

Pilot for the extent of women's knowledge regarding risk factors leading to oestoporosis (Comparative study)

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Abstract

Osteoporosis is a serious public health problem that currently causes global concern. It is a silent and incurable disease, and so many people are not alert to it until complications occur. Osteoporosis is a serious public health problem that currently causes global concern. It is a silent and incurable disease, and so many people are not alert to it until complications occur. The aim of the present study is to assess women knowledge level toward the risk factors for oestoporosis. Descriptive comparative with convenience random sampling was used sampling 300 from Egypt, Sudan and Kingdom of Saudi Arabian which divided into 100 women from community of each country which carried out in Egypt in Damanhur city, Sudan in Elkhartoum city and in Saudi Arabian in Jeddah city .One modified tool for data collection was used divided into 2 main parts related to sociodemographic characteristics, knowledge toward risk factors of osteoporosis respectively. Results of the present study revealed significance difference in many items related to knowledge, dietary habits between Egyptian, Saudi and Sudanese women regarding risk factors of osteoporosis. also, No relation between women age , Economic status and their attitude regarding performed bone densitometry test among all studied sample while a significant relation was found among only Sudanese women in relation to their jobs and economic situation . There are obvious needs for development and implementing educational instructional scheme for women in Arab countries regarding prevention of oestoporosis. In addition, the study results supported the three hypotheses of the research. Increase women motivation to attend educational classes regarding osteoporosis prevention and increased their awareness and knowledge level.

Keywords: Women, knowledge, Risk factors, Osteoporosis.

INTRODUCTION

One of these chronic diseases is osteoporosis. By 2020, one in two Americans over age fifty will have or be at risk for developing osteoporosis. Due to this increase and other predictions, the Surgeon General has identified bone health as a critical component to the overall health and quality of life of Americans (U.S. Department of Health and Human Services (USDHHS), 2004).

Osteoporosis can be broken down into two words; the term "osteo" means bone and the term "porosis" means porous or having pores. Osteoporosis refers to a disease causing the bone structure to become more open and porous resulting in fractures. According to National

Institute of Health, (NIH), The term osteopenia is a less advanced stage of bone loss as compared to osteoporosis; it reflects BMD values "between 1 and 2.5 standard deviations below the mean of young adults of the same race and sex"(Khan et al., 2002).

Osteoporosis is defined by the World Health Organization (WHO) as a bone mineral density that is 2.5 standard deviations or more below the mean peak bone mass (average of young, healthy adults) as measured by DXA; the term "established osteoporosis" includes the presence of a fragility fracture (All dredge et al., 2009).

In both developed and developing countries osteoporosis is a growing health problem that is well recognized. This contributes greatly to the high costs of health care and mortality. This is therefore reason enough to conduct epidemiologic surveys in order to

know the prevalence of osteoporosis and related risk factors within communities. By doing this, long lasting solutions for prevention and control are achieved. (Karimi, 2011).

According to osteoporosis foundation fact sheet, 1 in 3 women who are over 50 years will suffer a fracture due to osteoporosis and these increases to 1 in 2 who are over 60 years of age. The prevalence of osteoporosis, in Qatari women the prevalence of osteoporosis is comparable to other countries.. (Bener et al., 2007). Approximately 1.6 million hip fractures occur each year worldwide, the incidence is set to increase to 6.3 million by 2050. The highest risks of hip fractures are seen in Norway, Sweden, Iceland, Denmark and the USA. However, osteoporosis should no longer be considered an old women's disease but rather young women should also be included. Regular physical activity, healthy eating and not smoking can prevent and alleviate problems associated with age-related loss of muscle strength and bone density (Karimi, 2011).

In Qatar, the prevalence of osteoporosis among postmenopausal women was found to be 12.3%. This result is similar to the study findings of Jordan where 13% of women aged 40–60 had osteoporosis. In the USA, 16% of postmenopausal Caucasian women are estimated to have osteoporosis in the lumbar spine. In comparison, a higher prevalence was observed among Japanese women aged between 50 and 79 years; 35% in the spine and 12% in the hip. Among Saudi women, it was documented that 24% had osteoporosis. Another study involving healthy postmenopausal women in Denmark indicated 50% prevalence of osteoporosis in those older than 50 years (Bener et al., 2007).

On the other hand , Osteoporosis is a major public health problem, causing fractures of wrist, back and hip with high associated morbidity and mortality particular at risk are post menopausal women, (Pawar, 2007). National Osteoporosis Foundation, 2002 reported that Up to 44 million Americans have either low bone mass or osteoporosis. Osteoporosis results in height loss, muscle weakness, loss of physical function and independent living, social isolation, increased length of hospitalization, chronic pain, and fractures (Kuin Cheong, 2002).

Many women are not diagnosed with osteoporosis until they have sustained one or more fractures, despite advances in diagnosis and therapeutic interventions. Priority should be directed towards finding and managing patients who have the highest risk of falling and experiencing fracture (Karimi, 2011) . Bone mineral density (BMD) is often used as an estimate measure for bone strength while it only accounts for 70% of bone strength. Osteoporosis is an increasing global health concern, and educational programmes have been identified as a crucial strategy in its prevention. However, the effectiveness of osteoporosis educational programmes has mainly been evaluated in women”(Khan et al., 2002).

Osteoporosis affects over 28 million Americans. It is one of the five areas of focus for Healthy People 2010. Health care expenses have been projected to triple by 2040, related to the occurrence of hip fractures in the increasing elderly population. However, research has shown that health care providers do not provide adequate teaching to patients about osteoporosis prevention. So, Bone density test is important variable for early detection of osteoporosis, as it defined as decreased bone mass with deterioration of the architecture of the skeleton ().

There are many factors that increase the risk of a person developing osteoporosis. Individuals with more risk factors are at greater risk of osteoporosis and this can further be divided into non modifiable meaning that an individual has no control over them and modifiable risk factors for osteoporosis meaning the individual can make life style changes to change and control the development of osteoporosis. So, Early and effective interventions are necessary to reduce the risk of future fracture. It is vital to consider what kind of information is relevant for the various age groups in order for them to prevent or manage osteoporosis at different times in their life. For example, school age, post menopausal or older age (Karimi, 2011).

In fact, Osteoporosis is different from most other diseases in that there is no one single cause. The best prevention for the onset is proper nutrition and exercise beginning in childhood and continuing through young adulthood. Although osteoporosis can affect anyone, it is most prevalent in females. College students, women in particular , need to be better informed about how proper nutrition and regular exercise can help them achieve optimal peak bone mass. The risk of developing osteoporosis can be minimized for young women by lifestyle behaviors they choose early on. There are several identified means to prevent Osteoporosis (Rodzik, 2008).

Regardless that Osteoporosis is difficult to treat and is still incurable, prevention is critically important. Indeed, it is preventable by changing unhealthy lifestyles to maximize bone mass density before its occurrence. For example, evidence shows that increasing calcium intake and regular weight-bearing exercise are lifestyle actions that can increase bone mass density and prevent the development of osteoporosis (Tung, 2006).

For this reason, the role of nurses in osteoporosis education and counseling is to function at all levels of prevention. Primary prevention, also known as health promotion, focuses on the prevention of disease and illness with specific preventive measures. The goal of primary prevention is to ensure that maximal peak bone mass is obtained and bone loss is minimized. Primary prevention of osteoporosis should include screening, increased calcium intake, appropriate nutrition, physical activity and age-appropriate exercise (Mar, 2004) . thus the aim of current study was help primary level of prevention in exploring women knowledge levels in order

to clarifying the needs of those women in this level of prevention .

Aim of the study

To explore the women knowledge levels regarding osteoporosis risk factors in three different Arab Regions namely Egypt, Kingdom of Saudi Arabia (KSA), and Sudan.

Research Significance

Osteoporosis is an important public health problem in older adults. It is more common in postmenopausal women and not only gives rise to morbidity but also markedly diminishes the quality of life in this population. There is lack of information about the risk factor of osteoporosis in developing countries. In this study we aimed to assess the risk factors for osteoporosis in postmenopausal women from selected BMD centers of two developing Asian countries (Iran and India) (Keramat et al., 2008).

Osteoporosis is a disease that threatens more than 61 million post menopausal women in India. More than 28 million post menopausal women in America. It is a major public health problem in many parts of the world. 84 per cent of women those who are 80 years of age are affected, the average 75 years old women have lost 25 per cent of their cortical bone and 40 per cent of their trabecular bone with the aging. Because of Osteoporosis the number of hip fracture may increase three fold by the year 2040. Thus any reduction in osteoporosis among educated women may have large impact on health care expenditure (Pawar, 2007).

Writing Group for the Women's Health Initiative Investigation, 2002 reported that one of the major squealed to osteoporosis is hip fracture. There are no warning signs of osteoporosis until fracture occurs. Although there are current therapies for osteoporosis treatment, Hormone therapy (HT) has been the gold standard for the treatment and prevention of osteoporosis. However, the use of health teaching for prevention of osteoporosis has come under question due to increased risk of Coronary heart disease and breast cancer. Additionally, Perception of susceptibility to a condition/health threat is one of the main concepts in the Health Belief Model and the Teachable Moment. These theories are not based on an assumption that patients necessarily perceive a health threat or their existing behaviour as needing modification (Sujic, 2011).

Conceptual framework

Conceptual model of the current study was based on the

Health Belief and behavior change Models to clarify the importance of exploring health beliefs which affect health status. This model seeks to the Model was used to examine the role of osteoporosis' beliefs and attitudes in community-dwelling women. This model assumes that Patients' perception of their health plays a central role in individual-level theories of health behavior change. Major theories of health behaviour change such as the Health Belief Model (McBride, Emmons and Lipkus, 2003).

Research Questions

1. What are the women knowledge levels regarding risk factors of osteoporosis in the three selected Arab Countries region?
2. What are dietary habits of those women in the three selected Arab Countries region?

Operational definitions

- Knowledge

The level of understanding of educated women regarding osteoporosis after menopause

- Osteoporosis

Is a systemic skeletal disorder characterized by compromised bone strength pre disposing to an increased risk of fracture.

SUBJECTS AND METHODS

A descriptive comparative research design will be utilized in this study; the study will be portrayed under the four main designs as follows:

- 1- Technical Design
- 2-Operational Design
- 3-Administrative design
- 4- Statistical Design.

Research design

The present study is a descriptive comparative study aiming to explore women knowledge levels regarding risk factors of osteoporosis in three Arab countries region

Research Hypotheses

To fulfill the aim of the study, the following research hypotheses were tested:

H1 There will be significant difference between the three Arab regions in their women knowledge levels according to their socio demographic variables as (Age, education, occupation, monthly family income).

H2: There will be significant difference between the three Arab women ' countries knowledge and their dietary habits

H3: There will be significant Relation between three countries in performance of boned density test with their women age group, job and economic situation

Technical design

The technical designs for this study included research setting, subjects, tools and methods of data collection.

A-study setting

This study was carried out in three geographical areas from community as follows ; Egypt in Damnhour city, Kingdom of Saudi Arabia in Geddah and, Sudan in Elkhartom city.

Target population

The target populations were women inage group above 30 years attend outpatient clinics in the three countries as mentioned above.

B-Subjects

A sample of 300 female who were attending Outpatient clinics from the three countries which select 100 women from each country The inclusion criteria were women above 30 years old and willing to participate in the study. While the exclusion criteria include women who had osteoporosis and opposite sex, also women who refused to participate in the study.

C-Tools for Data Collection

Data was collected by using one tool:

Tool I- Questionnaire Sheet

Were modifacated tool from; Taylor et al. (2008). Timby; (2009); Potter and Perry (2008) and Garden (2007). This tool aimed to explore women awareness regarding prevention of osteoporosis. That composed to two parts:

Part 1a) Personnel Data

Personnel data Was Contains information related to demographic characteristics of the studied women as

their sex, age, social status, educational degree and occupation.

Part 2b) women's knowledge and dietary habits

It includes 31 question related to nurses knowledge regarding oestoprosis risk factors, dietary habits

Methods of Data collection

Ethical considerations

Ethical Consideration

1. Explain the aim of the study to the directors of the outpatient clinics in the all countries to take his permission to do this study.
 2. Explain the aim of the study to each woman to be familiar with the importance of her participation.
 3. Confidentiality of the information was assured by the researcher.
- The tools were tested for content the validity and clarity by
4. experts in nursing and medical field and appropriate modification were done accordingly.

Field work

The interview sheet was filled out individualized with the researcher in the three geographical areas . Data was collected from the selecting settings by the researcher using the pre constructed tools.

1) Each women was individually interviewed by the researcher; the questionnaire was filled by the women while they are on duty, purpose of the study was explained prior to get the questionnaire sheet, and it distributed to be answered within (20 -30 minutes) then collected.

2) sheet was filling about 1-2 women per day started from august 2011 to June 2012 , over a period of 11 months starting according to women availability for attendance to the hospital clinics and availability of time for both assistant researcher in the three countries to collect data.

(2)-Operational design

The operational design includes preparatory phase, content validity, reliability, pilot study and fieldwork.

A-Preparatory phase

It includes reviewing of literature, different studies and theoretical knowledge of various aspects of the problems

using books, articles, internet, periodicals and magazines.

B- Content validity

Ascertained by 4 expertises from nursing and medical staff

C-Content Reliability

Was done through

D-Pilot Study

Pilot study was carried out after the development of the tools on 10% of the nurses to test applicability of the tools then necessary modification were done according to the results of the results of pilot study and expertise opinions. The purpose of pilot study was:

- 1- To test the applicability of the study tools.
- 2- To estimate any need for addition in the tool.

(3) Administrative Design

An official letter from the faculty of nursing was sent to the selected area of the study .The director of each setting was contacted and informed in order to obtain permission to include the nurses on the present research.

(4) Statistical Design

Collected data was arranged, tabulated and analyzed according to the type of each data.

Scoring system

The total score of women's knowledge against 31 questions was calculated to be 87. The respondent was given one point for each correct answer and zero for incorrect answers. Total score of 75%and more was considered satisfactory, while scores below 75% was considered unsatisfactory.

Statistical analysis

Data analysis

Data was collected and entered into a database file. Statistical analysis was performed by using the SPSS 17 computer software statistical package. Data was described by summary tables and figures. For comparing the (Knowledge and Practice) with socio-demographic characteristics, value for Monte Carlo and Post Hoc Test

(Schaffer) and Fisher Exact test was used. Statistical significance was considered at P-value <0.05 and highly significance at P-value <0.01.

Descriptive statistics

Numbers and percentages

Used for describing and summarizing qualitative data.

The following statistical measures were used

1- Monte Carlo and Post Hoc Test (Schaffer)

Used to compare between two or more proportion.

2- Fisher exact test probability (FETp)

They are used when X² is not valid (>20%of the expected cell have count less than 5).

Limitation of the study

Hardly to contact in the Sudan and KSA for collection of data which takes long time more than the researcher prediction.

RESULTS

Table1. shows that near total (99%) of Sudanese women were in age group between 30-45 years while the equal percents in both Egyptian and Saudi women (43%) were in 50-60 age group, also about (69% , 73% , 68%) of the studied sample were house wife's between all countries respectively .As regards marital status (70% and 68% , 94%) of the sample had secondary and higher educational level respectively, while equal percent (15.6%) were illiterate or had primary education . in addition to , the most of Sudanese , Egyptian , Saudi women (90% , 87%, 84%) doesn't perform bone density test respectively . on the other hands , there are a statistically significant difference in all countries regarding economic status.

Table 2. There were statistically significant differences in the most of knowledge items regarding risk factors of oestoprosis among all studies sample with (p-value .001).

Table 3. In relation to description of women dietary habits, all women in (Egypt , KSA, Sudan) had fluctuated answers in all preferred dietary items with a statistically significant difference between them with (p-value .000).

Table 4. As regards the comparison of knowledge and dietary habits among the different studied groups there are statistically significant difference were found between Sudanese and Saudi women in their knowledge and dietary habits (p-value.001).

Table 1. Comparison between the different studied groups according to their demographic characteristics

	Egypt		KSA		Sudan		p
	No.	%	No.	%	No.	%	
Age							
30 – 45	41	41.0	38	38.0	99	99.0	0.001*
50 – 60	43	43.0	43	43.0	1	1.0	
>60	16	16.0	19	19.0	0	0.0	
Job							
Student	0	0.0	0	0.0	6	6.0	0.003*
Teacher	21	21.0	17	17.0	9	9.0	
Supervisor	10	10.0	10	10.0	17	17.0	
House wife	69	69.0	73	73.0	68	68.0	
Marital Status							
Married	70	70.0	68	68.0	94	94.0	0.001*
Single	10	10.0	5	5.0	6	6.0	
Widow	12	12.0	11	11.0	0	0.0	
Divorced	8	8.0	16	16.0	0	0.0	
Economic situation							
Low	67	67.0	18	18.0	14	14.0	0.001*
Moderate	28	28.0	33	33.0	82	82.0	
High	5	5.0	49	49.0	4	4.0	
Bone density test							
Yes	16	16.0	13	13.0	10	10.0	0.451
No	84	84.0	87	87.0	90	90.0	

p: p value for Chi square test

*: Statistically significant at $p \leq 0.05$ **Table 2.** Description of different studied groups according to their knowledge levels regarding osteoporosis risk factors

STATEMENTS	Agree		Moderate		Disagree		Test of sig.
	No.	%	No.	%	No.	%	
WOMEN HIGH RISK FOR OESTOPROSIS THAN MEN							
Egypt	81	81.0	12	12.0	7	7.0	p = 0.328
KSA	74	74.0	20	20.0	6	6.0	
Sudan	76	76.0	13	13.0	11	11.0	
OESTROGEN IS PREVENTIVE DRUG TO OESTOPROSIS							
Egypt	39	39.0	43	43.0	18	18.0	p = 0.277
KSA	38	38.0	48	48.0	14	14.0	
Sudan	48	48.0	33	33.0	19	19.0	
COFFEE IS RISKFACTORS FOR OESTOPROSIS							
Egypt	4	4.0	59	59.0	37	37.0	<0.001*
KSA	4	4.0	20	20.0	76	76.0	
Sudan	79	79.0	9	9.0	12	12.0	
LOW WIEIGHT IS NOT RISKFACTOR FOR PREVENTION							

Table 2. continue

Egypt	25	25.0	41	41.0	34	34.0	p <0.001*
KSA	4	4.0	46	46.0	50	50.0	
Sudan	56	56.0	17	17.0	27	27.0	
LOW EXPOSURE TO SUN LIGHT IS NOT RISK FACTORS FOR OESTOPROSIS							
Egypt	32	32.0	9	9.0	59	59.0	p = 0.010*
KSA	36	36.0	14	14.0	50	50.0	
Sudan	53	53.0	12	12.0	35	35.0	
CORTISON PRODUCTS IS INCCREASD INCIDENCE OF OESTOPROSIS							
Egypt	70	70.0	27	27.0	3	3.0	p <0.001*
KSA	49	49.0	40	40.0	11	11.0	
Sudan	47	47.0	28	28.0	25	25.0	
OESTOPROSIS IS NOT AHEREDIATRY DISEASE							
Egypt	22	22.0	34	34.0	44	44.0	p<0.001*
KSA	26	26.0	40	40.0	34	34.0	
Sudan	59	59.0	7	7.0	34	34.0	
EXERCISES HASN'T ANY RELATION WITH OESTOPROSIS							
Egypt	4	4.0	19	19.0	77	77.0	p <0.001*
KSA	9	9.0	28	28.0	63	63.0	
Sudan	63	63.0	9	9.0	28	28.0	
THERE ARE NO EARLY SIGNS andSYMPTOMS FOR OESTOPROSIS							
Egypt	61	61.0	26	26.0	13	13.0	p = 0.010*
KSA	40	40.0	44	44.0	16	16.0	
Sudan	62	62.0	25	25.0	13	13.0	
OESTOPROSIS IS HIGH RISK FOR FRACTURE							
Egypt	68	68.0	20	20.0	12	12.0	p<0.001*
KSA	47	47.0	32	32.0	21	21.0	
Sudan	77	77.0	17	17.0	6	6.0	
MILK IS IMPORTANT FOR PREVENTION OF OESTOPROSIS							
Egypt	55	55.0	31	31.0	14	14.0	p<0.001*
KSA	81	81.0	14	14.0	5	5.0	
Sudan	76	76.0	13	13.0	11	11.0	

p: p value for Chi square test MCp: p value for Monte Carlo test

*: Statistically significant at $p \leq 0.05$

Table 3. Description of different studied groups according to their diet habits

	Always		Sometime		rarely		Never		Test of sig.
	No.	%	No.	%	No.	%	No.	%	
Skimmed milk									
Egypt	0	0.0	13	13.0	32	32.0	55	55.0	p <0.001*

Table 3. Continue

KSA	0	0.0	9	9.0	33	33.0	58	58.0	
Sudan	31	31.0	46	46.0	12	12.0	11	11.0	
Milk with fruit									
Egypt	2	2.0	59	59.0	34	34.0	5	5.0	
KSA	2	2.0	40	40.0	33	33.0	25	25.0	p <0.001*
Sudan	8	8.0	43	43.0	25	25.0	24	24.0	
Orange juice with milk									
Egypt	0	0.0	3	3.0	10	10.0	87	87.0	
KSA	0	0.0	3	3.0	19	19.0	78	78.0	MCp <0.001*
Sudan	5	5.0	14	14.0	16	16.0	65	65.0	
Banana juice with milk									
Egypt	11	11.0	25	25.0	64	64.0	0	0.0	
KSA	10	10.0	25	25.0	64	64.0	1	1.0	p <0.001*
Sudan	29	29.0	38	38.0	13	13.0	20	20.0	
Vegetables									
Egypt	44	44.0	29	29.0	22	22.0	5	5.0	
KSA	39	39.0	24	24.0	24	24.0	13	13.0	MCp <0.001*
Sudan	95	95.0	4	4.0	1	1.0	0	0.0	
Meat									
Egypt	8	8.0	5	5.0	27	27.0	60	60.0	
KSA	96	96.0	4	4.0	0	0.0	0	0.0	MCp <0.001*
Sudan	78	78.0	16	16.0	5	5.0	1	1.0	
Fish									
Egypt	17	17.0	25	25.0	53	53.0	5	5.0	
KSA	0	0.0	24	24.0	55	55.0	21	21.0	p <0.001*
Sudan	33	33.0	51	51.0	12	12.0	4	4.0	
Dates									
Egypt	5	5.0	13	13.0	18	18.0	64	64.0	
KSA	90	90.0	10	10.0	0	0.0	0	0.0	MCp <0.001*
Sudan	59	59.0	30	30.0	11	11.0	0	0.0	
Honey									
Always	16	16.0	14	14.0	32	32.0	38	38.0	
Sometime	93	93.0	7	7.0	0	0.0	0	0.0	p <0.001*
rarely	20	20.0	41	41.0	31	31.0	8	8.0	
Soybean									
Egypt	0	0.0	0	0.0	8	8.0	92	92.0	
KSA	0	0.0	0	0.0	8	8.0	92	92.0	MCp <0.001*
Sudan	34	34.0	21	21.0	14	14.0	31	31.0	
Nuts									
Egypt	2	2.0	11	1.0	16	16.0	71	71.0	
KSA	34	34.0	27	27.0	18	18.0	21	21.0	p <0.001*
Sudan	32	32.0	41	41.0	22	22.0	5	5.0	
Ice cream									
Egypt	1	1.0	12	12.0	34	34.0	53	53.0	
KSA	3	3.0	17	17.0	27	27.0	53	53.0	p <0.001*
Sudan	30	30.0	40	40.0	25	25.0	5	5.0	

p: p value for Chi square test

MCp: p value for Monte Carlo test

*: Statistically significant at p ≤ 0.05

Table 4. Comparison between the different studied groups according to their knowledge and dietary habits

	Egypt	KSA	Sudan	F _p
Knowledge				
Min. – Max	1.0 – 7.0	0.0 – 9.0	3.0 – 11.0	<0.001*

Table 4. Continue

Mean ± SD	4.61 ± 1.20	4.08 ± 1.31	6.96 ± 1.64	
p₁		Sch _p = 0.028*	Sch _p <0.001*	
p₂			Sch _p <0.001*	
dietary habits				
Min. – Max	4.0 – 21.0	12.0 – 24.0	13.0 – 30.0	<0.001*
Mean ± SD	10.86 ± 3.39	17.62 ± 2.68	23.19 ± 3.91	
p₁		Sch _p <0.001*	Sch _p <0.001*	
p₂			Sch _p <0.001*	

p: p value for comparing between the three studied group

p₁ : p value for comparing between Egypt and each other group

p₂ : p value for comparing between KSA and Sudan

F: F test f (ANOVA)

Sch: Post Hoc Test (Scheffe)

*: Statistically significant at p ≤ 0.05

Table 5. Relation between attitude regarding performed bone density test of all studied sample with their age, job and economic situation

	Bone density test											
	Egypt				KSA				Sudan			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Age												
30 – 45	8	50.0	33	39.3	7	53.8	31	35.6	10	100.0	89	98.9
50 – 60	8	50.0	35	41.7	6	46.2	37	42.5	0	0.0	1	1.1
>60	0	0.0	16	19.0	0	0.0	19	21.8	0	0.0	0	0.0
Test of sig.	p = 0.162				p = 0.145				FEp = 1.00			
Job												
Student	0	0.0	0	0.0	0	0.0	0	0.0	3	3.3	3	30.0
Teacher	6	37.5	15	17.9	4	30.8	13	14.9	9	10.0	0	0.0
Supervisor	1	6.3	9	10.7	1	7.7	9	10.3	16	17.8	1	10.0
Other	9	56.3	50	71.4	8	61.5	65	74.7	62	68.9	6	60.0
Test of sig.	p = 0.203				MCp = 0.361				MCp = 0.032*			
Economic situation												
Low	58	69.0	9	56.3	15	17.2	3	23.1	13	14.4	1	10.0
Moderate	22	26.2	6	37.5	28	32.2	5	38.5	74	82.2	8	80.0
High	4	4.8	1	6.3	44	50.6	5	38.5	3	3.3	1	10.0
Test of sig.	MCp = 0.412				p = 0.709				MCp = 0.445			

p: p value for Chi square test

FEp: p value for Fisher Exact test

MCp: p value for Monte Carlo test

*: Statistically significant at p ≤ 0.05

Table 5. shows that No relation between women age , Economic status and their attitude regarding performed bone densitometry test among all studied sample while asignificant relation was found among only Sudanese women in relation to their jobs and economic situation with (p-value . 0.032).

DISCUSSION

In response to the increase incidence of oestoprosis among women, Assessment of women knowledge and

awareness regarding this disease is essential to detect those women needs and promote optimum health as well as cost benefit. Therefore, the aim of the current study was to assess the women knowledge of osteoporosis risk factors in three different Arab Region namely Egypt, KSA, Sudan.

Regarding socio demographic characteristics of the studied sample, the current study revealed that near all Sudanese women had age ranged between 30-45 years with equal percent of Egypt and KSA , also near two third of the studied sample were house wife's between all countries respectively. As regards marital status the

equal percent (15.6%) were illiterate or had primary education. these findings goes in the same line with Atwood, 2008 who mentioned that Osteoporosis experienced by either sex prior to 50 years of age is identified as Idiopathic, Also , Mandato et al., 2005 reported that oestoporosis is more common in women after the menopause , but is nevertheless also an important concern in men. For example, in the United States of America, about one in eight men aged over 50 have an Osteoporosis-related problem. Current prevalence data show that nearly 30 million women over age 50 are at risk for or have osteoporosis. America's Bone Health: The State of Osteoporosis and Low Bone Mass in Our Nation. (National Osteoporosis Foundation, 2002 and Siris et al., 2001). A similar figure has been found in Canada (Osteoporosis Society of Canada 2003). In Mainland China, about 83% of men aged over 50 have osteoporosis (Lau, 2003).

According to Vestergaard, 2000 Osteoporosis is considered as a major and growing public health problem in both sexes but particularly in women. It is responsible for approximately 75,000 fracture events each year in Australia in those over 60 years of age at a cost to the community of \$774 M . It is estimated that the proportion of women with osteoporosis increases from 15% in those aged 60 to 64 years up to 71% in those over 80 years of age. In the United States, 10 million people already have osteoporosis and 18 million more have low bone mass .

On the other respect of justifications the notable reason submitted from Karimi , 2011 about why osteoporosis is more common in women is due to the fact that bone loss in men starts later and the progression is slow. Men also have an advantage of not having a period of rapid hormonal change and accompanying rapid bone loss. In women the peak bone mass is lower due to the hormonal changes that occur at menopause and the effect of pregnancy. Women need to be cautious about their diet and ensure that it is well balance because failure to observe this, and given the hormonal changes, calcium composition in their bodies can be altered. Taking calcium supplementation is also advised.

In addition to, Atwood, 2008 stated that Factors that influence the development of osteoporosis include: age, sex, genes, lifestyle, smoking and alcohol use, and chronic disease. Due to the multiple etiological factors influencing osteoporosis, it is classified into two categories: primary and secondary. There are three subcategories of primary osteoporosis: Type I, Type II, and idiopathic. Type I refers to postmenopausal osteoporosis and is, therefore, restricted to females, while Type II refers to age related osteoporosis and is experienced by both males and females.

Based on current findings revealed that there were statistically significant differences in the most of knowledge items regarding risk factors of osteoporosis among all studies sample. This finding goes in the same

line with Riaz et al 2008 in their study conducted on Saudi Arabia and founded that the knowledge on osteoporosis in younger women was very poor compared to relatively older females. Also indicates that Pakistani women with higher socioeconomic status have significantly better knowledge of osteoporosis than women with a low socioeconomic status, regardless of age. Similarly, another study found that better educated Chinese women in Singapore knew more about osteoporosis compared to the less educated ones. Also , Rodzik, 2008 mentioned that yet several studies indicate that a significant number of women do not have adequate knowledge about osteoporosis and the associated risk factors and preventive behaviors as Ailinger and Emerson, 1998; Ali, 1996; Terrio and Auld, 2002).

In India , Pande et al., 2005 The correct definition of osteoporosis was given by 74%, but highlights on general lack of knowledge about osteoporosis in learned Indian women and also the need for increased involvement of medical professionals in patient education . Also, there was statistically significant difference in the total score depending on the faculty of education, with staff members from the science faculty having the maximum mean score ($p < 0.05$). We found no influence of age, menopausal status, previous history of fracture and family history of osteoporosis on the level of knowledge. While In Singapore Zhang and Chandran , 2011 highlight the fact that knowledge of osteoporosis among nurses in Singapore may be insufficient. More osteoporosis outreach programmes for nursing professionals are warranted.

In addition to , Rodzik , 2008 highlight on the finding of Weiss and Sankaran (1998) whose conducted a study at a Pennsylvania university with 144 college-age sorority women that examined knowledge, attitude, and behavior toward osteoporosis prevention. The survey analysis revealed generally poor knowledge about osteoporosis and prevention strategies but strong desire for information about the disease and preventive behaviors. Only 46% of their respondents correctly identified physical inactivity as a risk factor for developing osteoporosis. Thus, more than half of the young, at-risk women surveyed were unaware of one of the most critical risk factors for osteoporosis. Results of this study provided evidence that conducting an osteoporosis education program is beneficial for college aged women.

According to the result of current study regarding women performance of bone density test, the most of Sudanese, Egyptian and Saudi women doesn't perform bone density test respectively. on the other hands , there are a statistically significant difference in all countries regarding economic status . these results was clarified according to researcher opinion related to the difference of beliefs to perform these test and check frequently the physician which the most of Arab country go to the physician clinic only when they are feel sick. This finding goes in the same line with (Cheong, 2002) who neces-

sitate on importance of Bone mineral density (BMD) testing which it used to determine indirectly the amount of mineral in bones, is related to bone strength and provides a good prediction of fracture risks. Moreover, Barbour, 2012 stated that Osteoporosis is a major public health problem in men and women. Low bone mineral density (BMD) is a major risk factor for fracture. Fractures have major implications for morbidity and mortality.

In addition to, The GLOW study looked at women from 10 countries in Europe, North America and Australia and included more than 60,000 women who were postmenopausal – a time when bone loss that leads to osteoporosis occurs from declining estrogen levels and recommended that Women should remain aware of their risk factors for osteoporosis and take action. Three or more alcoholic beverage daily, low weight, two or more falls in the past year, rheumatoid arthritis, a history of bone fractures and older age put women a high risk for osteoporosis that can progress and lead to fractures and debilitation. Long term use of steroids also leads to loss of bone density (Blanchard, 2010).

Based on the study finding regarding women dietary habits, all women in (Egypt, KSA, Sudan) had fluctuated answers in all dietary habits items with a statistically significant difference between them. It could be in researcher idea for the geographical and dietary manner for healthy food consumption between these countries. This finding goes in the same results of Hong Kong report which indicates that about 70% of the incidence of osteoporosis in Hong Kong is due to 'unhealthy' lifestyles (Cuhk 2000b).

In Egypt, The majorities of adolescent females are not consuming the recommended daily amount of calcium and are lacking sufficient osteoprotective exercise for building healthy bone. Care of body image which is prevalent among participants is contributing to lack of milk intake. Modifiable risk factors (as dietary factors, life styles and smoking) are more prevalent than non modifiable risk factors as family history of both fracture and osteoporosis. And this may open window to intervention. An osteoporosis educational program can significantly improve overall knowledge in adolescent females. Also, there was no significant relationship between knowledge and behavior. However, as was evident from this study, risk factors such as negative effect of drinking soft drinks, tea and coffee were identified among 58.1% which was higher than that reported by Amal A. El Badawy et al., (2002) in a similar study carried out in Zagazig at which a rate was only 7% (Mahfouz et al.,2007)

Furthermore, In Qatari women Our survey results showed that a good proportion of women taking the right diet avoided possible risks of osteoporosis. Nearly half of the studied women were taking dairy products like milk, cheese and yogurt and these subjects had a better BMD at spine, neck and wards sites ($P < 0.05$). (Bener et al.,

m2007). This report finding goes in the same way with Yeap et al., 2010 whose found Malaysian women Knowledge of oestoporosis risk factors was good: 97.1% identified low calcium intake, 87.8% lack of exercise, 80.0% family history of OP, and 75.8% postmenopausal status. A total of 38.7% of the attendees thought that oestoporosis was more serious than cancer and 35.1% more serious than heart disease.

In Australia, Osteoporosis knowledge and calcium from food (% of RDI) increased from baseline to 3 months in both groups ($P < 0.01$). Use of osteoporosis medications increased between baseline and 3 months in the OPSMC group while decreasing in the one-session group ($P = 0.039$). There were no differences between the groups or over time in physical activity, calcium or exercise self-efficacy.(Laslett et al, 201)

On the other hand, In Vietnam, CHEONG, 2002 stated from Albright et al., 1997 that knowledge of Nutrition education for low-literacy populations should be presented in a fashion that will help them understand how and what to change in their dietary habits Materials should be easy to read and understand (should aim for a 6th grade reading level or less). Culturally relevant, and address the issue of cost of food .also, Brochures on learning how to read nutrition food labels were successfully improved low-literacy participants' skill at using the Nutrition Facts food label. In a focus group involving low income.

In this regard, Keramat et al., 2008 highlight on The role of nutrition is perhaps the most controversial area in the causation of Osteoporosis. Calcium, phosphate, and vitamin D are essential for normal bone structure and function, but several other micronutrients also have essential roles in bone mass. Non nutrients such as phytoestrogens may also improve the status of bone tissue, women whose diets meet their calcium recommendation consume significantly more servings of milk and milk products and more several essential nutrients than women whose diet do not meet their calcium needs. In India, nil consumption of milk, have been shown as risk factors of osteoporosis, In Iran, daily consumption of milk and cheese =>30 g/d have been shown as protective factors of osteoporosis. Also the consumption of almond, Soya products, were shown as protective factors in India. Almond was also reported as good sources of calcium in literature. The isoflavones in soybeans, which function both as phytoestrogens and antioxidants, may result in the inhibition of bone resorption.

On another point of views, Cheong, 2002 focused on Supplementation of calcium in the diet does not completely eliminate postmenopausal bone loss. However, it does slow the rate of decline. Higher calcium intakes in the elderly reduce the risk for hip and spine fractures also his study included the report of French study to discuss supplementing the diet of older institutionalized women with vitamin D3 (800 IU) and

calcium (1200 mg) for 18 months resulted in a significant increase in femoral neck and proximal femur BMD nested by Chapuy et al., 1992). So the curriculum that was implemented in this study emphasized dairy foods, calcium-fortified foods, and supplements. In order to sustain intakes of such foods, participants were shown examples of calcium-rich and calcium-fortified foods, as well as given calcium-fortified orange juice to taste. In addition, since the conclusion of his study, the lesson on calcium and vitamin D has been expanded from one to three lessons.

Recently, from another new trend research marker was done to investigate the association between osteoporosis and many chronic disease Bhupathiraju, 2011 study the relation between Cardiovascular diseases (CVD) and osteoporosis which are two major public health problems in the aging population. However, it remains unclear how risk factors for CVD, as opposed to incident CVD events, affect bone health. Puerto Rican adults living in Massachusetts have documented health disparities and have a disproportionate cardiometabolic risk burden compared to other Hispanic subgroups, but little is known about bone health in this population. It is therefore important to understand the association between CVD risk factors and bone health in this high risk group while in Brazil, a high prevalence of osteoporosis and osteopenia in out-patients with COPD. Patients with osteoporosis had more severe COPD than patients with normal bone mass.(Silva et al., 2011)

Concerning the relation between women age, job and Economic status and their attitude regarding performed bone densitometry test . the present study revealed that there was a significant relation was found among only Sudanese women in relation to their jobs and economic situation . This finding supported by Bener et al., 2007 who's reported that The differences in BMD values may be a result of differences in ethnicity, dietary habits and life style factors .The BMD values of Qatari women are similar to their Caucasian counterparts, but the BMD at spine of Qatari women is a little lower than Caucasians in all age groups, whereas at the total femur, the BMD of Qatari women are higher in the age group 30–59 . While the BMD values of Kuwaiti females are also similar to their Caucasian counterparts and significantly higher than those for Lebanese and Saudi women.

In contrast , another study was done on male In Hong Kong, it has been estimated that about 49% (175,713) of men aged 65 and over have low bone mass density and 9% (31,816) of Hong Kong Chinese men have osteoporosis [The Chinese University of Hong Kong (CUHK) 2003]. More importantly, these Hong Kong figures have doubled over the past decade (CUHK 2003). Recent studies Show that the problems of osteoporosis in men have been increasing (Francis, 2000; Cuhk 2003).

Another research create an economic reason from WHO , 2003 for women attitude toward performance of BDM because It is expensive to diagnose and manage

osteoporosis and more so if surgical intervention are sought or when acute episodes occur. The patients and family members have to make lifestyle adjustments due to the financial and psychological impact. (Karimi, 2011). While Mavromatis, 2011 sit misunderstanding as greatest reason for non performance of BDT that osteoporosis is a poorly understood concept among the general public.

Based on the study findings, there are a statistically significant difference were found between Sudanese and Saudi women in their knowledge and dietary habits. These finding goes in the same way of study was done In Saudi Arabia by Riaz et al., 2008 whose reported that women belonging to higher socioeconomic status and better education had slightly more knowledge about osteoporosis compared to those with a low education level, regardless of age while results in Vietnam by Nguyen et al., 2011 founded that a majority (81.6%) of the women had heard of osteoporosis. Awareness was associated with education, working in health care, and having a family member with osteoporosis. On average, Vietnamese women answered 49% of the knowledge questions correctly; scores ranged from 0 to 26 questions correct out of 30 (mean = 14.71 ± 5.2, median = 15). Mean knowledge scores were higher among those reporting a family member with osteoporosis, nurses (vs other vocations), and women with a high school education or greater (relative to those who had not completed high school). More than 90% of the women expressed interest in a prevention and treatment program.

While , Alexandraki et al., 2008 reported that 96 % of the Greek women knew osteoporosis definition and sources of this knowledge the older age was associated with less knowledge (OR=0.93, CI: 0.88-0.97, p=0.004), and higher education with increased knowledge (OR=1.68, CI: 1.10-2.55, p=0.014) about osteoporosis. 56.4% of the participants were aware of at least one osteoporosis risk factor. In multivariate analysis, it was revealed that the participants who referred increased milk products consumption in childhood (OR=3.72, CI: 1.34-10.36, p=0.012) and current performance of physical activity (OR=13.06, CI: 3.22-53.05, p<0.001) were more likely to be informed about osteoporosis risk factors; age >61 years was associated with decreased knowledge of risk factors (OR=0.27, CI: 0.09-0.82, p=0.018).

In Turkish, Awareness and accurate definition of osteoporosis was high in younger and high educated women (p < 0.001). Osteoporosis knowledge was low with a mean score of 5.52 out of 20. Younger and more educated women had higher knowledge scores. Low calcium in diet and menopause were the first two risk factors chosen for osteoporosis. Knowledge about osteoporosis among rural Turkish women is low, and majority of women are unaware of the risk factors and consequences of osteoporosis. (Gemalmaz, and Oge, 2008) . While in Athens the older greek women age was associated with less knowledge (OR=0.93, CI: 0.88-0.97,

$p=0.004$), and higher education with increased knowledge (OR=1.68, CI: 1.10-2.55, $p=0.014$) about osteoporosis (Alexandraki et al., 2008)

In Malaysia, Significantly more women than men ($P = .015$), those with more than 10 years of schooling ($P < .001$), and those earning more than \$US285 per month ($P = .022$) had heard of Osteoporosis. In this self-selected population, women, the better educated, and those earning higher incomes were more aware of OP. Knowledge of OP was obtained mainly from printed materials. (Yeap et al., 2010) while in Spanish women osteoporosis was significantly associated with age, family history, age at onset of menopause, prolonged immobilization, weight loss, and other diseases that increase the probability of developing osteoporosis. (Pérez et al., 2011)

In Israel, The overall level of knowledge about the disease demonstrated by the participants was moderate. Higher education, older age, and fewer fractures were correlated with a higher level of knowledge. In addition, higher levels of education and knowledge were correlated with higher calcium intake. Lastly, a higher knowledge level, older age, and fewer fractures were correlated with higher participation in physical activities. (Edelstein, 2011). Additionally, Osteoporosis Center of the Columbia University Medical Center, New York-Presbyterian Hospital. Stated that "Without a clear understanding of their risks, women cannot begin to protect themselves from fracture." (Blanchard, 2010)

CONCLUSION

Although this was a small pilot study in three Arab countries, it does highlight the fact that knowledge of osteoporosis among those women we and there are obvious needs for designed osteoporosis prevention program for women which effective in improving their knowledge. In addition, the study results supported the three hypotheses of the research.

RECOMMENDATIONS

Recommendations for future educational modules include the following:

1. Develop an educational module that targets individuals. This module should include risk factors, modifiable risk factors, screening, pharmacologic interventions, and non-pharmacologic interventions (exercise, diet, calcium supplementation).
2. Develop an educational module for health professionals, such as nurses, physical therapists, nutritionists and others who commonly interact with patients about healthy lifestyle choices. This module should include the above information but with more technical content.
3. Develop an educational module appropriate for

community groups. This module would contain similar information to the one created for patients, but it would stress osteoporosis prevention as a public health measure.

Recommendations for future research related to osteoporosis prevention are listed below. These recommendations are based upon the gaps identified in the literature review.

1. The natural history of osteoporosis is not adequately described. A cohort of young children should be followed across their lifespan to acquire this knowledge. In this way, the role of exercise behavior could be traced, including when it is the most effective for preventing the development of osteoporosis.
2. Specific types of exercise, intensity, and frequency that promote bone density and reduce osteoporosis risk are not well understood. To make recommendations to women, this information is essential.

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REFERENCES

- Alexandraki KI, Syriou V, Ziakas DP, Apostolopoulos VN, Alexandrakis IA, Piperi CP, Kavoulaki E, Myriokefalitakis L, Korres G, Diamanti-Kandarakis E (2008). The knowledge of osteoporosis risk factors in a Greek female population. *Maturitas*. 20;59 (1):38-45
- Allredge B, Mary AK, Lloyd Y, Kradjan W, Guglielmo J (2009). *Applied therapeutics: the clinical use of drugs*. Philadelphia: Wolters Kluwer Health/Lippincott Williams and Wilkins; 101–3.
- and physical activity: CRC press.
- Atwood LM (2008). Osteoporosis in a prehistoric bay area population Published master Thesis in science, San Jose State University; 12
- Barbour K (2012). Osteoporosis: Identification of factors associated with fracture, bone mineral density, bone geometry and bone strength in older adults. Pro Quest Dissertations and Theses; 8
- Bener A, Hammoudeh M, Zirie M (2007). Prevalence and predictors of osteoporosis and the impact of life style factors on bone mineral density, *APLAR Journal of Rheumatology*, 10:Pp . 227–233
- Bhupathiraju S (2011). Diet, cardiovascular disease risk factors, and bone health in older Puerto Ricans, Pro Quest Dissertations and Theses.; 12
- Blanchard K (2010) : Awareness of osteoporosis risk for fracture alarmingly low among women
- Cheong JM (2002). Reduction In Modifiable Osteoporosis-Related Risk Factors In Older Adults In Elderly Nutrition Programs
- Edelstein EO (2011). What Do Israeli Osteoporotic Men Know and Do about Their Disease? *J. Osteoporos.*; 2011
- Gemalmaz A, Oge A (2008): Knowledge and awareness about osteoporosis and its related factors among rural Turkish women. *Clin. Rheumatol J.*; 27 (6):723-8
- Karimi W (2011). Preventing Osteoporosis In Menopause- A Literature Riview, Published Bachelor's Thesis In General Nursing, Turku University Of Applied Sciences; 4-6

- Keramat A, Patwardhan B, Larijani B, Chopra A, Mithal A, Chakravarty D, Adibi H, Khosravi A (2008). The Assessment Of Osteoporosis Risk Factors In Iranian Women Compared With Indian Women , *BMC Musculoskeletal Disord. J.*; 9(28).
- Khan KM, Liu-Ambrose T, Sran MM, Ashe MC, Donaldson MG, Wark JD (2002). New criteria for female athlete triad syndrome? As osteoporosis is rare, should
- Kuin Cheong J (2002). Reduction In Modifiable Osteoporosis-Related Risk Factors In Older Adults In Elderly Nutrition Programs, Published master thesis in science, Graduate Faculty of The University of Georgia; 13
- Laslett LL, Lynch J, Sullivan RT, McNeil DJ (2011). Osteoporosis education improves osteoporosis knowledge and dietary calcium: comparison of a 4 week and a one-session education course. *Int. J. Rheum. Dis.*; 14 (3):239-47
- Mahfouz ME, Kamel GE, Mosalem FA, Sameh E (2007). Osteoporosis-Related Lifestyle Choices And Knowledge Among Adolescent Females In El-Minia City, El-Minia Med., *Bull. 18(1) Egypt*: 11
- Mar JM (2004). The Role Of Exercise In Osteoporosis Prevention: An Educational Module For Clinicians , Published Master Thesis As A Clinical Project In Science , College Of Nursing , The University Of Arizona; 6
- McBride CM, Emmons KM, Lipkus IM (2003). Understanding the potential of teachable moments: the case of smoking cessation. *Health Educ. Res.*, 18:156-170.
- Mekary R (2005). Osteoporosis And Osteopenia Management In Women: Survey, Case referent Study, And Interventional Exercise Trial , Published Master Doctor thesis of Philosophy , Graduate Faculty of the Louisiana State University and Agriculture and Mechanical College; 7
- NguyenVN, Dinh TA, Ngo QV, Tran VD , Breitkopf CR (2011). Awareness and Knowledge of Osteoporosis in Vietnamese Women. *Asia Pac J Public Health.* , 11(14):1
- osteopenia be among the criteria for defining the female athlete triad syndrome? *Brit. J. Sports Med.*;36 i1,10(14).
- Pande K, Pande S, Tripathi S, Kanoi R, Thakur A, Patle S (2005). Poor Knowledge About Osteoporosis in Learned Indian Women , *JAPI* , 53:1
- Pawar SH (2007). A Study To Assess The Knowledge Of Educated Women Regarding Post Menopausal Osteoporosis In Selected Area Of Raichur With A View To Develop Health Education Module", Navodaya College Of Nursing , Raichur University; 17
- Pérez MAJ, Palacios S, García CF, Pérez M (2011). Assessing osteoporosis risk factors in Spanish menopausal women. *Gynecol. Endocrinol. J.* ; 27(10):807-13
- Published master thesis in Science , Graduate Faculty ,University of Georgia ,Athens, Georgia.
- Riaz M, Patel J, Tariq M, Khan SM, Zuberi L (2008). Knowledge about Osteoporosis among healthy women attending a tertiary care hospital, *Journal of Pakistan Medical Association* , April; 1
- Rodzick BE (2008). Osteoporosis Education in College-Age Women , Published master thesis in Nursing science , Nursing College , Eastern Michigan University , Michigan:6-8
- Sanborn C, Simmonds M (2002). Aging of joints and skeletal system: Influence of gender
- Silva DR, Coelho AC, Dumke A, Valentini DJ, Nunes NJ, Stefani LC, Mendes LF, Knorst MM (2011). Osteoporosis prevalence and associated factors in patients with COPD: a cross-sectional study. *Respir. Care.* 56 (7):961-8
- Sujic R (2011). Exploring Patients' Perception of Osteoporosis Following a Fragility Fracture: Results of a Literature Review and Analysis of a Provincial Database , Published Master thesis in Science , Department of Health Policy, Management and Evaluation University of Toronto : p. 12
- Tung WC (2006). Effects of an osteoporosis educational programme for men, The Chinese University of Hong Kong, Shatin, New Territories, Hong Kong , Accepted for publication 31 March;1
- Yeap SS ; Goh, M.E.L ; Gupta,E.D . (2010): Knowledge about osteoporosis in a Malaysian population. *Asia Pac. J. Public Health.* 22(2):233-41
- Zhang RF, Chandran M (2011) Knowledge of osteoporosis and its related risk factors among nursing professionals , *Singapore Med. J.*; 52(3):158