International Journal of Healthcare Sciences ISSN 2348-5728 (Online)
Vol. 6, Issue 1, pp: (384-390), Month: April - September 2018, Available at: www.researchpublish.com

EFFECTIVENESS OF HEALTH BELIEF MODEL BASED EDUCATIONAL INTERVENTION ON OSTEOPOROSIS KNOWLEDGE TEST AMONG FEMALE ACADEMICIAN IN MALAYSIA

[1*]Amin, Samia, [2*]Abdul Rahman Hejar, [3]Ismail Suriani, [4]Zainal Abidin Emilia

[1,2,3,4] Faculty of Medicine and Health Sciences, Universiti Putra Malaysia
*Corresponding Author: Abdul Rahman Hejar (hejar@upm.edu.my); Samia Amin (drsamia27@gmail.com)

Abstract: **Osteoporosis is a comprehensive health problem in world wide. Knowledge assessment on osteoporosis risk factors and preventive measures, physical activity and adequate calcium intake among women is a better operational process to develop and implement health behavioral educational program. The objective of this study was to develop and evaluate the effect of an educational intervention based on Health Belief Model to improve knowledge regarding osteoporosis among female academician in Malaysia. A single blinded randomized controlled trial was conducted among 212 female academicians; intervention was conducted for 12 weeks; data was collected at baseline, immediately, one month and three months after intervention. Data was analyzed by Statistical Package for Social Sciences version 20. The mean age of participants was 37.1 years (SD=7.2) and majority of them were Malay (84%), married (88%) with tertiary education (90%). After intervention, from baseline to three months follow up there was a significant increase in the mean score of knowledge (20.7 - 28.3, p<0.001). Controlling for baseline socio-demographic data, the GLM model showed a significant difference between groups (F=1.73, p<0.001) and within groups for knowledge score (F=1.009, p<0.001). These results provided evidence for the effectiveness of an educational intervention in promoting osteoporosis knowledge which suggests that increase knowledge on osteoporosis can improve exercise and calcium intake even after three months of intervention, but policy should implement for long term intervention to sustain this effectiveness.**

Keywords: **Osteoporosis, Knowledge, Female, Health Belief Model, Malaysia.**

I. INTRODUCTION

Osteoporosis literally means 'porous bone'. It is a skeleton disorder where bone becomes fragile due to loss of bone mass and strength which leads to fracture. Due to the asymptomatic nature of osteoporosis, female who are the most crucial cohort than men, may sometimes even did not notice the progression of the disease until there is an accidental fall occur.

Work place-based health educational intervention improve intake of calcium and even load bearing moderate to vigorous physical activity. A study conducted by Tan, LaMontagne, English & Howard, (2016) which stated that workplace intervention is effective even after 6 months of intervention. But unfortunately, there is no available data in Malaysia where the workplace explored as a platform for osteoporosis prevention interventions. So, this study utilized workplace platform for osteoporosis prevention. The objective of this study was to develop and evaluate the effect of an educational intervention based on Health Belief Model to improve knowledge regarding osteoporosis among female academician in a public university, Malaysia.

II. METHODS AND MATERIALS

This study was single blinded randomized controlled trial. The study population was full time female academician (age 25-55 Years); invited to participate with informed consent form. A multi-stage random sampling was used; respondents of different faculties were randomized into intervention and control group; allocation concealment was implemented by sequentially numbered, opaque, sealed envelopes by the main researcher. Six hundred and twenty-four female academicians were screened at their respective faculties. Response rate was 91% at baseline. Finally, the number of participants during study period was 212 at baseline (114 in the intervention and 98 in the control), 201 immediately (108 in the intervention and 93 in the control), 193 at one month (103 in the intervention and 90 in the control) and 193 participants (103 in the intervention and 90 in the control group) who completed the three months post intervention assessment. Health Belief Model was used as theoretical framework.

A structured questionnaire on Osteoporosis Knowledge Test (OKT) was used for data collection (November 2016 – January 2017). The Revises Osteoporosis Knowledge Test (Gendler et. al., 2012) which 32 items tool originally; for this study three items were not considered to keep from original Osteoporosis Knowledge Test and one item was kept from previous Osteoporosis Knowledge Test. When scoring the OKT, first determine whether the subject has answered the questions correctly; correct answers were coded as 1, incorrect as 0; total scores range from 0 - 30. There were two subscales: Nutrition and Exercise; 11 questions are common in both subscale; Thus, the possible total score for exercise ranges from 0 to 18. Nutrition subscale ranges from 0 to 23. The knowledge level for both exercise and nutrition subscale and overall osteoporosis knowledge were categorized as low for scores within 0 -49%, average for scores within 50 - 75% and high for scores within 76 - 100%. Permission of modification was taken from the original author (Kim et. al., 1991; Gendler et. al., 2012) and pre-test was done to validate by factor analysis (Eigen value OKT=4.6) and Cronbach's alpha coefficient (OKT=0.95).

To measure OKT data were collected on socio-demographic background, source of information and knowledge on osteoporosis. An educational intervention of three months duration (12 weeks) was given with a follow up motivational sessions by telephone. The control group received the same educational intervention material after the completion of the study. To evaluate the effect of the intervention, data were collected at baseline, immediately, one month and three months after intervention for both groups. Data analysis was conducted using Statistical Package for Social Sciences (version 20). Descriptive and multivariate statistics (GLM) were used for analysing the data. In this study a per protocol analysis was done that included only those participants who completed the protocol for the intervention that they were originally allocated. This research project has been granted ethical approval from the Ethical Review Board of Universiti Putra Malaysia (UPM/TNCPI/RMC/1.4.18.2) and registered under Australia New Zealand clinical trial which is available in following link: http://www.anzctr.org.au/ACTRN 12616001699459.

III. RESULTS

A. Socio-demographic Characteristics of Participants:

Table I describes the socio-demographic background of study participants. The mean age was 37.1 (SD = 7.1) years in the control group and 38.67 (SD = 7.2) in the intervention group.

TABLE I: ASSOCIATION OF THE SOCIO- DEMOGRAPHIC FACTORS WITH STUDY GROUPS(N = 212)

Characteristics		Intervention (n=114) n (%)	Control (n=98) n (%)	t value	p-value
Age (Years)	(Mean ± SD)	38.6 ± 7.2	37.1 ± 7.1	t= -1.675	0.095
	Below 30	17 (14.9)	14 (14.2)		
	31 - 45	58(50.8)	61 (62.2)		
	Above 45	39 (34.3)	23 (23.4)		
Ethnicity	Malay	101 (88.5)	90 (91.7)	$\chi 2$ =0.036	0.982
	Chinese	7 (6.1)	5 (5.1)		
	Indian	6 (5.4)	3 (3.2)		
Religion	Islam	101(88.5)	90 (91.7)	$\chi 2$ =0.144	0.931
	Buddha	2(1.7)	1 (1.1)		
	Hindu	6(5.2)	3 (3.1)		
	Christian	5(4.6)	4(4.1)		

Marital status	Single	6(5.2)	4 (4.1)	$\chi 2$= 0.845	0.672
	Married	105(92.1)	94 (95.9)		
	Widow	1(1.1)	0(0.0)		
	Divorce	2(1.6)	0(0.0)		
Nationality	Malaysian	112(98.2)	97(98.9)	$\chi 2$ = 2.350	0.799
	Non-Malaysian	2(1.7)	1(1.1)		
Staff status	Full time	114(100.0)	98(100.0)	$\chi 2$ = 1.961	0.581
	Contract	0(0.0)	0(0.0)		
Level of education	Master	49(42.9)	47(47.9)	$\chi 2$= 0.945	0.623
	PhD	65(57.1)	51(52.1)		
Monthly income (Ringgit Malaysia)	(Mean ± SD)	7767.9 ± 892.4	7597.6 ± 647.9	t = -1.575	0.117
	Below 5000	14(12.2)	14(14.2)		
	5000-8000	83(72.8)	71(72.4)		
	Above 8000	17(14.9)	13(13.2)		
*Significant at level at p< 0.05					

B. Sources of Information on Osteoporosis:

Table II shows different sources of getting osteoporosis information.

TABLE II: ASSOCIATION OF OSTEOPOROSIS INFORMATION WITH STUDY GROUPS (N= 212)

Source of information		Intervention (n=114) n (%)	Control (n=98) n (%)	χ^2- value	p-value
Internet	Yes	86(75.4)	52(53.1)	2.330	0.239
	No	28(24.5)	46(46.9)		
Magazine	Yes	23(20.1)	13(13.2)	1.408	0.235
	No	91(42.9)	85(86.7)		
Doctors	Yes	41(35.9)	35(35.7)	0.254	0.615
	No	73(64.1)	63(64.2)		
Television	Yes	14(12.1)	11(11.2)	3.158	0.076
	No	100(87.7)	87(88.7)		
Brochures	Yes	28(24.5)	17(17.3)	0.515	0.473
	No	86(75.4)	81(82.6)		
Scientific seminar	Yes	31(27.1)	18(18.3)	0.236	0.627
	No	83(72.8)	80(81.6)		

C. Participants' Knowledge on Osteoporosis at Baseline:

Table III describes the mean knowledge score of participants in the control and intervention groups for each category of knowledge measurement at baseline. No significant differences were found between intervention and control groups on knowledge of osteoporosis at baseline in both exercise and nutrition subscale.

TABLE III: COMPARISON OF MEAN KNOWLEDGE SCORES BETWEEN INTERVENTION AND CONTROL GROUPS AT BASELINE (N = 212)

Osteoporosis knowledge category		Intervention (n=114) n (%)	Control (n=98) n (%)	t value	p-value
Exercise subscale	(mean ± SD)	11.95±2.88	11.89±3.91	t = -0.318	0.751
	(min-max)	(0-18)	(0-18)		
	Low (0-10)	41(35.9)	45(45.9)		
	Moderate (11-15)	38(33.3)	32(32.6)		
	High (16-18)	35(30.7)	21(21.4)		
Nutrition subscale	(mean ± SD)	9.08±4.72	8.10±4.39	t = 0.074	0.941
	(min-max)	(0-23)	(0-23)		
	Low (0-9)	77(67.5)	58(59.1)		
	Moderate (10-18)	25(21.9)	26(26.5)		
	High (19-23)	12(10.5)	14(14.2)		

Total knowledge	(mean ± SD)	20.89±6.97	20.75±6.15	t = -1.168	0.869
	(min-max)	(0-30)	(0-30)		
	Low (0-14)	78(68.4)	68(69.3)		
	Moderate (15-22)	29(25.4)	27(27.5)		
	High (23-30)	7(6.2)	3(3.0)		

D. Between- group Comparison of Knowledge Immediately After Intervention:

Table IV describes the distribution and mean knowledge score of participants in the intervention group (n = 108) and control group (n = 93) immediately after intervention. Significant differences were found between intervention and control groups for all the categories of knowledge of osteoporosis exercise and nutrition subscale including the total score of osteoporosis knowledge test ($p < 0.001$) immediately after intervention.

TABLE IV: COMPARISON OF MEAN KNOWLEDGE SCORES BETWEEN INTERVENTION AND CONTROL GROUPS IMMEDIATELY AFTER INTERVENTION (N = 201)

Osteoporosis knowledge category		Intervention (n=108) n (%)	Control (n=90) n (%)	t value	p-value
Exercise subscale	(mean ± SD)	12.50±3.63	11.78±2.93	-5.84	<0.001*
	(min-max)	(0-18)	(0-18)		
	Low (0-10)	9(8.3)	40(44.4)		
	Moderate (11-15)	40(37.1)	29(32.2)		
	High (16-18)	59(54.6)	21(23.3)		
Nutrition subscale	(mean ± SD)	18.80±2.29	9.76±3.04	-7.213	<0.001*
	(min-max)	(0-23)	(0-23)		
	Low (0-9)	21(19.4)	71(78.8)		
	Moderate (10-18)	69(63.8)	16(17.7)		
	High (19-23)	18(16.6)	3(3.3)		
Total knowledge	(mean ± SD)	30.70±5.68	20.06±5.88	-14.09	<0.001*
	(min-max)	(0-30)	(0-30)		
	Low (0-14)	4(3.7)	68(75.5)		
	Moderate (15-22)	64(59.2)	21(23.3)		
	High (23-30)	40(37.3)	1(1.1)		
* Significant difference at p< 0.05					

E. Between- group Comparison of Knowledge One Month After Intervention:

Table V shows distribution and mean knowledge score of participants in the intervention (n = 103) and control (n = 90) groups at one month after intervention. Significant differences were found between intervention and control groups for all the categories of knowledge of osteoporosis exercise and nutrition subscale including the total score of osteoporosis knowledge test ($p < 0.001$) one month after intervention.

TABLE V: COMPARISON OF MEAN KNOWLEDGE SCORES BETWEEN INTERVENTION AND CONTROL GROUPS ONE MONTH AFTER INTERVENTION (N = 193)

Osteoporosis knowledge category		Intervention (n=103) n (%)	Control (n=90) n (%)	t value	p-value
Exercise subscale	(mean ± SD)	13.18±3.84	10.78±3.93	-3.381	<0.001*
	(min-max)	(0-18)	(0-18)		
	Low (0-10)	10(9.7)	40(44.4)		
	Moderate (11-15)	41(39.8)	29(32.2)		
	High (16-18)	52(50.4)	21(23.3)		
Nutrition subscale	(mean ± SD)	14.83±2.42	9.76±2.34	-5.804	<0.001*
	(min-max)	(0-23)	(0-23)		
	Low (0-9)	21(20.3)	71(78.8)		
	Moderate (10-18)	69(66.9)	16(17.7)		
	High (19-23)	18(17.4)	3(3.3)		

Total knowledge	(mean ± SD)	29.80±5.90	21.06±6.29	-10.741	<0.001*
	(min-max)	(0-30)	(0-30)		
	Low (0-14)	6(5.8)	68(75.5)		
	Moderate (15-22)	67(65.1)	21(23.3)		
	High (23-30)	30(29.1)	1(1.1)		
* Significant difference at p< 0.05					

F. Between- group Comparison of Knowledge Three Months After Intervention:

Table VI describes the distribution and mean knowledge score of participants in the intervention (n = 103) and control (n = 90) groups at three months after intervention. Significant differences were found between intervention and control groups for all the categories of knowledge of osteoporosis exercise and nutrition subscale including the total score of osteoporosis knowledge test (p < 0.001) three months after intervention.

TABLE VI: COMPARISON OF MEAN KNOWLEDGE SCORES BETWEEN INTERVENTION AND CONTROL GROUPS THREE MONTHS AFTER INTERVENTION (N = 193)

Osteoporosis knowledge category		Intervention (n=103) n (%)	Control (n=90) n (%)	t value	p-value
Exercise subscale	(mean ± SD)	2.08±0.85	1.71±0.92	-3.253	<0.001*
	(min-max)	(0-18)	(0-18)		
	Low (0-10)	10(9.7)	40(44.4)		
	Moderate (11-15)	47(45.6)	31(34.4)		
	High (16-18)	46(51.1)	19(21.1)		
Nutrition subscale	(mean ± SD)	3.65±1.47	2.66±1.34	-5.391	<0.001*
	(min-max)	(0-23)	(0-23)		
	Low (0-9)	22(21.3)	68(75.5)		
	Moderate (10-18)	73(70.8)	21(23.3)		
	High (19-23)	8(7.7)	1(1.1)		
Total knowledge	(mean ± SD)	28.36±6.07	20.32±6.25	-9.828	<0.001*
	(min-max)	(0-30)	(0-30)		
	Low (0-14)	10(9.7)	65(72.2)		
	Moderate (15-22)	65(63.1)	22(24.4)		
	High (23-30)	28(27.1)	3(3.3)		
* Significant difference at p< 0.05					

G. Within-Group Comparison of Knowledge on Osteoporosis:

Tables VII compares change in the knowledge categories of the participants from baseline to three months after intervention for the intervention and control groups respectively. Overall the results indicate that female respondents in the intervention group had higher level of knowledge for exercise and nutrition of osteoporosis. Therefore, the educational intervention study had a positive effect in improving the level of knowledge of osteoporosis among female academician.

TABLE VII: COMPARISON OF CHANGES IN KNOWLEDGE SCORES IN THE INTERVENTION AND CONTROL GROUPS FROM BASELINE TO THREE MONTHS AFTER INTERVENTION (N=193)

Osteoporosis knowledge category		Pretest (mean ± SD)	Post test (mean ± SD)	Mean change	t-value	p-value
Exercise subscale	Control	1.89±0.91	1.71±0.92	-0.18	2.925	0.004*
	Intervention	1.95±0.88	2.08±0.85	+0.13	-1.232	0.221
Nutrition subscale	Control	3.10±1.39	2.66±1.34	-0.44	3.634	<0.001*
	Intervention	3.08±1.72	3.65±1.47	+0.57	-2.822	0.006
Total knowledge	Control	20.75±6.15	20.32±6.25	-0.43	0.586	0.559
	Intervention	20.89±6.97	28.38±6.07	+7.49	10.749	<0.001*
*Significant difference at p<0.05						

H. Between and within group's comparison of knowledge using GLM repeated measures:

The effect of intervention on changes in knowledge was further analysed by using the GLM repeated measures test to detect the differences in change within and between groups for continuous data and controlling for baseline socio-demographic data. The results show a significant difference between groups ($F = 173$, $p < 0.001$) and within groups for knowledge score ($F = 1009$, $p < 0.001$). Bonferroni adjusted alpha calculated based on alpha (0.05) divided by six pairs to test the null hypothesis (adjusted alpha = 0.008) time of intervention comparison in both intervention (Table VIII) and control group (Table IX) .

TABLE VIII: COMPARISON OF CHANGE IN KNOWLEDGE SCORE WITHIN INTERVENTION GROUP USING GLM REPEATED MEASUREMENTS (N = 103)

Time (I)	Mean ± SD	Time (J)	Mean difference (J-I)	t-value	p-value
1	20.89±6.97	2	+9.81	-13.626	<0.001*
		3	+8.91	-12.599	<0.001*
		4	+7.49	10.749	<0.001*
2	30.70±5.68	3	-0.90	2.216	0.029
		4	-2.32	-4.546	<0.001*
3	29.80±5.90	4	-1.42	-4.518	<0.001*
4	28.38±6.07				
T1: Pretest, T2: Posttest, T3: One-month follow-up, T4: Three-month follow-up * Significant difference at level< 0.008					

TABLE IX: COMPARISON OF CHANGE IN KNOWLEDGE SCORE WITHIN CONTROL GROUP USING GLM REPEATED MEASUREMENTS (N = 90)

Time (I)	Mean ± SD	Time (J)	Mean difference (J-I)	t-value	p-value
1	20.75±6.15	2	-0.69	+2.871	0.005*
		3	+0.31	-1.322	0.189
		4	-0.43	-0.586	0.559
2	20.06±5.88	3	+1.00	-2.969	0.004*
		4	+0.20	+0.826	0.411
3	21.06±6.29	4	+0.26	-4.147	<0.001*
4	20.32±6.25				
T1: Pretest, T2: Posttest, T3: One-month follow-up, T4: Three-month follow-up * Significant difference at level< 0.008					

IV. DISCUSSION

In this current study, the mean knowledge score significantly improved after intervention among intervention group and it was sustained even after three months of intervention which is both statistically and practically significant. This interpretation reflects that the appropriate health education must require to improve knowledge on osteoporosis. Many intervention studies have consistently proven that osteoporosis knowledge improved after the intervention (Sedlak et. al., 2014; Gaines & Marx, 2011). Evenson, et al., (2016) have observed 153 women by using pre- and post- questionnaires by Health Belief Model educational intervention which reported that knowledge was improved after educational intervention which has similar finding of our study. Although the study participants are highly educated for this study but this intervention module can even increase osteoporosis knowledge among non-educated or non-professional female population. Amal & Amera (2015) assessed the osteoporosis knowledge level by a health educational program among rural peri-menopausal women which reported that 9.7% of women had good knowledge during pre-intervention as compared to 62.7% during post intervention phase. As osteoporosis is dependent on calcium intake and regular exercise; therefore, the intervention module helps to get all the information regarding nutrition and exercise to increase knowledge to prevent osteoporosis.

V. CONCLUSION

In this current study, educational intervention program enhanced knowledge of university academicians which will help them to take care of their own bone health as well they can contribute their knowledge for the prevention of osteoporosis among the students and also family, friends and peers. University female academicians can contribute by mentoring in psychological and physical counselling of this adolescent and early youth group to improve bone health which is crucial to prevent osteoporosis in their adulthood.

REFERENCES

[1] Amal MG. & Amera BR. (2015). Effect of systematic health education on perimenopausal rural women's knowledge and practices regarding osteoporosis, Jour Nurs Healt Sci, 4 (3), 31-4.

[2] Evenson AL. & Sanders GF. (2016). Educational intervention impact on osteoporosis knowledge, health beliefs, self-efficacy, dietary calcium, and vitamin D intakes in young adults. Ortho nurs. 35(1), 30-6

[3] Gaines J M & Marx K A. (2011). Older men's knowledge about osteoporosis and educational interventions to increase osteoporosis knowledge in older men: a systematic review. Maturitas. 68 (4), 5–12

[4] Gendler PE, Coviak CP, Martin JT, Kim KK, Dankers JK, Julieanne JM & Sanchez TA. (2012). Revision of the osteoporosis knowledge test: reliability and validity, West Jour Nur Res.37 (12), 1623-1643

[5] Kim KK, Horan ML, Gendler P. and Patel MK.(1991), Development and evaluation of the osteoporosis health belief scale. Res Nur & Healt. 14(2), 155–163.

[6] Sedlak CA, Doheny MO & Jones SL. (2007) .Osteoporosis education programs: changing knowledge and behaviors. Pub Healt Nurs, 17 (5): 398-402.

[7] Tan AM, LaMontagne AD, English DR & Howard P. (2016). Efficacy of a workplace osteoporosis prevention intervention: a cluster randomized trial. BMC Pub Healt, 16(1), 859.