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IMPACT OF EDUCATIONAL INTERVENTION ON KNOWLEDGE PERTAINING TO OSTEOPOROSIS AMONG PREMENOPAUSAL WOMEN IN SELECTED TERTIARY EDUCATIONAL INSTITUTIONS IN LAGOS STATE, NIGERIA

Enobong Nnenna Iris Udoetuk[1], Olanrewaju Moturayo Florence (Ph.D.)[2], Olaoye Titilayo (Ph.D.)[3], Ajayi Oluwaseun Chidera (Ph.D.)[4]

[1-4]Babcock University.

Emails:
[1]enobongudoetuk@gmail.com, [2]olanrewajum@babcock.edu.ng, [3]olaoyet@babcock.edu.ng, [4]ajayichidera1997@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 knowledge pertaining to osteoporosis among premenopausal women in selected tertiary educational institutions in Lagos State, Nigeria. METHODOLOGY: The study employed quasi-experimental design. The population of the study was pre-menopausal women working at two tertiary educational institutions in Lagos State, 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, for their level of knowledge no significant difference ($p > 0.05$) was found to exist between mean scores for the control group (CG) (3.26 ± 0.94) and the experimental group (EG) (3.10 ± 1.21). At immediate post-intervention, there was a significant difference ($p < 0.05$) between the mean scores for the CG (2.76 ± 1.13) and the EG (13.83 ± 0.37), and effect size (ES) was found to be 2.01. Finally, at 12th week, there was a significant difference ($p < 0.005$) between the CG (3.23 ± 1.19) 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 knowledge 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, Premenopausal Women, Osteoporosis.

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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 the 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).

According to the United Nations (2015), by 2050, about 25% of the population in every geographical region (except Africa) will be aged 60 years or more. It is also projected that the number of people at high fracture risk will increase in all regions of the world, especially Africa (Clynes et al., 2020). Moreover, the incidence of hip fracture is said to be increasing in populations undergoing epidemiological transition, possibly secondarily to the adoption of Westernized lifestyles (Cooper et al., 2011, as cited in Clynes et al., 2020).

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 of 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 of 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.

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 of developing osteoporosis in the future. 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).

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.

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METHODOLOGY

Study Design

The study employed quasi-experimental design, with one experimental group and one control group, to determine the impact of a health education intervention program on improving their level of knowledge of osteoporosis among premenopausal women in selected tertiary educational institutions in Lagos State, Nigeria. At baseline, data was collected from all groups in the study; a six-week intervention was administered to the experimental group. The control group did not receive an intervention program but an equivalent health intervention program related to diabetes. A sample size of 60 premenopausal women in selected tertiary educational institutions was chosen 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. As the required sample size was thirty, five participants were purposefully selected from five faculties and the administrative department.

The inclusion criteria for this study included: participants who were employed as staff of the two selected tertiary educational institutions in Lagos State, and who 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 12^{th} 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, knowledge of osteoporosis. The same instrument was administered at baseline, immediate post intervention and 12-weeks follow up. Cronbach Alpha scores were generated for the individual constructs (knowledge = 0.781).

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Table 1.

Description of the Data Collection

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

Key: X = Intervention

O = Outcome

Study Variables

The independent variables in this study were the sociodemographic characteristics of the participants.

The dependent variable in this study is:

Knowledge levels pertaining to prevention of osteoporosis.

Data Analysis

The data collected for the study was collated, entered and coded using the Statistical Package for Social Sciences (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.

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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. Three percent (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%)

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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%)

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Baseline Results for Experimental and Control Groups on the Levels of Knowledge Pertaining to Osteoporosis among Premenopausal Women in Selected Tertiary Educational Institutions in Lagos State

The baseline analysis in Table 2 shows no significant difference in knowledge levels between the experimental and control groups regarding osteoporosis, as indicated by a p-value of 0.56 ($p>0.05$). The experimental group had a mean knowledge score of 3.10±1.21, while the control group scored slightly higher at 3.27±0.94 on a 15-point scale, both reflecting low knowledge levels.

Table 2.

Independent Sample T-Test Analysis of Experimental and Control Groups on the Levels Of Knowledge Pertaining to Osteoporosis among Premenopausal Women in Selected Tertiary Educational Institutions in Lagos State at Baseline

Variable	Maximum Points on Scale of Measure	Experimental N=30		Control N=30		p-value
		X̄(SE)	±SD	X(SE)	±SD	
Knowledge Low (0-6) Moderate (7-9) High (10>)	14	3.10(0.22)	1.21	3.27(0.17)	0.94	0.56

*** $p>0.05$, $t_{58} = 0.594$ (Test of significance for an independent sample t-test)**

Immediate Post-Intervention Results for Experimental and Control Groups on Levels of Knowledge Pertaining to Osteoporosis among Premenopausal Women in Selected Tertiary Educational Institutions in Lagos State

Table 3 presents the analysis of knowledge levels pertaining to osteoporosis prevention at immediate post-intervention among premenopausal women in the experimental (EG) and control (CG) groups. The experimental group had a mean knowledge score of 13.83±0.38, significantly higher than the control group's mean score of 2.77±1.14 on a 15-point scale ($t_{58} = 50.65$, $p<0.05$). This suggests a marked improvement in the experimental group's knowledge level after the educational intervention. The effect size (Cohen's d = 13.02) indicates a large effect, as values above 0.8 are considered large, demonstrating the intervention's strong impact on knowledge enhancement.

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Table 3.

Independent Sample t-test Analysis of Experimental (EG) and Control (CG) Groups on Levels of Knowledge Pertaining to Osteoporosis and Its Prevention among Premenopausal Women in Selected Tertiary Educational Institutions in Lagos State at Post-Intervention

Variable	Maximum Points on Scale of Measure	Experimental N=30		Control N=30		ES (p-value)
		$\bar{X}$(SE)	±SD	X(SE)	±SD	
Knowledge Low (0-6) Moderate (7-9) High (10>)	14	13.83(0.07)	0.38	2.77(0.21)	1.14	13.02(0.06)

*** p>0.05, t_{58} = 50.65 (Test of significance for an independent sample t-test)**

Results at 12th Week for Experimental and Control Groups on Levels of Knowledge Pertaining to Osteoporosis Among Premenopausal Women in Selected Tertiary Educational Institutions in Lagos State

Table 4 presents the 12th-week follow-up analysis of knowledge levels regarding osteoporosis among participants in the experimental (EG) and control (CG) groups. The experimental group achieved a significantly higher mean knowledge score (13.63±0.67) compared to the control group (3.23±1.19) on a 14-point scale, with a p-value of 0.00 ($p<0.05$). The large Cohen's d effect size (10.77) reflects a substantial impact of the educational intervention, as effect sizes greater than 0.8 are considered large.

Table 4.

Independent Sample T-Test Analysis of Experimental and Control Groups on Levels of Knowledge Pertaining to Osteoporosis among Premenopausal Women in Selected Tertiary Educational Institutions in Lagos State at 12th Week

Variable	Maximum Points on Scale of Measure	Experimental N=30		Control N=30		ES (p-value)
		$\bar{X}$(SE)	±SD	X(SE)	±SD	
Knowledge Low (0-6) Moderate (7-9) High (10>)	14	13.63(0.12)	0.67	3.23(0.22)	1.19	10.77(0.00)

***p<0.05, t_{58} = 41.61 (Test of significance for an independent sample t-test)**

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Evaluation of the Impact of the Intervention across Baseline, Immediate Post-intervention, and 12th Week Phases on Levels of Knowledge Pertaining to Osteoporosis among Premenopausal Women in Selected Tertiary Educational Institutions in Lagos State

The ANOVA analysis in Table 5 evaluates the impact of the intervention on knowledge levels across baseline, immediate post-intervention, and 12th week for the experimental (EG) and control (CG) groups. For the experimental group, the mean knowledge score improved significantly from 3.10±1.21 at baseline to 13.83±0.38 immediately after the intervention and slightly decreased to 13.63±0.67 at the 12th-week follow-up. The results showed a statistically significant difference ($F=1644.49$, $p=0.000$, $p<0.05$).

In contrast, the control group demonstrated relatively stable but low mean scores across all phases: 3.27±0.94 at baseline, 2.77±1.14 immediately post-intervention, and 3.23±1.19 at the 12th-week follow-up. The differences were not statistically significant ($F=1.950$, $p=0.148$, $p>0.05$).

The mean plot illustrates a significant elevation in knowledge for the experimental group compared to the control group, confirming the effectiveness of the educational intervention in improving osteoporosis knowledge.

Table 5.

ANOVA Analysis of the Impact of Intervention on Knowledge across Baseline, Immediate Post-intervention and 12th Week Values for the Control Group and Experimental Group

		N	Mean	Std. Deviation	F	p-value
Knowledge experiment group Low (0–6) Moderate (7–9) High (10>)	Baseline	30	3.1000	1.2134	1644.49	0.000*
	Immediate post intervention evaluation	30	13.8333	0.3791		
	12th week evaluation	30	13.6333	0.6687		
Knowledge control group Low (0–6) Moderate (7–9) High (10>)	Baseline	30	3.2667	0.9444	1.950	0.148
	Immediate post intervention	30	2.7667	1.1351		
	12th week evaluation	30	3.2333	1.1943		

*p<0.05

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DISCUSSION

Prior to the intervention, both groups demonstrated below average knowledge 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 knowledge 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 was intended to determine the impact of an educational intervention on knowledge, 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 participation possessed below-average levels of knowledge 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 12^{th}-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.

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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. 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.

- 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, geographical location, etc. These interventions may be carried out in multiple settings: at schools, universities, hospitals, clinics, workplaces, community gatherings, places of worship, etc., to ensure that they reach as broad an audience as possible.

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