



EFFECT OF EDUCATIONAL INTERVENTION ON OSTEOPOROSIS PREVENTIVE PRACTICES AMONG PREMENOPAUSAL WOMEN IN SELECTED TERTIARY EDUCATIONAL INSTITUTIONS IN LAGOS STATE, NIGERIA

Enobong Nnenna Iris Udoetuk¹, Olanrewaju Moturayo Florence (Ph.D.)²,

and Ajayi Oluwaseun Chidera (Ph.D.)³

¹⁻³Babcock University

¹enobongudoetuk@gmail.com, ²olanrewajum@babcock.edu.ng,

³ajayichidera1997@gmail.com

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ABSTRACT: Background: Osteoporosis is one of the most common degenerative diseases, occurring more frequently in women. It is characterized by reduced bone mass and deterioration of bone structure. Osteoporosis is particularly insidious because it has no symptoms, and is often discovered after a fragility fracture has already occurred. Literature has established that prior awareness of the condition could help in promoting better preventive practices. Thus, this study examined the effects of a health educational intervention on osteoporosis preventive practices among premenopausal women in selected tertiary educational institutions in Lagos State, Nigeria. **METHODOLOGY:** The study employed quasi-experimental design. The population of study was premenopausal women working at two tertiary educational institutions in Lagos State, and was estimated to be 461. A total sample size of 60 was determined using the Power formula. Purposive sampling was used. Participants were grouped into one experimental group and one control group. A semi-structured, validated questionnaire, with Cronbach's alpha coefficients ranging from 0.78 to 0.84 was used to collect data at baseline, immediately after the intervention, and at the 12th week follow-up. Data was analysed using descriptive and inferential statistics at a 5% level of significance. **RESULTS:** The mean age of the participants was 37.15 ± 1.79 years. At baseline, no significant difference ($p > 0.05$) was found to exist between mean scores for the control group (CG) (6.40 ± 2.31) and the experimental group (EG) (6.77 ± 2.73). At immediate post-intervention, there was significant difference ($p < 0.05$) between the mean scores for the CG (6.60 ± 2.08) and the EG (17.00 ± 7.62), and effect size (ES) was found to be 2.01. Finally, at 12th week, there was significant difference ($p < 0.005$) between the CG (7.20 ± 2.25) and the EG (19.73 ± 4.96), and ES was found to be 3.25, indicating that the intervention had a considerable effect on the experimental group. **CONCLUSION:** The educational intervention was an effective tool for improving preventive practices pertaining to osteoporosis among premenopausal women in Lagos State. It is recommended that time and resources be invested in comprehensive health education pertaining to osteoporosis and its prevention, to ensure that premenopausal women become more knowledgeable about the disease and its predisposing factors, in order to prevent its occurrence in old age.

KEYWORDS: Educational intervention, Knowledge, Practices, Premenopausal women, Prevention, Osteoporosis.



INTRODUCTION

Osteoporosis is a non-communicable disease of great public health importance; its global prevalence has been estimated to be 18.3% (Salari et al., 2021), and its regional prevalence has been reported to be highest in Africa, at 39.5% (Salari et al., 2021). The condition occurs most often in postmenopausal women, but it has also been diagnosed in men aged 50 and above. Fifty percent of women and twenty percent of men aged over 50 years are at risk of osteoporotic fracture during their lifetimes (Kemmak et al., 2020).

Osteoporosis constitutes a significant economic burden on health systems of various countries. For example, in 2010, about 3.5 million osteoporotic fractures were estimated to have occurred in the European Union, and the resulting cost was about 37 billion euros. In 2005, about 13.7 to 20.3 billion dollars went towards the direct costs of osteoporosis in the United States. In some countries, care for osteoporosis accounts for more than 30% of GDP (Kemmak et al., 2020a). In a 2022 Nigerian study of 120 osteoporotic fracture inpatients, the median cost of treatment of osteoporotic fractures was \$758 (Nworie et al., 2022). Osteoporosis is a problem of public health importance, because it significantly affects musculoskeletal health, and it contributes to decreased quality of life during late middle age and late adulthood.

The staff of tertiary educational institutions were used as the subject population for this study, because they are typically well-educated, and therefore well-informed about health-related matters. In addition, because they typically belong to the middle socioeconomic classes and may lead Westernised, sedentary lifestyles, they are at higher risk for osteoporosis than, say, persons who do hard physical labour for a living. Moreover, the staff of tertiary educational institutions retire at ages sixty-five to seventy; they are at risk for osteoporosis for fifteen to twenty years of their career lifespan, making health education pertaining to osteoporosis prevention necessary.

Furthermore, female premenopausal staff were selected because women are affected by osteoporosis to a higher degree than men, and because educating this particular section of the population on osteoporosis prevention is the best course of action to prevent its occurrence. The prevalence of osteoporosis in Lagos remains unknown. However, a study carried out in Ibadan, a town in Southwestern Nigeria, demonstrated a prevalence of 56.9% (45% in males and 65.8% in females) in patients 60 years and above (Alonge et al., 2017).

Additionally, other studies have demonstrated that health-depleting behaviours contributing to the occurrence of osteoporosis (smoking, alcohol consumption and unhealthy dietary patterns) are common among Nigerians (Adeloye et al., 2022; Olatona et al., n.d.), and by implication, residents of Lagos State. Premenopausal women play an important role in society, due to their ability to reproduce, and their function as active members of the workforce. Osteoporosis generally does not affect premenopausal women. However, premenopausal women are at risk for developing osteoporosis in the future. Existing studies in the Middle East indicate that premenopausal women tend to have relatively poor levels of knowledge pertaining to osteoporosis (Shahmohammadi et al., 2020; Mahmoud et al., 2020; Shawashi & Darawad, 2020; Pakyar et al., 2021; Almarabheh et al., 2023)

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Lagos State. Premenopausal women play an important role in society, due to their ability to reproduce, and their function as active members of the workforce.

METHODOLOGY

Study Design

The study employed a quasi-experimental design with one experimental group and one control group to determine the effects of an education intervention program on improving the preventive practices of osteoporosis among premenopausal women in selected tertiary educational institutions in Lagos state, Nigeria. At baseline, data were collected from all groups in the study, after which a six-week intervention was administered to the experimental group. The control group did not receive an intervention program but an equivalent beneficial health education program related to diabetes. A sample size of 60 premenopausal women in selected tertiary educational institutions was selected using the Power formula. A random sampling technique was used to group the participants into an Experiment Group (EG) and Control Group (CG). Two tertiary educational institutions in Lagos State were selected via purposive sampling. Five participants were purposefully selected from each faculty and the administrative department.

The inclusion criteria for this study included: participants who were then employed as staff of the two selected universities in Lagos State, and were premenopausal women. The participants were assessed using a research instrument designed to obtain baseline data. The workers recruited for the experimental group were trained using the training manual designed for the study, after which they were evaluated with the same instrument used for baseline assessment. Participants in the control group received training on another health-related subject and were thereafter assessed using the same research instrument administered at the pre-intervention stage. The intervention programs were administered over a six-week period, after which the research instrument was also administered to both groups, and data was collected.. At the 12th week mark, the research instrument was administered a third time to both groups, and data was collected again.

Research Instrument and Data Collection

The research method chosen for this study was quantitative in nature. To create a reliable and valid instrument for data collection, the researcher gathered information from various sources including a review of relevant literature, as well as examining instruments used in similar studies. With this information, an appropriate instrument was developed for use in collecting data from the participants. The instrument was designed to ensure that it aligns with the research objectives and the research questions. The instrument was a semi-structured, participant-administered questionnaire, which gathered information on the demographic characteristics and preventive practices pertaining to osteoporosis. The same instrument was administered at baseline; immediate post intervention and at 12th week follow up. Cronbach Alpha scores were generated for the individual constructs (practices=0.845).

**Table 1: Description of the Data Collection**

Groups	Baseline Data	Interventions	Outcome Evaluation (end of intervention program)	Impact Evaluation(at 12 th weeks)
Control Group	O	-	O	O
Experimental Group	O	X	O	O

Key: X = Intervention

O = Outcome

Study Variables

The independent variable in this study was the sociodemographic characteristics of the participants.

The dependent variable in this study was practices pertaining to prevention of osteoporosis.

Data Analysis

The data collected for the study was collated, entered and coded using the Statistical Product for Service Solutions (SPSS) version 22. The data was cleaned by running a frequency analysis on each item and checking responses to ensure that the values were accurately coded. Data was analysed using descriptive, and inferential statistics at 5% level of significance. Effect size (ES) was used to measure the magnitude of the intervention in the Experimental group.

Ethical Clearance

An application for ethical approval for this study was submitted to the Babcock University Research Ethics Committee. The purpose of the study was explained to all participants, after which they gave verbal consent and signed consent forms. All participants were assured of anonymity and the confidentiality of the information received from them.

RESULTS

Demographic Characteristics of the Participants

The mean age of the participants was 37.15 ± 1.79 years. With regards to marital status, the control group was 97% married, and the experimental group was 67% married. With regards to the level of educational attainment of the respondents, 6.7% of the control group possessed a National Diploma (ND) or National Certificate of Education (NCE), 10% possessed a Higher National Diploma (HND), 63% possessed a Bachelor's degree, 10% possessed a Master's degree, and 10% possessed a doctorate degree. 3% of the experimental group possessed a Senior Secondary School Certificate, 7% possessed an NCE/ND, 23% and 13% possessed a PhD. Analysis of status as teaching or non-teaching staff indicated that 70% of the control group were non-teaching staff; while 53% of the experimental group were teaching staff.

**Table 1a: Sociodemographic Characteristics of Participants**

		Control (N=30)	Experiment (N=30)	Total(60)
Age	31 – 40 years	30 (50%)	30 (50%)	60 (100%)
Marital Status	Single	0 (0%)	6 (20%)	6 (10%)
	Married	29 (96.7%)	20 (66.7%)	49 (81.7%)
	Separated/Divorced	1 (3.3%)	4 (13.3%)	5 (8.3%)
	Total	30 (100.0%)	30 (100.0%)	60 (100.0%)

Table 1b: Sociodemographic Characteristics of Participants

		Control (N=30)	Experimental (N=30)	Total
Ethnicity	Minority ethnic groups	2 (6.7%)	9 (30.0%)	11 (18.3%)
	Hausa	1 (3.3%)	4 (13.3%)	5 (8.3%)
	Igbo	10 (33.3%)	5 (16.7%)	15 (25.0%)
	Yoruba	17 (56.7%)	12 (40.0%)	29 (48.3%)
	Total	30 (100.0%)	30 (100.0%)	60 (100.0%)
Religious affiliation	Christianity	14 (46.7%)	8 (26.7%)	22 (36.7%)
	Islam	10 (33.3%)	19 (63.3%)	29 (48.3%)
	Traditional religion	6 (20.0%)	3 (10.0%)	9 (15.0%)
	Total	30 (100.0%)	30 (100.0%)	60 (100.0%)

**Table 1c: Sociodemographic Characteristics of Participants**

		Control (N=30)	Experimental (N=30)	Total
Educational Attainment	Secondary school certificate	0 (0.0%)	1 (3.3%)	1 (1.7%)
	National Diploma/ National Certificate of Education	2 (6.7%)	2 (6.7%)	4 (6.7%)
	Higher National Diploma	3 (10.0%)	7 (23.3%)	10 (16.7%)
	Bachelor's degree	19 (63.3%)	8 (26.7%)	27 (45.0%)
	Master's degree	3 (10.0%)	8 (26.7%)	11 (18.3%)
	Doctorate Degree	3 (10.0%)	4 (13.3%)	7 (11.7%)
	Total	30 (100.0%)	30 (100.0%)	60 (100.0%)
Monthly Income	Below 50,000 naira	3 (10.0%)	7 (23.3%)	10 (16.7%)
	50,001-100,000 naira	11 (36.7%)	4 (13.3%)	15 (25.0%)
	100,001-200,000 naira	6 (20.0%)	13 (43.3%)	19 (31.7%)
	200,001-300,000 naira	10 (33.3%)	6 (20.0%)	16 (26.7%)
	Total	30 (100.0%)	30 (100.0%)	60 (100.0%)
Teaching or non-teaching staff	Teaching staff	9 (30.0%)	16 (53.3%)	25 (41.7%)
	Non-Teaching staff	21 (70.0%)	14 (46.7%)	35 (58.3%)
	Total	30 (100.0%)	30 (100.0%)	60 (100.0%)

Baseline results for experimental and control groups on preventive practices pertaining to osteoporosis among premenopausal women in tertiary educational institutions in Lagos State

Table 2 presents the independent sample t-test analysis of knowledge of preventive practices in both the experimental (EG) and control (CG) groups at baseline. The scores are measured on a scale from 0 to 24. The experimental group (EG) had a mean score of 6.77 ± 2.73 , while the control group (CG) had a mean score of 6.40 ± 2.31 , with a p-value of 0.577. This result indicates that there was no statistically significant difference between the two groups at baseline ($p > 0.05$). Both groups demonstrated a low level of knowledge of preventive practices related to osteoporosis at the baseline.



Table 4.2: Independent Sample t-test Analysis of Experimental and Control Groups on Preventive Practices Pertaining to Osteoporosis among Premenopausal Women in Selected Tertiary Educational Institutions in Lagos State at Baseline

Variables	Maximum Points on Scale of Measure	Experimental N=30		Control N=30		p-value
		$\bar{X}$ (SE)	$\pm$ SD	$\bar{X}$ (SE)	$\pm$ SD	
Preventive practices						
Low (0-8)	24	6.77	2.73	6.40(0.42)	2.31	0.57
Moderate (9-16)		(0.49)				7
High (17>)						

$p > 0.05$ $t_{58} = 0.56$ (Test of significance for an independent sample t-test)

Immediate post-intervention results for experimental and control groups on knowledge of preventive practices pertaining to osteoporosis among premenopausal women in selected tertiary educational institutions in Lagos State

Table 3 shows the independent sample t-test analysis of preventive practices in the experimental (EG) and control (CG) groups at post-intervention. The scores on the preventive practices scale, ranging from 0 to 24, were significantly higher in the experimental group (EG) with a mean score of 17.00 ± 7.02 , compared to the control group (CG) with a mean score of 6.60 ± 2.08 . The difference between the two groups was statistically significant with a p-value of 0.000, indicating a strong effect of the health educational intervention.

The effect size (ES) of 2.01 suggests a large effect, which is consistent with the large difference observed in the mean scores between the experimental and control groups. This indicates that the intervention had a significant positive impact on the preventive practices of the experimental group, leading to much higher engagement in osteoporosis prevention practices compared to the control group. The results underline the effectiveness of the intervention in promoting preventive practices related to osteoporosis prevention among premenopausal women in the experimental group.

Table 3: Independent Sample t-test Analysis of Experimental (EG) and Control (CG) Groups on Preventive Practices of Premenopausal Women in Selected Tertiary Educational Institutions in Lagos State Pertaining to Osteoporosis at Post-intervention

Variables	Maximum Points on Scale of Measure	Experimental N=30		Control N=30		ES (p-value)
		$\bar{X}$ (SE)	$\pm$ SD	$\bar{X}$ (SE)	$\pm$ SD	
Preventive practices						
Low (0-8)	24	17.00	7.02	6.60(0.38)	2.08	2.01
Moderate (9-16)		(1.28)				(0.000)
High (17>)						

$P < 0.05$ $t_{34.046} = 7.784$ (Test of significance for an independent sample t-test)



Results at 12th week follow-up for experimental and control groups on knowledge of preventive practices pertaining to osteoporosis among premenopausal women in selected tertiary educational institutions in Lagos State

Table 4 presents the independent sample t-test analysis of preventive practices between the experimental (EG) and control (CG) groups at the 12th-week follow-up. The mean score for the experimental group (EG) was 19.73 ± 4.96 , which is significantly higher than the control group (CG) which had a mean score of 7.20 ± 2.25 . This difference is statistically significant with a p-value of 0.000, indicating a strong effect of the health educational intervention on the knowledge of preventive practices of the experimental group.

The effect size (ES) of 3.25 indicates a large effect, suggesting that the intervention had a substantial and lasting impact on the preventive practices of the experimental group. This large difference in scores between the two groups highlights the significant improvement in osteoporosis prevention practices among premenopausal women in the experimental group, compared to minimal changes in the control group. The results emphasize the effectiveness of the educational intervention in fostering better preventive practices related to osteoporosis prevention at the 12th-week follow-up.

Table 4: Independent Sample t-test Analysis of Experimental and Control Groups on Preventive Practices of Premenopausal Women in Selected Tertiary Educational Institutions in Lagos State Pertaining to Osteoporosis and its Prevention at 12th Week Follow-up

Variables	Maximum Points on Scale of Measure	Experimental N=30		Control N=30		ES (p-value)
		$\bar{X}$ (SE)	$\pm$ SD	$\bar{X}$ (SE)	$\pm$ SD	
preventive practices						
Low (0-8)	24	19.73(0.91)	4.96	7.20(0.41)	2.25	3.25
Moderate (9-16)						(0.000)
High (17>)						

$P < 0.05$, $t_{40.43} = 12.601$ (Test of significance for an independent sample t-test)

Evaluation of the impact of interventions across baseline, immediate post-intervention, and 12th week follow-up phases on preventive practices of premenopausal women in selected tertiary educational institutions in Lagos State pertaining to osteoporosis and its prevention

Table 5 presents the ANOVA analysis of the impact of the health educational intervention on preventive practices across the baseline, immediate post-intervention, and 12th-week follow-up for both the experimental group (EG) and control group (CG). The experimental group (EG) showed significant improvement in knowledge of preventive practices over time. The mean score at baseline was 6.77 ± 2.74 , which increased to 17.00 ± 7.02 immediately post-intervention and further to 19.73 ± 4.96 at the 12th-week follow-up. This difference was statistically significant with an F-value of 51.687 and p-value of 0.000, indicating the effectiveness of the intervention in improving preventive practices among the EG.



In contrast, the control group (CG) showed minimal changes over the same periods. The mean scores were 6.40 ± 2.31 at baseline, 6.60 ± 2.08 post-intervention, and 7.20 ± 2.25 at the 12th-week follow-up, with an F-value of 1.059 and a p-value of 0.351, indicating no significant changes in the control group's knowledge of preventive practices. The mean plot for the EG would show a sharp upward slope from baseline to the 12th-week follow-up. The increase reflects the significant impact of the educational intervention in improving knowledge preventive practices related to osteoporosis. The mean plot for the CG would show a flat or minimal slope across the three time points, reflecting no substantial improvement in preventive practices. Overall, the significant increase in the EG's knowledge of preventive practices highlights the positive impact of the health education intervention on knowledge of preventive practices pertaining to osteoporosis.

Table 5: ANOVA Analysis of the Impact of Intervention on Preventive Practices across Baseline, Immediate Post-intervention and 12th Week Follow-up Values for the Control Group and Experimental Group

			N	Mean	Std. Deviation	F	p- value
Practice of experimental group Low (0-8) Moderate (9-16) High (17>)	Baseline		30	6.7667	2.73777	51.687	0.000*
	Immediate post intervention evaluation		30	17.0000	7.01722		
	12th wk. Follow-up evaluation		30	19.7333	4.96146		
Practice of experimental group Low (0-8) Moderate (9-16) High (17>)	Baseline		30	6.4000	2.31338	1.059	0.351
	Immediate post intervention evaluation		30	6.6000	2.07780		
	12th wk. Follow-up evaluation		30	7.2000	2.24990		

*p<0.05



DISCUSSION

Prior to the intervention, both groups demonstrated below average preventive practices pertaining to osteoporosis. After the intervention, the group which received the intervention on osteoporosis exhibited a marked improvement in their level of knowledge areas. The scores at follow-up were especially impressive. The paired t-test analysis indicated that there were significant differences between the baseline scores and post-intervention scores for the experimental group, as well as significant differences between the scores at baseline and at follow-up. Additionally, all the alternate hypotheses were accepted, and Cohen's D values were above 0.5 for the experimental group for practices pertaining to osteoporosis prevention. Thus, the intervention was successful.

In a study involving female community leaders in Peru, participants with a high school education or above demonstrated higher levels of osteoporosis-related knowledge (Hsieh, 2020). This is consistent with the results of this study, which indicate that a high level of educational attainment is associated with a high level of knowledge pertaining to osteoporosis. Another study carried out at a polytechnic in Enugu, Nigeria, found that osteoporosis awareness was highest among respondents aged ≥ 51 years (33.3%) and lowest among respondents aged ≤ 20 years (6.3%) (Njeze et al., 2017).

The results of this study indicated that the health education intervention was successful; knowledge levels were significantly increased in the experimental group after the intervention and at follow-up, as was indicated by the paired t-test analysis ($p < 0.05$). A 2020 interventional study carried out in Turkey found similar results; an HBM-based educational intervention was administered to 45 premenopausal women at high risk for osteoporosis, while a control group of 30 premenopausal women remained without any intervention on osteoporosis. Over the course of one year, the research instruments were administered at three-month intervals.

CONCLUSION

This study aimed to determine the effect of an educational intervention on preventive practices pertaining to osteoporosis prevention among a cross-section of premenopausal staff of selected tertiary educational institutions in Lagos State. At baseline, it was observed that the participants possessed below-average levels of practices pertaining to osteoporosis. After the intervention, no significant change from the results obtained at baseline data collection was observed in the control group, but a significant change in knowledge pertaining to the prevention of osteoporosis was observed in the experimental group. Further improvement in the results obtained from the experimental group was seen at the 12th-week follow-up. It is therefore concluded that the intervention was successful. Thus, this study demonstrated that health education is an important tool to assist in changing attitudes and mindsets, and contributing to improved quality of life.



RECOMMENDATIONS

The study found that the average premenopausal Nigerian woman is likely to be somewhat ignorant about osteoporosis, the risk factors predisposing to it, its severity, and how to prevent it.

- i. This researcher recommends that premenopausal women be educated on osteoporosis, the risk factors predisposing to it, health enhancing behaviours contributing to its prevention, and harmful behaviours which contribute to its occurrence and severity.
- ii. Premenopausal women play important roles in society, as active members of the workforce and mothers of young children. Health education interventions should be targeted to each segment of society; according to age, gender, level of educational attainment, occupation, and geographical location, among others. These interventions may be carried out in multiple settings, such as schools, universities, hospitals, clinics, workplaces, community gatherings, and places of worship, among others.

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