osteoporotic (fragility) fracture during their lifespan. Mortality associated with osteoporotic fractures ranges from 15 to 30%, a rate similar to breast cancer and stroke ***(Akarirmak, 2018 & Gheita and Hammam, 2018).***

Particularly, there are several controllable and uncontrollable risk factors are associated with osteoporosis. Low activity level, smoking, alcohol abuse, numerous years of sedentary lifestyle and insufficient diet including eating disorder, low calcium & vitamin D intake, and excessive consumption of soft drinks are the most common controllable risk factors. While the uncontrollable factors comprise sex, family history, ethnicity and race, progressing age, status and body outline

measures of post-menopausal women ***(Mohamed et al., 2018).***

Osteoporosis is preventable, and an important point in preventing the disease is to modify thinking, lifestyle, and daily habits in such a way that they improve the quality of life and efficiency of individuals. Thus, teaching preventive behaviors such as physical activity and correct nutrition as a simple and efficient method can help us prevent the disease and promote and maintain our health. One of the most important World Health Organization (WHO) goals is to increase the number of women trained in the area of osteoporosis ***(Jeihooni et al., 2015).***

Adolescence is the period of development that begins at puberty and ends in early adulthood. Most commonly, adolescence is divided into three developmental periods: early adolescence (10–14 years of age), late adolescence (15–19 years of age), and young adulthood (20–24 years of age). Adolescence is characterized by a rapid pace of growth that is second only to that of infancy. Nutrition and the adolescent transition are closely intertwined, since eating patterns and behaviors are influenced by many factors, including peer influences, parental modeling, food availability, food preferences, cost, convenience, personal and cultural beliefs, mass media, and body image ***(Das et al., 2017).***

Life-long, bone-healthy nutrition, according to various stages of life, including pregnancy, infancy, childhood, adolescence, postmenopausal period and senile ages are some of the keys to prevention. Calcium, vitamin D and protein are the corner stones. Prevention of osteoporosis during childhood and adolescence is one of the most important issues in World Health Organization ***(Weaver et al., 2016).***

Based on Health Belief Model (HBM), people change their behavior when they understand that the disease is serious. Otherwise, they might not turn to healthy behaviors. Health Belief Model is a psychological model that attempts to explain and predict health behaviors through focusing on the attitudes and beliefs of individuals. It contains several primary constructs/concepts perceived susceptibility, severity, benefit, barrier, and self-efficacy that predict why people will take action to prevent, to screen for, or to control illness conditions ***(Diddana et al., 2018).***

Community health Nurse is in effective, powerful and significant position to help adolescent girls to change their attitude regarding osteoporosis prevention and fracture risk. Similarly they have a professional role and accountability regarding health promotion and disease prevention by advocating the adolescent girls to maintain bone health ***(Gamal & Rashed, 2015).***

Consequently, using health believe model as method for osteoporosis prevention through two measures, one is based on increasing the knowledge about osteoporosis and the other is related to preventive behavior and self-efficacy measures that reinforce attitude and behavioral change ***(Mansour et al., 2017).***

Significance of the problems:

Osteoporosis is a crippling condition that often results in premature mortality and significant morbidity that is manifested in the form of fractures, bone deformity, and chronic pain syndrome. Osteoporotic fractures account for more hospitalization days than other diseases like breast cancer, myocardial infarction, diabetes and others. Nevertheless, osteoporosis is a preventable disease, and primary prevention should begin as soon as possible because a rapid increase in bone density occurs at a young age ***(Malak & Toama, 2015 and Akarirmak, 2018).***

The prevalence of osteoporosis is rising steadily and becoming a major public health issue with the universal increasing life expectancy; in particular more rapidly in the developing countries. For example, it is a very old disease, as it was already present in ancient Egyptians. It is projected that by 2050, Egypt

will be close to 130 million inhabitants ***(El-Tawab, 2016 & Gheita and Hammam, 2018)***.

The WHO reports that there are numerous ways to prevent osteoporosis and fragility fractures, though the most optimal approach is to have adequate amounts of calcium intake and weight-bearing physical activity all throughout the lifespan, but especially during youth such as childhood and adolescence when bone mineral density (BMD) can be maximized, and this enhances bone strength to prevent osteoporosis and fragility fractures later in life into adulthood ***(Nguyen, 2018).***

Aim of the study:

This study aimed: to assess health beliefs, knowledge and practices of adolescence girls regarding osteoporosis through:

- Assessing knowledge of adolescent girls about osteoporosis.
- Assessing reported practices of adolescent girls regarding osteoporosis.
- Assessing health beliefs of adolescent girls regarding osteoporosis.

Research Questions:

What's the level of adolescence girls' knowledge toward osteoporosis?

What are the adolescence girls' health beliefs toward osteoporosis?

What are the adolescence girls' practices regarding osteoporosis?

Subjects and Methods

Subjects and methods of this study were portrayed under four main domains as following:

1-Technical Design:

Research design:

Descriptive design was utilized in this study.

Research setting:

The study was conducted at schools of Mrs. Aisha, Secondary Girls Alqadima (Mohamed Gaber Qusla) and Secondary Girls Alhaditha in Beni-Suef city.

Subjects of the study, sampling:

- **Type of sampling**: Multistage random sample technique was used for selection of adolescent girls as the following:
  - First stage: three schools were chosen randomly from total five schools.
  - Second stage: second year from each school was chose.
  - Third stage: one class was chose from each school.

- **Size of sampling** : sample was carried on 130 adolescent girls

School name	Total number of second year	Selected number
- Secondary Girls Alhaditha	- 436	- 46
- Secondary Girls Alqadima	- 396	- 41
- Mrs. Aisha	- 410	- 43
- Sample size (total number of adolescent girl)		- 130

Tools of data collection: to achieve the aim of the study, data was collected by using the following tools:

❖ **Tool I:** interviewing Questionnaire was used to collect data and include three parts

a) First part: was designed to assess socio-demographic data of adolescent girls and it was included Name of school, The father's educational status, The mother's educational status, Father's occupation, Mother's occupation, Family Income, medical history of fracture and family history of osteoporosis and anthropometric measurement that include weight, height to assess BMI of adolescence girls. The researcher checked the scale for accuracy. Weight was measured to the nearest 0.1 kg with an electronic scale with adolescence girls wearing light clothing and without shoes. Adolescence girls height was measured to the nearest 0.1 cm with a wooden stadiometer placed on a flat surface ***(WHO and UNICEF, 2009).***

❖ **Scoring system for BMI**

According the BMI, adolescence girls were classified into: BMI was less than 18.5; it falls within the underweight range, BMI was 18.5 to <25, it falls within the normal and BMI was 25.0 to <30, it falls within the overweight range. It was calculated by the equation: BMI = Weight in Kg / Height² in meters ***(WHO, 2021)***

b) Second part: was designed to assess knowledge of adolescent girls' about osteoporosis through asking questions. It covered Knowledge about osteoporosis, Exercise as a protective behavior against osteoporosis, Sources and importance of calcium and vitamin D and their body requirements, Drinking soft drinks and caffeine and their harm and Importance of sun exposure.

❖ **Scoring System for knowledge:**

For knowledge items, the correct answers were predetermined according to literature review, a correct response was scored 1 and the incorrect one was scored zero. For each area, knowledge was considered satisfactory if percentage score was 60% and above and un-satisfactory if percentage score was less than 60%.

c) Third part: was designed to assess reported practices of adolescent girls' through asking questions. It covered practice regarding exercise, calcium intake, caffeine and soft drinks intake and sun exposure.

❖ **Scoring System for practice:**

For practices items, the correct answers were predetermined according to literature review, a correct response was scored 1 and the incorrect one was scored zero. For each area, practices was considered adequate if the percentage score was 60% or more and inadequate if the percentage score less than 60%.Inadequate practice if less than 60%.

❖ **Tool II:** Osteoporosis Health Belief model Scale was designed to assess beliefs of adolescent girl's about osteoporosis, it was adopted from ***Kim et al. (2013)*** and it was included Perceived susceptibility and seriousness of osteoporosis, Perceived benefits of exercise, Perceived benefits of calcium intake, Perceived barriers of exercise, Perceived barriers of calcium intake, Perceived cues of action (health motivation) and self-efficacy.

❖ **Scoring system of Health Belief model:**

Possible responses was measured using a 3-point Likert scale for each variable were “disagree”, “to some extent”, and “agree”. A score was given for each response from 1 to 3, whereby higher scores indicated a stronger feeling of each variable. Unless perceived barrier disagree scored 3, to some extent 2 and agree 1

Tool validity and reliability:

The Validity: Study tools that were designed submitted to a panel of five reviewers and experts from community health nursing department, faculty of nursing, Ain Shames University. Each one of the experts on the panel was asked to examine the instrument for content coverage, clarity, wording, length, format, and overall appearance. Modifications of tools were done according to panel judgment.

The reliability was done by Cronbach's Alpha coefficient test which revealed that each of the two tools consisted of relatively homogenous items as indicated by the moderate to high reliability of each tool.

II. Administrative and Ethical Design:

For ethical reason, primary approval obtained from the Research and Ethics committee at Faculty of Nursing, Ain-shams University, also, an official permission was obtained from Mobilization and Statistics Center about the selected schools to conduct the study. Each participant informed about the purpose of the study and its significance. They were informed as well, that participation in the study is completely voluntary, as well as they have the right to withdraw from the study at any point without any penalty. Additionally, all participants were assured that their anonymity and confidentiality secured through coding the

data. Moreover, participants were informed that the data not reused for any research purposes without their permission.

Pilot study:

It was conducted on 10% adolescent girls were chosen randomly to test the content, the aim of the pilot study was to evaluate clarity, visibility, applicability, as well as the time required to fulfill the developed tools. According to the obtained results, modifications such as omission, addition and rewording were done. The number of the pilot study was excluded from the study sample.

Field Work:

- Approval was taken from research of ethics committee, faculty of nursing, Ain Shams University.
- An official permission including the title and purpose of the study were submitted from the concerned authorities in the Mobilization and Statistics Center to get an approval for data collection to conduct the study in the selected schools.
- After obtaining a permit the researcher started to interview the adolescence to explain the aim of study in the three schools, 3 days per week (Tuesday, Wednesday and Thursday), one day for each school from 9 am to 2pm for data collection.
- Data collection was carried out in the period of November 2019.

IV: Statistical Design:

Data were revised, coded, analyzed and tabulated using the number and percentage distribution and carried out in the computer. Using appropriate statistical method.

The following statistical techniques were used

Percentage, Mean Value, Standard Deviation, Chi-square (X2), Pearson's r test and proportion probability (P-value).

Significance of results:

- ✓ When P> 0.05 it is statistically not significant difference.
- ✓ When P<0.05 or <0.02 it is statistically significant difference.
- ✓ When P<0.01or P<0.001 it is high statistically significant difference.

Results:

Table (1): shows that, father's educational status of adolescent girls had 53.5%, 53.7% respectively high educated in Mrs.Ashis and Althanawia Banat Alqadima School, while 56.5 % high educated in Althanawia Banat Alhaditha School. Besides, mother's educational status of adolescent girls had 41.1% high educated in Mrs.Ashis school, while 31.7% high educated in Althanawia Banat Alqadima School and 37% high educated in Althanawia Banat Alhaditha School. Regarding to father occupation, 55.8% employed in Mrs.Ashis school, while 58.5% employed in Althanawia Banat Alqadima School and 60.9% employed in Althanawia Banat Alhaditha School. While mother occupation, 41.9 % employed in Mrs. Ashis school, were 26.8% employed in Althanawia Banat Alqadima School and 28.3% employed in Althanawia Banat Alhaditha School. Finally, 58.1% of adolescent girls in Mrs. Aisha school had family income that suffices to the basic needs as well 68.3% of them in Althanawia Banat Alqadima school and 82.6% of them in Althanawia Banat Alhaditha school.

Table (2): shows that, only 7.7% of the adolescent girls had satisfactory knowledge about disease, calcium & vitamin D preprogram respectively. Besides, 32.3% of the adolescent girls had satisfactory knowledge about importance of sun exposure.

Figure (1): denotes that, 83.1% of the adolescent girls had unsatisfactory knowledge about disease while 16.9% of them had satisfactory knowledge about it.

Table (3): denotes that, 69.2% of the adolescent girls had adequate reported practices regarding calcium intakes. Besides, 29.2% of the adolescent girls had inadequate reported practices regarding drinking soft drinks and caffeine. Finally, 56.2% of the adolescent girls

had adequate reported practices regarding sun exposures.

Figure (2): clears that, 29.2% of the adolescent girls had adequate reported practice regarding disease while 70.8% of them had inadequate reported practice regarding disease.

Table (4): represents that 16.9% of adolescent girls had positive beliefs toward susceptibility and seriousness of disease with mean value 17± 5.78, while 72.3% of them had positive beliefs toward benefits of exercise with mean value 15.12 ± 3.26 and 70.8% of them had positive beliefs toward benefits of calcium with mean value 15.03 ± 3.40. Finally, total mean value of health beliefs is 100.32 ± 17.59.

Figure (3): shows that, 46.2 % of the adolescent girls had positive beliefs regarding disease, while 58.8% of them had negative beliefs regarding disease.

Table (5): reveals that, there was highly statistically significant relation between total adolescent girls' knowledge about osteoporosis and their demographic characteristics as fathers' and mothers' educational level, family income, family history of osteoporosis and history of fracture with (P= <0.01). While, there was no statistically significant relation with their school, fathers' and mothers' occupation and body mass index at (P= > 0.05).

Table (6): reveal that, there was highly statistically significant relation between total adolescent girls' reported practices about osteoporosis and their demographic characteristics as fathers' and mothers' educational level, family income, family history of osteoporosis and history of fracture with (P= <0.01). While, there was no statistically significant relation with their school, fathers' and mothers' occupation and body mass index with (P= > 0.05).

Table (7): shows that, there was highly statistically significant relation between total adolescent girls' beliefs regarding osteoporosis and their demographic characteristics as fathers' and mothers' educational level, family income, family history of osteoporosis and history of fracture with (P= < 0.01). While, there was no statistically significant relation with their school, fathers' and mothers' occupation and body mass index at (P= > 0.05).

Table (8): shows that, there was highly significant positive correlation between total adolescent girls' knowledge about osteoporosis and their practices with (P= < 0.01).

Table (1): Distribution of adolescent girls according to their schools and demographic data (n=130).

Demographic characteristic	Mrs. Aisha (n=43)		Althanawia Banat Alqadima (n=41)		Althanawia Banat Alhaditha (n=46)		X^2 p value
	No	%	No	%	No	%	
The father's educational status							
Not read and write	1	2.3	4	9.8	3	6.5	6.731 FE
Primary	4	9.3	3	7.3	0	0.0	0.340
Secondary	15	34.9	12	29.2	17	37.0	
High education	23	53.5	22	53.7	26	56.5	
The mother's educational status							
Not read and write	6	14.0	5	12.2	2	4.3	8.731 FE
Primary	2	4.6	9	22.0	9	19.6	0.181
Secondary	17	39.5	14	34.1	18	39.1	
High education	18	41.9	13	31.7	17	37.0	
Father's occupation							
Employee	24	55.8	24	58.5	28	60.9	0.234
Free business	19	44.2	17	41.5	18	39.1	0.852
Mother's occupation							
Employee	18	41.9	11	26.8	13	28.3	2.701
House wife	25	58.1	30	73.2	33	71.7	0.257
Family income							
Suffice the basic needs	25	58.1	28	68.3	38	82.6	6.420
Not enough to cover the basic needs	0	0.0	0	0.0	0	0.0	0.039
Sufficient for basic and entertainment needs	18	41.9	13	31.7	8	17.4	
Family history of osteoporosis							
Yes	4	9.3	2	4.9	5	10.9	1.089 FE
No	39	90.7	39	95.1	41	89.1	0.621
History of fracture							
Yes	12	27.9	10	24.4	12	26.1	0.135
No	31	72.1	31	75.6	34	73.9	0.968
Body mass index							
Under weight	5	11.6	7	17.1	6	13.0	6.154
Normal	29	67.5	28	68.3	38	82.7	0.192
Over weight	9	20.9	6	14.6	2	4.3	

Table (2): Distribution of adolescent girls according to their knowledge (n=130).

	Satisfactory		Unsatisfactory	
	No	%	No	%
Knowledge about disease	10	7.7	120	92.3
Knowledge about exercise	90	69.2	40	30.8
Knowledge about calcium & vitamin D	10	7.7	120	92.3
Knowledge about soft drink caffeine intake	15	11.5	115	88.5
Knowledge about importance of sun exposure	42	32.3	88	67.7

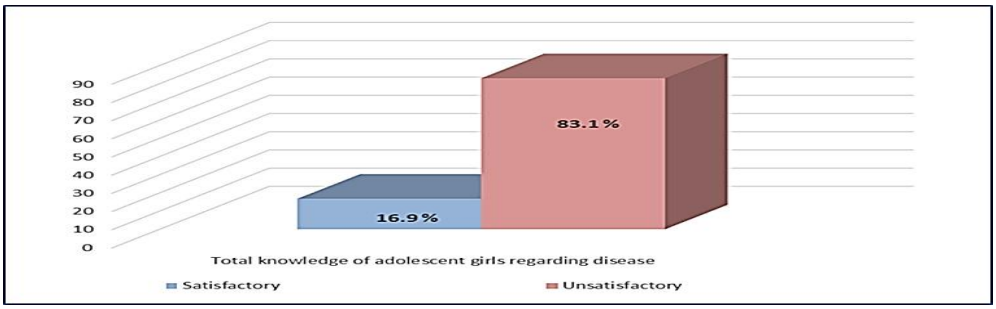

Figure (1): Percentage distribution of the adolescent girls according to their total knowledge (n=130).

Table (3): Distribution of adolescent girls according to their adequate reported practices regarding the disease (n=130).

Item [(a)]	Adequate practices		Inadequate practices	
	No	%	No	%
Practices of adolescent girls regarding exercise	9	6.9	121	93.1
Practices of adolescent girls regarding calcium intake	90	69.2	40	30.8
Practices of adolescent girls regarding drinking soft drinks and caffeine	38	29.2	92	70.8
Practices of adolescent girls regarding sun exposure	73	56.2	57	43.8

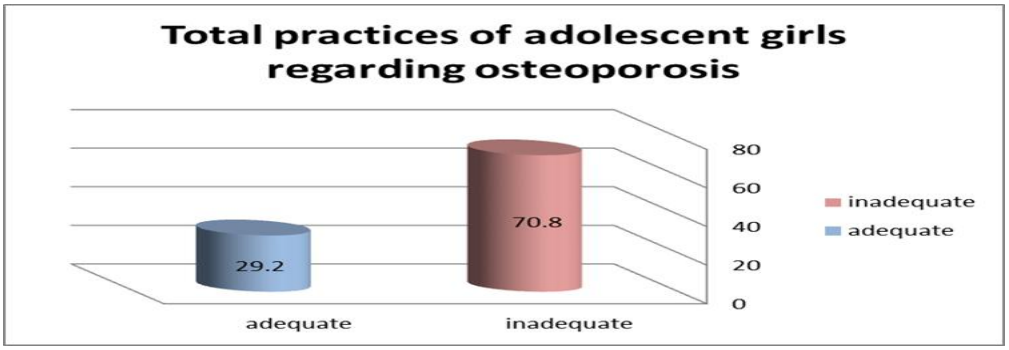

Figure (2): Percentage distribution of the adolescent girls according to their total reported practices (n=130).

Table (4): Distribution of the adolescent girls according to their basic item of health belief model (n=130)

	Negative health beliefs		Positive health beliefs		Mean ± SD
	No	%	No	%	
Perceived susceptibility and seriousness	108	83.1	22	16.9	17.00 ± 5.78
Perceived benefits of exercise	36	27.7	94	72.3	15.12 ± 3.26
Perceived benefits of calcium	38	29.2	92	70.8	15.03 ± 3.40
Perceived barrier of exercise	79	60.8	51	39.2	12.12 ± 4.47
Perceived barrier of calcium	114	87.7	16	12.3	9.33 ± 3.25
Perceived cues of action	50	38.5	80	61.5	12.36 ± 2.90
Self-efficacy	69	53.1	61	46.9	19.35 ± 6.52
Total	70	53.8	60	46.2	100.32 ± 17.59

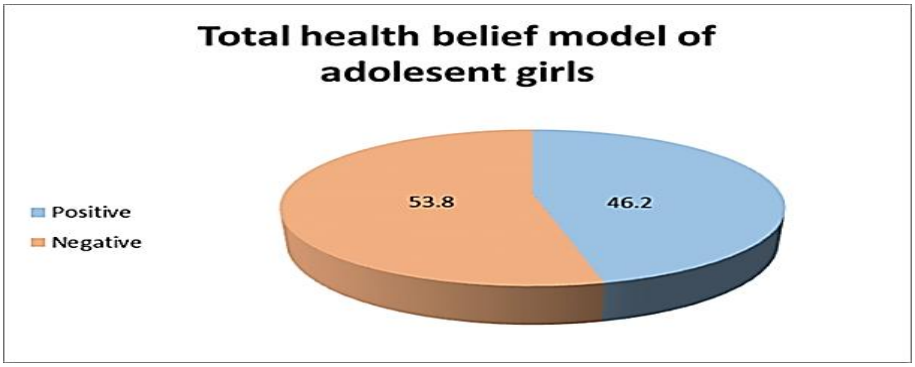

Figure (3): Percentage distribution of adolescent girls according to their total health beliefs regarding the disease (n=130)

Table (5): Relation between adolescent girls' demographic characteristics and their total knowledge about osteoporosis (n=130).

Demographic characteristics		Total knowledge Satisfactory (n=22)		Unsatisfactory (n=108)		X2	P-Value
		N	%	N	%		
Name of school	Mrs. Aisha	8	36.4	35	32.4	1.027	.980
	Althanawia Banat Alqadima	6	27.2	35	32.4		
	Althanawia Banat Alhaditha	8	36.4	38	35.2		
Fathers' educational level	Not read and write	0	0.0	8	7.4	12.95	.009**
	Primary	0	0.0	7	6.5		
	Secondary	8	36.4	36	33.3		
	High education	14	63.6	57	52.8		
Mothers' educational level	Not read and write	0	0.0	13	12	13.28	.007**
	Primary	0	0.0	20	18.5		
	Secondary	8	36.4	41	38		
	High education	14	63.6	34	31.5		
Father's occupation	Employee	12	54.5	64	59.3	1.105	.917
	Free business	10	45.5	44	40.7		
Mother's occupation	Employee	8	36.4	34	31.5	1.947	.842
	House wife	14	63.6	74	68.5		
Family income	Sufficient the basic needs	4	18.2	87	80.6	15.30	.001**
	Not enough to cover the basic needs	0	0.0	0	0.0		
	Sufficient for basic and entertainment needs	18	81.8	21	19.4		
Family history of osteoporosis	Yes	11	50	0	0.0	20.98	.000**
	No	11	50	108	100		
History of fracture	Yes	15	68.2	19	17.6	13.12	.009**
	No	7	31.8	89	82.4		
Body mass index	Less than normal weight	6	27.3	12	11.1	2.360	.771
	Natural	10	45.4	85	78.7		
	More than normal weight	6	27.3	11	10.2		

Table (6): Relation between adolescent girls' demographic characteristics and their total reported practices about osteoporosis (n=130).

Demographic characteristics		Total practices				X2	P-Value
		Adequate (n=38)		Inadequate (n=92)			
		N	%	N	%		
Name of school	**Mrs. Aisha**	13	34.2	30	32.6	.918	1.114
	Althanawia Banat Alqadima	10	26.3	31	33.7		
	Althanawia Banat Alhaditha	15	39.5	31	33.7		
Fathers' educational level	**Not read and write**	0	0.0	8	8.7	13.80	.005**
	Primary	0	0.0	7	7.6		
	Secondary	10	26.3	34	37		
	High education	28	73.7	43	46.7		
Mothers' educational level	**Not read and write**	0	0.0	13	14.1		
	Primary	0	0.0	20	21.7	14.19	.003**
	Secondary	10	26.3	39	42.4		
	High education	28	73.7	20	21.7		
Father's occupation	**Employee**	26	68.4	50	54.3	3.471	.119
	Free business	12	31.6	42	45.7		
Mother's occupation	**Employee**	15	39.5	27	29.3	2.563	.152
	House wife	23	60.5	65	70.7		
Family income	**Sufficient the basic needs**	8	21.1	83	90.2		
	Not enough to cover the basic needs	0	0.0	0	0.0	16.02	.000**
	Sufficient for basic and entertainment needs	30	78.9	9	9.8		
Family history of osteoporosis	**Yes**	11	28.9	0	0.0	19.82	.000**
	No	27	71.1	92	100		
History of fracture	**Yes**	24	63.2	10	10.9	13.67	.009**
	No	14	36.8	82	89.1		
Body mass index	**Less than normal weight**	8	21.1	10	10.9		
	Natural	22	57.8	73	79.3	2.562	.514
	More than normal weight	8	21.1	9	9.8		

Table (7): Relation between adolescent girls' demographic characteristics and their total beliefs regarding osteoporosis (n=130).

Demographic characteristics		Total beliefs regarding osteoporosis				X2	P-Value
		Positive (n=114)		Negative (n=16)			
		N	%	N	%		
Name of school	Mrs. Aisha	37	32.5	6	37.5	1.155	.366
	Althanawia Banat Alqadima	37	32.5	4	25		
	Althanawia Banat Alhaditha	40	35	6	37.5		
Fathers' educational level	Not read and write	0	0.0	8	50	14.95	.002**
	Primary	0	0.0	7	43.8		
	Secondary	43	37.7	1	6.2		
	High education	71	62.3	0	0.0		
Mothers' educational level	Not read and write	0	0.0	13	81.2	16.55	.000**
	Primary	17	14.9	3	18.8		
	Secondary	49	43	0	0.0		
	High education	48	42.1	0	0.0		
Father's occupation	Employee	66	57.9	10	62.5	2.266	.156
	Free business	48	42.1	6	37.5		
Mother's occupation	Employee	38	33.3	4	25	3.660	.102
	House wife	76	66.7	12	75		
Family income	Sufficient the basic needs	89	78.1	2	12.5	16.32	.000**
	Not enough to cover the basic needs	0	0.0	0	0.0		
	Sufficient for basic and entertainment needs	25	21.9	14	87.5		
Family history of osteoporosis	Yes	11	9.6	0	0.0	19.54	.000**
	No	103	90.4	16	100		
History of fracture	Yes	31	27.2	3	18.8	18.07	.000**
	No	83	72.8	13	81.2		
Body mass index	Less than normal weight	14	12.3	4	25	2.087	.691
	Natural	85	74.6	10	62.5		
	More than normal weight	15	13.1	2	12.5		

Table (8): Correlation between total adolescent girls' knowledge about osteoporosis and their practices (n=130).

Items	Total practice at pre program	
Total knowledge at pre program	R	.304
	p- value	.000**

Discussion:

Currently, osteoporosis is one of the topmost five disorders leading to disability and prolonged hospital stay for post-menopausal females. Accordingly, osteoporosis is the second to cardiovascular disease as a global health care problem. The current study aimed to assess health beliefs, knowledge and practices of adolescent girls regarding osteoporosis.

Regarding distribution of adolescent girls according to their total knowledge about disease, the current study revealed that minority of the adolescent girls had satisfactory

knowledge about disease. From the investigator point of view, The reason for the lack of knowledge about osteoporosis may be due to the fact that adolescent girls are between the ages of 15-16 years and therefore, their information about such diseases is limited, or because the disease is known to affect older age groups. Another reason could be due to decrease educational program in this field. This result was supported with ***Shawashi1and Darawad1, (2020)*** who conducted a study in Jordan entitled "Osteoporosis Knowledge, Beliefs and Self-efficacy Among Female University Students: A Descriptive Study " and found generally low levels of knowledge regarding osteoporosis among the participant**.**

Regarding distribution of the adolescent girls according to their total reported practices, the current study clears that more than one quarter of the adolescent girls had adequate practice regarding disease. From the investigator point of view, this result may be due to the lack of knowledge led to poor protective practices. This result was supported with ***Al-Ayyadhi et al. (2020)*** who conducted a study entitled "Screening for Bone Mineral Density and Assessment Knowledge Level of Low Peak Bone Risk Factors and Preventive Practices among Kuwaiti Future Mothers" and found that the participants' preventive behaviors is low.

Regarding total health belief model of adolescent girls regarding the disease, the current study showed that more than two fifth of the adolescent girls had positive beliefs regarding disease, while more than half of them had negative beliefs regarding disease. From the investigator point of view, this result may be due to increase health belief model for adolescent girls in their activities. This result was supported with ***Ali et al. (2020)*** who conducted a study entitled "The Effect of Application of Health Belief Model on Osteoporosis' Knowledge and Preventive Behaviors among adolescences girls" and found that about two fifth of participants had positive beliefs regarding disease.

Regarding the relation between adolescent girls' demographic characteristics and their total knowledge about osteoporosis, the current study revealed that there was highly statistically significant relation between total adolescent girls' knowledge about osteoporosis and their demographic characteristics as fathers' and mothers' educational level, family income, family history of osteoporosis and history of fracture. According to the investigator opinion, in the current study the significant association between adolescent knowledge and fathers' and mothers' educational level could be due to the fact that people with higher education are more likely to understand, use health information resources and having a better chance to get information from courses and social media than those who are illiterate.

This result was accordance with ***Pinar & Pinar, (2020)*** who conducted a study entitled "The Impact of Health Belief Model Based Educational Intervention on adolescence's Knowledge, Beliefs, Preventive Behaviors and Clinical Outcomes about Osteoporosis" and found that there was a highly statistically significant relation between total adolescent' knowledge about osteoporosis and their demographic characteristics. Conversely, this result was in disagreement with ***Norozi, et al (2020)*** who conducted a study entitled " The effect of educational intervention based on the health belief model on osteoarthritis-preventive behaviors in adolescences women" and found that there was no statistically significant relation between total adolescent' knowledge about osteoporosis and their demographic characteristics.

Regarding the relation between adolescent girls' demographic characteristics and their total reported practices about osteoporosis, the current study demonstrated that there was highly statistically significant relation between total adolescent girls' practices about osteoporosis and their demographic characteristics as fathers' and mothers' educational level, family income, family history of osteoporosis and history of fracture. While, there was no statistically significant relation with their school, fathers' and mothers' occupation and body mass index.

This result was accordance with ***Shams et al., (2018)*** who conducted a study entitled "Effect

of Education-Based Intervention Using Group Discussion on the Knowledge, Attitude, and Practice of Postmenopausal Women about Osteoporosis Preventive Behaviors" and found that there was highly statistically significant relation between total adolescent girls' practices about osteoporosis and their demographic characteristics. Also, this result was supported with ***Panahi & Kazemi, (2018)*** who conducted study entitled "Health literacy: An effective component in prevention of osteoporosis in women" and found that there was highly statistically significant relation between total reported practices about osteoporosis and their demographic characteristics.

Regarding the relation between adolescent girls' demographic characteristics and their total beliefs regarding osteoporosis, the current study showed that there was a highly statistically significant relation between the total adolescent girls' beliefs regarding osteoporosis and their demographic characteristics as fathers' and mothers' educational level, family income, family history of osteoporosis and history of fracture. While, there was no statistically significant relation with their school, fathers' and mothers' occupation and body mass index. The finding of the current study could be due to that the higher education levels of fathers' and mothers' of adolescent girls have positive effects on health beliefs.

This result was accordance with ***Shams et al. (2018)*** who conducted a study entitled "Effect of Education-Based Intervention Using Group Discussion on the Knowledge, Attitude, and Practice of Postmenopausal Women about Osteoporosis Preventive Behaviors" and found that there was a highly statistically significant relation between total beliefs regarding osteoporosis and their demographic characteristics. Conversely, this result was disagree with ***Chan et al. (2018)*** who conducted a study entitled "A review of knowledge, belief and practice regarding osteoporosis among adolescents" and found that there was highly statistically significant relation between total beliefs regarding osteoporosis and their demographic characteristics.

The correlation between total the adolescent girls' knowledge about osteoporosis and their reported practices, the current study showed that there was a highly significant positive correlation between total adolescent girls' knowledge about osteoporosis and their reported practices. The finding of the current study could be explained by the investigator opinion as the link between knowledge score and practices change is logic as the adolescent girls who gained more knowledge change are more likely to improve their reported practices regarding osteoporosis.

The findings of the current study are in the same line with ***Akbartabar Toori, (2020)*** who conducted a study entitled " The Impact of Teaching on Health Belief Model Constructs in the Preventive Behaviors of Osteoporosis in Adolescences Girls" and found that there was a highly significant positive correlation between total adolescent girls' knowledge about osteoporosis and their reported practices. Conversely, this result was in disagree with ***Chan et al. (2018)*** who conduct a study entitled "A review of knowledge, belief and practice regarding osteoporosis among adolescents" and found that there was no significant correlation between the total adolescent girls' knowledge about osteoporosis and their practices.

Conclusion:

Based on the findings of this study, it can be concluded that, Adolescent girls in the current study had lacked appropriate knowledge and practices regarding osteoporosis. More than half of them had negative beliefs regarding disease. The study shows that, there was a highly statistically significant relation between total adolescent girls' knowledge about osteoporosis and their demographic characteristics as fathers' and mothers' educational level, family income, family history of osteoporosis and history of fracture. While, there was no statistically significant relation with their school, fathers' and mothers' occupation and body mass. There was a highly statistically significant relation between total adolescent girls' practices about osteoporosis and their demographic characteristics as fathers' and mothers' educational level, family income,

family history of osteoporosis and history of fracture. While, there was no statistically significant relation with their school, fathers' and mothers' occupation and body mass index. Also, there was a highly statistically significant relation between total adolescent girls' beliefs regarding osteoporosis and their demographic characteristics as fathers' and mothers' educational level, family income, family history of osteoporosis and history of fracture. While, there was no statistically significant relation with their school, fathers' and mothers' occupation and body mass index. Finally, there was a highly significant positive correlation between total adolescent girls' knowledge about osteoporosis and their reported practices.

Recommendations:

Based on the findings of the current study, the following recommendations could be suggested:-

- ✓ Designing and implementing nursing intervention based on health belief model for improving knowledge and beliefs regarding prevention of osteoporosis among adolescent girls.
- ✓ Messages directed to women in all age group emphasize on the importance of high dietary calcium intake, and vitamin D, weight-bearing exercise, decreased use of caffeine in prevention of osteoporosis.

Further studies need to be performed to:

- ✓ Assess knowledge, practices and health beliefs regarding prevention measure of osteoporosis among other age groups and male students.

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