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RESEARCH ARTICLE

IMPROVING THE ADHERENCE TO OSTEOPOROSIS TREATMENT BY USING STRUCTURED PATIENT EDUCATION

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ABSTRACT

Osteoporosis is a disorder in which there is a reduction of bone mass, with a consequent increase in risk of bone fracture. The term "treatment adherence" is defined as two distinct concepts, persistence and compliance. Nurses play a significant role in the consistency of treatment, and compliance to osteoporosis management. Structured education is a planned and graded program that is comprehensive in scope, flexible in content, responsive to an individual's needs, and adaptable to patient's educational and cultural background**.** Aim: This study aims to improve the adherence to osteoporosis treatment using structured patient education. Subject and methods: A quasi-experimental study was conducted in osteoporosis clinic in Al-Noor specialist hospital, at Makah Al-Mukkaramah over a period of six months. Convenient sample of 100 Patients, classified into two groups, 50 patients assigned in each group. Two tools were used in this study. The first tool was consisted of three parts; socio-demographic data, nutrition and exercises. The second tool was an observation check list, that used to observe patients during Forteo treatment and adherence Results: There were statistical significant differences between the study and control groups regarding **i**nformation about exercises, nutrition and also, the practice of Forteo administration. Conclusion: structured patient education applied through, skillful nurses help to improve patient's adherence to osteoporosis treatment. We recommended the application of structured patient education as a routine nursing care for patient with osteoporosis.

INTRODUCTION

The word osteoporosis comes from the Greek word "porous bones." It occurs when bones lose an excessive amount of their protein and mineral content, particularly calcium. Over time, bone mass, and therefore bone strength, is decreased. As a result, bones become fragile and break easily. (All dredge *et al.,* 2009; El-Desouki and Al-Sulimani 2007) The risk factors of osteoporosis include inadequate nutrition, inadequate vitamin D, and calcium. Other factors include the hormonal role, physical activity, cigarette smoking, caffeine and alcohol consumption. (Arden *et al.,* 2006) Osteoporosis is estimated to affect 200 million women worldwide. (Johnell and Kanis 2006) It affects an estimated 75 million people in Europe, USA and Japan. In Australia, The lifetime risk of osteoporotic fracture after 50 years of age is 42% in women, and 27% in men. (Sambrook *et al.,* 2002) Women are particularly prone to osteoporosis because they have less bone mass than men to develop osteoporosis. The threshold level at which osteoporosis may cause fractures is reached more quickly in those women, because bone formation phase is encouraged in some way by the presence of estrogen. (Thomson Gale 2006) In Saudi females, previous studies have revealed a high prevalence of osteopenia and osteoporosis among post-menopausal women. Nutritional, genetic and environmental factors have been blamed for such trend. The lifestyle of Saudis is different from the West. Their level of physical activity, sun exposure, calcium and vitamin D intake are also variable. Low exposure to the sun and low vitamin D level, have been noted among Saudis. (El-Desouki 2003; National Osteoporosis Foundation 2010) Treatment of osteoporosis depends primary on intake of diet rich in calcium sometimes calcium supplement is recommended, roughly 1,000–1,200 mg/day, it depends on patient' age. Vitamin D must be given to help in the absorption of calcium. The recommended daily dose of Vitamin D is 400–800 International Units (IU) for adults younger than age 50, and 800–1,000 IU for that age 50 and older. Different doses may be needed depending on blood level of vitamin D. Daily exercises, especially weight-bearing exercise, such as walking is also recommended. Some people also will need medication. A number of medications are available for the prevention and/or treatment of osteoporosis. (Len Fromer 2011)

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Osteoporosis can be prevented and can be diagnosed and treated before any fracture occurs. Importantly, even after the first fracture has occurred, there are effective treatments to decrease the risk of further fractures. Prevention, detection and treatment of osteoporosis should be a mandate of primary care providers. (Len Fromer 2011) Patient adherence to treatment is the degree to which patients adhere to medical advice and take medicines as directed. Adherence depends not only on patient acceptance of information about the health threat itself but also on the practitioner's ability to persuade the patient that the treatment is worthwhile and on the patient's perception of the practitioner's credibility, empathy, interest, and concern. (Amin 201) The term" treatment adherence" is defined as two distinct concepts. The first is persistence which is the extent to which the patient continues the treatment for prescribed duration. The second is compliance which is defined as the extent to which the patient follows recommendations about medications. Following diets and lifestyle changes, coincides with medical or health advice also are forms of compliance. Adherence should be evaluated actively during each visit. Calcium and vitamin D intake should also be assessed. Persistence is crucial for the successful treatment of osteoporosis, and can be improved by structured education. (Marcelli 2010).

Structured patient education is a planned and graded program that is comprehensive in scope, flexible in content, responsive to an individual's clinical and psychological needs, and adaptable to patient's educational and cultural background. (http://www.iofbonehealth.org/iof-articles/article-detail.html?articleID=6.) The nurse plays a significant role in the prevention, detection, and the management of osteoporosis. The skills of critical thinking, effective communication and interacting with other members of the inter-disciplinary team enable nurses to understand the needs of the patients and the goals of osteoporosis management. (Marcelli 2010) Nurses lay a key role in providing training for the performance of safe movement and safe activities of daily living, including posture, transfers, lifting and ambulation in populations with or at high risk for osteoporosis. Intervene as appropriate. As long as principles of safe movement, walking and daily activities, such as housework and gardening, are practical ways to contribute to maintenance of fitness and bone mass **(**Osterberg and Blaschke**)**. Following the diagnosis of osteoporosis, the nurse plays a significant role in the assessment, teaching and counseling. She initiates counseling and teaching regarding lifestyle factors, and the importance of treatment adherence. The nurse educates the patients how to inject medication in effective way to ensure continuity of therapy and improve patient adherence to medication. (Cook *et al.,* 2007) Improving adherence is difficult because passive patient education with printed information alone does not appear very effective. Nurse-patient interaction, including discussion of bone mineral density results, discussion of osteoporosis medication benefits, and feedback of treatment effects, may be more effective. Poor adherence leads to reduced effectiveness, increased morbidity and increased medical costs. Patients may be more adherences if they fear the consequences of fracture, but this requires that they perceive themselves to be at-risk, which may require education. (Lau *et al.,* 2008)

Aim of the study

This study aims to improve the adherence to osteoporosis treatment using structured patient education.

SUBJECTS AND METHODS

Design

A quasi-experimental study was conducted to compare the adherence to treatment between two groups of patient with osteoporosis. Experimental group who received structured patient education by the researchers, and the control group who received the regular nursing education by assigned nurses in Al-Noor Specialist hospital.

Setting

The study was conducted at osteoporosis clinic in Al-Noor specialist hospital, at Makah Al-Mukkaramh. Patient was followed up in the same clinic.

Sample

A convenient sample of 100 female patients, diagnosed with osteoporosis. Fifty patients were assigned as experimental group and the other 50 patients were assigned in the control group. The sample had the following criteria:

- Female patients, age ranged from 40 to 80 years.
- Free from associated fracture, deformity or disability.
- Teriparatide (Forteo) is the treatment of choice for the study sample.

Exclusion criteria

Patients were excluded if they had any active psychiatric disorder or communication disorders.

Tools

Two tools were used in this study for data collection. The tools were developed by the researchers to collect data through questionnaire sheets and observation checklist. The first tool was a questionnaire sheet that consisted of three parts. The first part was used to assess patient's socio-demographic data, including: age, gender, level of education, marital status and occupation. It also, included medical history of osteoporosis duration, previous treatment, Use of Forteo treatment, and finally, the History of osteoporosis education. Perceived satisfaction with structure education, and perceived satisfaction with treatment (Forteo). The second part of the tool was a questionnaire sheet about nutrition to assess patients' information regarding healthy nutrition before and after education. The third part of the tool was a questionnaire sheet that was used to assess patients' information regarding exercise before and after education. The second tool was, Observation check list that, was used to observe patients practices regarding Forteo preparation and administration, before and after education. It consisted of five main steps used to assess patient's skills during Forteo administration before and after education. The main steps were Pen preparation, Pen usage,

Determination of the dose, Administration of medication and care after injection.

Data collection

Patients were asked to participate in the study. Patients, who agreed to participate, completed the questionnaire. They were assigned in the experimental or control group. The questionnaire sheets and check list were applied by the researchers for both groups before and after the study. The experimental group was educated by the researchers and the control group received regular education by the assigned hospital nurses. Pilot study was done on 10% of the sample to test the validity and reliability of the tools. The appropriate modifications were done. The pilot sample was excluded from the research.

METHODS

A formal letter was sent from vice dean of hospital affair, Umm Al-Qura University to the responsible director of Al-Noor Specialist hospital. An agreement was taken from the patients who participated in the study after simple explanation for the aim of the research. The researchers collected data at a period of six months from the beginning of May to the end of October 2011. Structure patient education was implemented through explanation, demonstration and re-demonstration. The action phase was classified into four sessions. The first session include assessment of socio-demographic data and pre-assessment of knowledge related to osteoporosis for both experimental and control group. Data were collected from each patient individually before and after education. The second session includes explanation about nutrition and exercises needed for improving range of motion. The third session included the demonstration of Forteo drug. In the fourth session the researchers reinforced the knowledge and practice that was already gained. Every session from the last three sessions started by revision of the previously acquired knowledge and skills. Every session took 30 minutes for revision, explanation, demonstration and re-demonstration, one week every two sessions. The researchers were using power point, brochure, and video demonstration to deliver relevant information and practice to the patients. Direct access using telephone counseling was provided to all patients in the experimental group to answer the questions of the patient. The evaluation of the program consisted of reassessment of the skills and knowledge acquired during the program after two month by using reassessment questionnaire sheets and observation check list.

Statistical analysis

The collected data were organized, tabulated computerized and analyzed by using," SPSS". Simple frequencies mean and standard deviation was used for quantitative data, χ^2, **P**-value was used as a test of significance qualitative data.

RESULTS

Figure (1and 2) shows, the demographic characteristics of the study and control groups. As shown, slightly more than half of the study group (52%) aged between 60 < 70 years and 12% of them aged between 40 < 70 years with a mean age of 59.82 $\pm$8.73years. Nearly equal percent of 38% and 34% of the control group aged between 40 < 50 years and 50 < 60 years respectively, the mean age of the control group was 61.90 $\pm$ 7.93years. Regarding table "1" it was clear that, Most of the study and control group (42% and 38%) respectively were illiterate. The majority of the participants (92% and 66%) of the study and control group respectively were married. A high percentage of 80% of the study group and 72% of the control group didn't work. Medical histories of the study and control groups are illustrated in Table (2). As regards, nearly two fifth of the study group. (40%) had been diagnosed as osteoporosis less than one year while, (42%) diagnosed 1-2 years. Compared to 62% of the control group who diagnosed as osteoporosis from 1-2 years. Fifty percent of the study group had hypertension compared to 64% of the control group. Most of the study and control group (78% and 56%) sequentially using Forteo as a continuous treatment. The majority of the participants (92% and 90%) of the study and control group respectively had history of Forteo cessation. Table (3) presents, percent distribution of the study and control groups according to exercises before and after education. As regards, the entire study group (100%) was exercised after education compared to 60% of the control group. Nineteen point four percent of the study was exercised daily compared to 30 % of the control group. Thirty eight point seven percent of the study group exercised 3-5 times/day after education compared to 20% of the control group. Slightly more than half of the study group (54%) exercised more than 10 minutes after education compared to 33.3% of the control group. Difficulty in walking was observed between the entire study group (100%) and 88% of the control group before education while, 62% and 68% of the study and control group had difficulty in walking after education. Eighty six percent and 68% of the study and control group respectively before education. While, it was 44% and 60% of the study and control group sequentially after education. Pain in joints and bones were observed in 92% and 20 % of the study group before and after study respectively, compared to 96% and 68% of the control group before and after education respectively. There were statistical significant differences regarding exercises before and after education.

Table (4) shows a comparison between the study and control group according to information about diet. It was regarded that, 70% of the study group compared to 4% of the control group ate particular diet for osteoporosis after education. Less than half of the study group (48%) mentioned diet rich in vitamin D, compared to 8% of the control group ate 3 meals a day. Eighty percent of the study group drank milk, compared to slightly less than half of the control group (48%). The entire study group (100%) drank one cup of milk/day compared to 48% of the control group. The entire study group (100%) compared to almost the entire control group (96%) ate vegetables and fruits after program. Exposure to sun was mentioned by 100% and 8% of the control and study group respectively, compared to 92% and none of the study and control group sequentially who exposed to sun for 30 minutes. As shown in Table (5), the entire study group (100%) does the preparation phase correctly after education, compared to 60% of the control group. The majority of the study group (92%) and 60% of the control group prepared the pen for injection correctly after education.

Eighty four percent of the study group determined the needed dose correctly after education compared to, 58% of the control group. Statistical significant differences were found regarding, preparation phase, preparation of the pen, and determination of the dose. (P= 0.000*) As regards Table (6), 54% of the study group takes a full dose of Forteo and, 24% of them take half dose of Forteo after education, compared to 28% and 4% of the control group who take full and half dose of Forteo respectively after education. Thirty six percent of the control group takes 25% of the dose compared to 14% of the study group. Less than tenth of the study group (8%) didn't take the dose compared to 32% of the control group after education. There were statistical significant differences regarding taking the full dose, half dose, and 25% of the dose or didn't take the dose. (P= 0.000*)

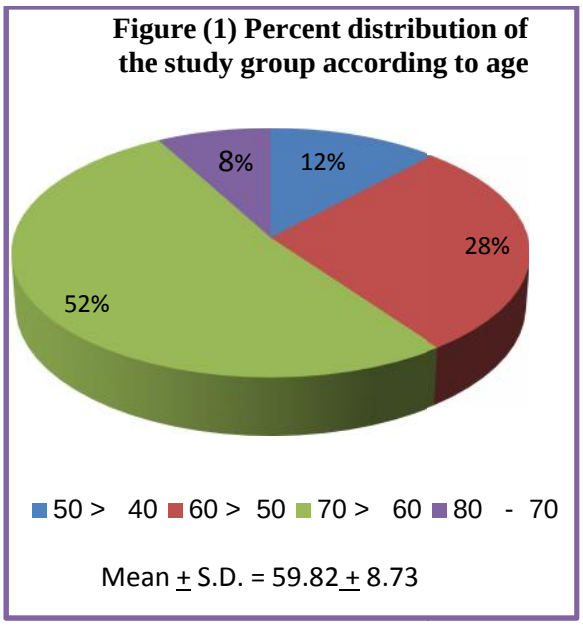

Figure (1) Percent distribution of the study group according to age

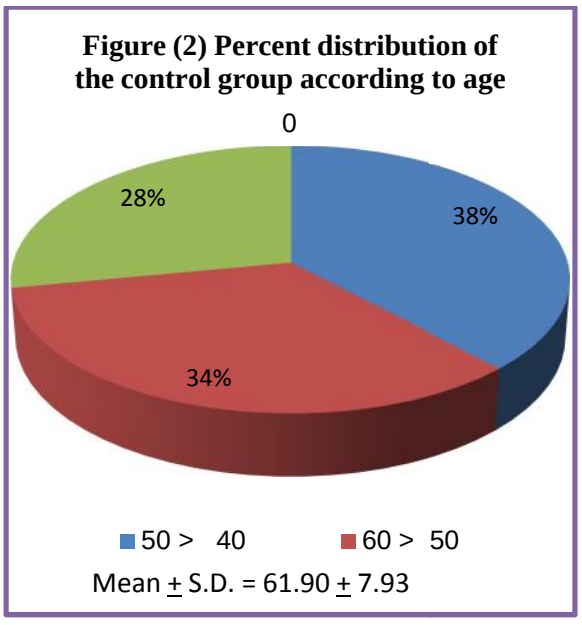

Figure (2) Percent distribution of the control group according to age

Table 1. Percent distribution of the study and control groups according to demographic data

Personal Characteristics	Study group		Control group	
	n.=50	%	n.=50	%
Educational level				
Illiterate	21	42	19	38
Primary School	13	26	14	28
Intermediate stage	8	16	7	14
High school	4	8	6	12
University	4	8	4	8
Marital Status				
Single	1	2	4	8
Married	46	92	33	66
Divorced	1	2	4	8
Widower	2	4	9	18
Occupation				
Work	10	20	14	28
Don't work	40	80	36	72

Table 2. Percent distribution of the study and control samples according to medical history

Medical History	Study Group		Control Group	
	n.=50	%	n.=50	%
Diagnosis of osteoporosis				
< 1 year	20	40	10	20
1-2 years	21	42	31	62
3-5 years	4	8	3	6
> 5 years	5	10	6	12
Chronic Illness				
D.M	8	16	10	20
Hypertension	25	50	32	64
Heart Disease	2	4	-	-
None	15	30	8	16
continuous using of Forteo				
Yes	39	78	28	56
No	11	22	22	44
Previous cessation of Forteo				
Yes	46	92	45	90
No	4	8	5	10
Previous education				
Yes	8	16	3	6
No	42	84	47	94

Table 3. Percent Distribution of the study and control groups according to exercises before and after education

Practice of Exercises	Study Group		Control group		χ^2	P-value
	Before %	After %	Before %	After %		
Exercise	62	100	40	60	26.48	.011*
Time of Exercise / week						
Daily	68	19.4	46.7	30		
1 < 3 time / day	8	41.9	53.3	50	24.48	.011*
3 - 5 time / day	24	38.7	-	20		
Duration of exercise						
< 10 min	61.3	46	80	66.7	52.08	.000*
> 10 min	38.7	54	20	33.3		
Difficulty in walking	100	62	88	68	26.48	.011*
Difficulty in moving parts	86	44	68	60	28.88	.000*
Back Pain	86	72	60	60	24.48	.011*
Pain in joints and bones	92	20	96	68	42.32	.000*

* Significant at ≤0.05 level.
** The table shows yes responses only.

DISCUSSION

Osteoporosis is a skeletal disorder in which bone strength is reduced as a result of loss of bone mass and the deterioration of the bone architecture.

Table 4. Percent Distribution of the study and control groups according to information about diet before and after education. (Each group n. =50)

Information About Diet	Study Group		Control group		χ^2	P-value
	Before	After	Before	After		
	%	%	%	%		
Particular diet for osteoporosis	18	70	4	4	60.84	.000*
Healthy food for Osteoporosis						
Rich in vitamins " D "	-	48	8	8		.000*
Rich in calcium	32	28	16	16	27.44	
Vegetables and fruit	10	10	60	60		
Don't Know	58	14	16	16		
Number of Daily meals						
Two meal	28	-	28	28	19.63	.000*
Three meal	72	100	72	72		
Drink Milk Every Day?	36	100	48	48	2.56	.110
If yes, how many cups?						
One cup (200 ml)	64	-	52	52	2.56	.110
Two cups (400 ml)	36	100	48	48		
Eating Yogurt Daily	30	100	32	32	14.44	.000*
Eating Vegetables and fruit	84	100	96	96	64.44	.000*
Exposed to sun Every day	20	100	16	16	40.96	.000*
Duration of sun exposure						
15 min	60	8	100	100	40.96	.000*
30 min	40	92	-	-		

* Significant at ≤0.05 level.
** The table shows yes responses only.

Table 5. Comparison between the study and control group regarding forteo administration after education

Forteo Administration	Study group		Control Group		χ^2	P-value
	n.=50	%	n.=50	%		
Preparation phase.	50	100	30	60	36.00	0.000*
Preparation of the pen	46	92	30	60	46.24	0.000*
Determination of the dose	42	84	29	58	27.04	0.000*

* Significant at ≤0.05 level
N.B. The results shows yes performance only.

Table 6. A comparison between study and control group according to adherence to forteo aftereducation

Follow up doses	Study group		Control group		χ^2	P-value
	n.=50	%	n.=50	%		
Take the full dose.	27	54	14	28	46.24	0.000*
Take half of the dose	12	24	2	4	84.64	0.000*
Take 25% of the dose	7	14	18	36	51.84	0.000*
Don't take any dose	4	8	16	32	84.64	0.000*

The leading causes of osteoporosis are a drop in estrogen in women at the time of menopause and a drop in testosterone in men Teriparatide (Forteo) is approved for the treatment of postmenopausal women who have severe osteoporosis and are considered at high risk for fractures. (El-Desouki and Al-Sulimani 2007) Structured patient education is a planned and graded program that is comprehensive in scope, flexible in content, responsive to an individual's clinical and psychological needs. Nurses educate the patient how to inject medication in effective way to ensure continuity of therapy and improve patient condition .nurses are instrumental in providing psychosocial support for individuals with osteoporosis. (National Osteoporosis Foundation 2010; Cramer *et al.,* 2008) As regards to age the present study revealed that, nearly half of the study group aged between 60< 70 years and nearly one third aged between 50 < 60 years , compared to one third of the control group who aged from 50< 60 years and 40 < 50 years.

These results occur because; Osteoporosis is a disease that linked to postmenopausal change. This results is correspondence with the study of Arden (2006) and Cramer (2008) Who reported that majority of the patient with osteoporosis occur in females of median age. (El-Desouki and Al-Sulimani 2007; Cramer *et al.,* 2008) These finding also is in congruent with the study of Jonathan (2007) who found that 32% of the patient ≥ 75 years. (Jonathan *et al.,* 2007) The current study showed that, slightly more than one third of the study group is treated before by Forteo and the majority of them had a history of Forteo cessation. As regards control group, nearly half of them used Forteo as a treatment and also the majority of them discontinue using of Forteo. This result is in congruent with the study of Arden (2006) who found that 42% of the patients stopped medication because of adverse effect. (El-Desouki and Al-Sulimani 2007) Jonathan (2007) reported that, 6% of his study sample discontinued treatment during 6 months of the study. (Jonathan *et al.,* 2007) Another study Amy (2009) also reports lack of adherence to treatment. (Amy H. Warriner *et al.,* 2007) The possible explanation of the results of the present study was lack of knowledge about the importance of medication, and dissatisfaction about nursing care.

Regarding to information about, exercises and diet, the present study revealed that, structured patient education is successful method to improve patient adherence to healthy lifestyles. It was found that the all of the study group were exercised after education, the majority of them exercised 3-5 times / day compared to two thirds of the control group who exercised after routine nursing education, one fifth of them were exercised 3-5 times/day. There was a statistical significant difference regarding routine nursing education performed by assigned nurses and structured patient education designed by the researchers. These results are matched with the result of Amy (2009), who found that, healthy lifestyle behaviors may put patients at a lower risk for adverse outcomes. (Amy H. Warriner *et al.,* 2007) These behaviors include weight bearing exercises, use of calcium and vitamin D supplements, and avoidance of tobacco and alcohol. Regarding to administration

of Forteo injection, the current study revealed that the majority of the study group improved in almost all steps of medication administration. There was a significant difference between the study and control group regarding Forteo administration. This may occur because the researchers used Face-To-Face interview, one to one education or telephone follow up throughout the structured patient education. These results are correspondence with the study of Jonathan (2007), who reported the improvement of patients' perception about learning how to use the pen injection. (Jonathan *et al.*, 2007) This may occur because structured patient education is based on assessment, education, evaluation and follow-up.

Conclusion

Osteoporosis is a chronic disease that require long –term treatment that need structured education programs developed by a skillful nurses. Improving patient adherence to osteoporosis treatments is crucial to the nurse, nurses have all the key skills required to coordinate structured education programs needed for those patients. The majority of the study group reported adherence to Forteo injection and follow up education. Most of them reported enhancement of their knowledge regarding exercises, diet and medication adherence.

Recommendations

The following recommendations are suggested

1. Develop educational program for the nurses about how to apply structured patients education in the management of patient with osteoporosis.
2. Developing educational programs for improve the lifestyle factors precipitate to osteoporosis as the primary prevention.
3. Future studies are needed to evaluate the adherence, compliance and persistence of Forteo medication in patients with severe osteoporosis.
4. Helping patients to develop or maintain the skills needed to cope optimally with osteoporosis.

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