



## Pregnancy Associated Osteoporosis: Knowledge Attitude and Practice of Exercise among Pregnant Women in a Selected Nigerian Community

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**ABSTRACT:** Pregnancy induced decrease in bone mineral density (BMD) often occurs at the femoral necks, lumbar spine and other sites during the second or third trimester of pregnancy leading to pain in the hips, pelvis, low back etc and sometimes fractures even with mild trauma/falls. Exercising during pregnancy has been known to offer several benefits including improving bone health. However, there is paucity of studies investigating the knowledge, attitude and practice of pregnant women towards exercising to minimize the risk for osteoporosis. The aim of this study was to investigate the knowledge, attitude and practice (KAP) of exercise for the prevention of pregnancy associated osteoporosis among urban and rural dwelling pregnant women in a selected Nigerian community. A total of 258 (168 urban dwelling and 90 rural dwelling) pregnant women were recruited and subjected to interview using a pre-validated questionnaire on KAP of exercise in the prevention of Pregnancy associated osteoporosis. The urban and rural dwelling women had moderate and poor knowledge of exercising for osteoporosis prevention respectively. Both groups of women had moderately positive attitude towards exercising for osteoporosis prevention. Also both groups of women had poor practice towards exercising for osteoporosis prevention. A significant association was only found between having another source of income in the family and the women's attitude towards exercise.

**KEYWORDS:** Attitude, Exercise, Knowledge, Osteoporosis, Pregnancy, Practice

### I. INTRODUCTION

During pregnancy and lactation, the fetus' physiological requirement of calcium burdens the maternal's calcium reservoir of the skeleton. Physiological adaptation during pregnancy under the control of complex hormonal regulating mechanisms prevents excessive resorption of calcium by the women's skeleton [1-3]. Pregnancy is a challenging period to the mother's bones because the building of the fetal skeleton requires a substantial transfer of calcium. This process is at its peak during the third trimester, when fetal bones experience substantial growth and calcification. The regulatory mechanisms are still not clear, but it seems obvious that the drainage of calcium from the mother has to bear some level of deterioration of the maternal skeleton except potent compensatory mechanisms intervene. If an adequate balance is not achieved, pregnancy would be a vulnerability period for maternal bones [4-6]. The increase in maternal blood calcium in turn meets the demands of fetal requirement for calcium, maintenance of the skeleton, regulation of the bone remodeling process, and skeletal growth [7,8]. However, many women do not have enough calcium in their diet and are undernourished. A deficiency of calcium propagates the maternal body to search for alternative sources of calcium of which one major source is the maternal skeleton. Losing the BMD in the mother's skeleton is recognized as osteoporosis associated with pregnancy [9]. Osteoporosis is an osteometabolic disease that reduces Bone Mineral Density resulting in a high potentiality of bone fracture [10,11]. It first appears during the third trimester of pregnancy or in early postpartum period during lactation [12,13] and increases the possibility of bone fractures at occurs at femoral necks, lumbar spine and other sites during the second or third trimester of pregnancy, which may seriously injure either the mother or child. Symptoms may include complaint of a sudden onset of sharp pain following fracture or chronic backache [8]. Pain may be felt in the periarticular, groin, buttock, upper anterior thigh, or hip pain during pregnancy [14-17].



Several factors including hormonal, mechanical, and dietary factors are involved in the maintenance of the skeleton, regulation of the bone remodeling process, and skeletal growth [7,8]. Various lifestyles have also been implicated as causative factors of osteoporosis. Sustained immobilization or a sedentary life-style may lead to osteoporosis, by decreasing the activity of the osteoblasts adversely affecting the bone remodeling process [8, 18,19]. Prevention of this disease has become the leading concern of health care systems worldwide. The health care systems are also trying to limit the number of disabilities caused by osteoporosis by providing rehabilitation [20] and moderate weightbearing exercise programs, [21,22] for patients who are at a high risk or suffer from osteoporosis [9]. Pharmacological strategies such as the use of antiresorptive and anabolic agents that may increase bone mineral density (BMD) and reduce the risk of osteoporotic fractures can be rather expensive.

However, general measures of prevention and treatment such as calcium and vitamin D supplementation, the guidance for fall prevention and the practice of specific physical exercises, can be instituted before the manifestation of the disease and may promote other health benefits [23]. Bone tissue is continuously remodeled, and as a dynamic tissue, it adapts and responds to various stimuli, such as physical exercise and mechanical vibration [23]. During physical activity, mechanical forces can be exerted on bones through ground reaction forces and by the contractile activity of muscles, resulting in maintenance or gain of bone mass. Studies have already pointed out many of the mechanical stimuli that are beneficial to bone tissue, including some physical activities as aquatic and ground exercises [24,25].

Pregnancy induced decrease in bone mineral density (BMD) often occurs at the femoral necks, lumbar spine and other sites during the second or third trimester of pregnancy. Typically, the loss of bone may lead to pain in the hips, pelvis, low back etc and sometimes fractures even with mild trauma/falls. Exercising during pregnancy has been known to offer several benefits including improving bone health. However, there is paucity of studies investigating the knowledge, attitude and practice of pregnant women towards exercising to minimize the risk for osteoporosis. The aim of this study was to investigate the knowledge, attitude and practice (KAP) of exercise for the prevention of pregnancy associated osteoporosis among urban and rural dwelling pregnant women in a selected Nigerian community.

## II. METHODS

### *Study design and participants*

This study utilized a descriptive cross-sectional survey research design. The data was collected using convenience sampling technique at several Antenatal Clinics within Tertiary and Rural Hospitals within Enugu, Nigeria. The participants were 258 (168 urban dwelling, 90 rural dwelling) pregnant women who were available and willing to participate.

### *Ethical approval*

Ethical approval was sought and obtained from the Medical Research and Ethics Committee of the University of Nigeria Teaching Hospital, Ituku-Ozalla. Informed consent was sought and obtained from participants before commencing data collection.

### *Data Collection*

The data was collected by investigators themselves interacting directly with the participants using a structured pre-validated questionnaire. The questionnaire consisted of three parts, the first part assessed socio-demographic and socio-economic variables, second part assessed the women's knowledge of osteoporosis and attitude towards exercising to prevent osteoporosis, third part assessed the practice of preventive exercises among the women. Confidentiality of participants was ensured by using numbers instead of names to code the data's collected. Only data collected in this study was used for analysis and results. The Questionnaires were issued out to the women who indicated interest to participate at the various selected areas.

### *Data Analysis*

Data collected was analyzed using the Statistical Package of Social Sciences (SPSS) version 21. Frequencies and percentages were used for descriptive data analysis. Pearson's correlation was used to check for relationships.



**III. RESULTS**

Demographic and socioeconomic characteristics of the participants are shown in Table I. Majority of the urban dwelling pregnant women were between 26-30 years of age (47.6%) while most of the rural dwelling women were within 19-25 years of age (32.3%). Many of the women had less than two children (91.7% urban, 87.8% rural) and had been exposed to some form of tertiary education (89.3% urban, 58.9% rural). The urban dwelling women mostly earned between 10,000-40,000 naira (44.0%) while the rural dwelling women had incomes mostly below 10,000 naira (43%). However, both groups of women mostly had alternative sources of income (91.1% urban, 86.6%). Tables II & III shows the women’s knowledge and attitude towards exercising towards prevention of osteoporosis. Although many of the women thought it necessary to exercise during pregnancy (95.2% urban, 84.4% rural), only an average number of the women were aware of the risk of osteoporosis (51.8% urban, 44.4% rural). A large number of the women admitted that exercise would improve bone health (85.7% urban, 72.2% rural) and some (83.3% urban, 73.3% rural) were currently exercising mostly 3-4 times weekly (38.1%urban, 40.0%rural). The type of exercises practiced by the women is shown in Table IV. Although the women practiced more of brisk walking (44% urban, 40% rural) based on self-prescription (32.7% urban, 33.3% rural) and major reason for exercising was to improve flexibility (60.7% urban, 45.6% rural), relaxation and breathing exercises (39.9% urban, 28.9% rural) was the most identified exercise type for osteoporosis prevention. Table V shows the level of the knowledge attitude and practice of the pregnant women. The urban and rural dwelling women had moderate (48%) and poor (50%) knowledge of exercising for osteoporosis prevention respectively. Both groups of women had moderately positive attitude towards exercising for osteoporosis prevention (65.5% urban, 60.1% rural). Also both groups of women had poor practice towards exercising for osteoporosis prevention (49.0% urban, 53.8% rural). Table VI shows the association of knowledge, attitude and practice with sociodemographic variables A significant association was only found between having another source of income in the family and the women’s attitude towards exercise.

**Table I:** Demographic characteristics of the pregnant women

<b>Age and Parity characteristics of the pregnant women</b>				
<b>Variables</b>	<b>Urban (n=168)</b>		<b>Rural (n=90)</b>	
	<b>Frequency</b>	<b>Percentages (%)</b>	<b>Frequency</b>	<b>Percentages (%)</b>
<b>AGE (yrs)</b>				
19-25	36	21.4	34	37.8
26-30	80	47.6	29	32.2
31-35	40	23.8	21	23.3
36-41	12	7.1	6	6.7
Total	168	100	90	100
<b>PARITY</b>				
<2	154	91.7	79	87.8
3-5	13	7.7	11	12.3
>5	1	0.6	0	0
Total	168	100	90	100
<b>Educational level categories of the pregnant women</b>				
<b>EDUCATION</b>				
None	0	0.0	1	1.1
Primary	1	0.6	5	5.6
Secondary	18	10.7	32	35.6
Tertiary	150	89.3	53	58.9
Total	168	100	90	100
<b>Income and alternative income sources categories of the pregnant women</b>				
<b>INCOME</b>				
<10,000	55	32.7	43	47.8



10,000-40,000	74	44.0	39	43.3
>40,000	36	22.6	8	8.9
Total	168	100	90	100
<b>ALTERNATIVE IN COME SOURCE</b>				
Yes	153	91.1	78	86.6
No	15	8.9	12	13.3
Total	168	100	90	100

**Table II:** Knowledge of osteoporosis and exercise prevention among the pregnant women

Questions	Urban(%)		Rural(%)	
	Yes	No	Yes	No
Have you heard of osteoporosis in pregnancy?	157(93.5)	11(6.5)	79(87.8)	11(12.2)
Do you know the causes of osteoporosis in pregnancy?	76(45.2)	92(64.4)	36 (37.8)	54(62.2)
Are you aware of the risk of osteoporosis in pregnancy?	87(51.8)	81(48.1)	40(44.4)	50(55.5)
Are you aware that some exercises/physical activity can help to improve bone health?	144(85.7)	24(13.7)	65(72.2)	25(27.8)
<b>Source of osteoporosis information</b>	<b>Urban</b>		<b>Rural</b>	
	<b>Freq</b>	<b>(%)</b>	<b>Freq</b>	<b>(%)</b>
Antenatal classes	128	76.2	60	66.7
Family	5	3.0	5	5.6
Television	4	2.4	3	3.3
Books and magazines	9	5.4	3	3.3
Friends	2	1.2	2	2.2
Health care professionals	14	8.3	13	14.4
Work place	2	1.2	1	1.1
Internet	4	2.4	3	3.3
<b>If you were to suggest, which of the following exercises do you think can be done to prevent osteoporosis in pregnancy?</b>	<b>Yes (%)</b>	<b>No Answer (%)</b>	<b>Yes (%)</b>	<b>No Answer (%)</b>
Aerobics	41(24.2)	127(75.6)	14(15.6)	76(84.4)
Pelvic Floor excs	49(29.2)	119(70.8)	13(14.4)	77(85.6)
Swimming	21(12.5)	147(87.5)	5(5.6)	85(94.4)
Stretching	47(28.0)	121(72.0)	25(27.8)	65(72.2)
Muscle strengthening	48(28.6)	120(71.4)	20(22.2)	70(77.8)
Abdominals	21(12.5)	147(87.5)	5(5.6)	85(94.4)
Stair climbing	9(5.4)	159(94.6)	2(2.2)	88(97.8)
Balance training	40(23.8)	128(76.8)	19(21.1)	71(78.9)
Relaxation and breathing	67(39.9)	101(60.1)	26(28.9)	63(70.0)
Brisk walking	74(44.0)	66(39.3)	36(40.0)	30(33.3)



**Table III:** Attitude of the pregnant women towards exercising for osteoporosis prevention

Questions	Urban		Rural	
	Yes(%)	No(%)	Yes(%)	No(%)
Is it necessary to exercise during pregnancy?	160(95.2)	8(4.8)	76(84.4)	14(15.5)
Would you exercise to prevent osteoporosis?	140(83.3)	28(16.7)	66(73.3)	24(26.7)
<b>If yes, why would you exercise?</b>	<b>Freq.</b>	<b>Percent</b>	<b>Freq.</b>	<b>Percent</b>
reduce risk of falls	17	10.1	17	18.9
reduce risk of fracture	27	16.1	14	15.6
maintain bone mineral density	47	28.0	21	23.3
prevent excessive weight gain	87	51.8	32	35.6
prevent or reduce fatigue	63	37.5	30	33.3
to increase flexibility	102	60.7	41	45.6
to increase agility	86	51.2	45	50.0
to increase muscle strength	76	45.2	31	34.4
<b>If no, why won't you exercise</b>				
I feel tired	10	6.0	9	10.0
I don't feel like exercising	2	1.2	2	2.3
I have busy schedule	8	4.8	6	6.7
Doctor's instruction	1	0.6	1	1.1
I don't have sufficient information on exercise	19	11.3	18	20.0

**Table IV:** Practice of exercises among the pregnant women towards prevention of osteoporosis

Questions	Urban		Rural	
	Yes(%)	No(%)	Yes(%)	No(%)
Do you currently exercise?	140(83.3)	28(16.7)	66(73.3)	24(26.7)
<b>What type of exercise do you practice?</b>	<b>Freq</b>	<b>Percent</b>	<b>Freq</b>	<b>Percent</b>
Aerobics				
	39	23.2	13	14.4
Abdominal	11	6.5	0	0.0
Swimming	5	3.0	0	0.0
Pelvic floor	32	19.0	13	14.4
Balance training	30	17.9	12	13.3
Stretching exercises	43	25.6	25	27.8
Muscle strengthening excs	22	13.1	11	12.2
Stair climbing	2	1.2	3	3.3
Breathing & Relaxation excs	46	27.3	18	20.0
Brisk walking	43	25.5	17	18.9
<b>How many times do you exercise per week?</b>				
1-2times	29	17.3	8	8.9
3-4 times	47	28.0	22	24.4
5 times and above	64	38.1	36	40.0



Who prescribes and instructs you in these exercises?				
Doctor	8	4.8	6	6.7
Nurse	20	11.9	10	11.1
Physiotherapist	44	26.2	16	17.8
My spouse	10	6.0	4	4.4
Myself	55	32.7	30	33.3
Others	3	1.8	0	0.0

**Table V:** Level of knowledge, attitude and practice of exercises in the prevention of osteoporosis among the pregnant women

Variable	Urban		Rural	
	Frequency	Percentages	Frequency	Percentages
<b>KNOWLEDGE</b>				
Poor	78	46.5	45	50.0
Moderate	81	48.0	41	46.1
Good	9	5.5	4	3.9
<b>ATTITUDE</b>				
Poor	33	19.5	25	27.8
Moderately positive	110	65.5	54	60.1
Good	25	15.0	11	12.1
<b>PRACTICE</b>				
Poor	82	49.0	48	53.8
Moderate	73	43.6	39	43.5
Good	13	7.4	2	2.7

**Table VI:** Association of knowledge, attitude and practice with socio-demographic variables among the pregnant women

Variable	Urban		Rural		
	R <sup>2</sup>	P-value	R <sup>2</sup>	P-value	
<b>KNOWLEDGE</b>	Age	17.322	0.632	16.930	0.595
	Parity	5.905	0.316	8.198	0.085
	Education level	4.642	0.704	8.198	0.085



	<b>Monthly Income</b>	3.273	0.351	5.979	0.050
	<b>Alternative income</b>	0.165	0.921	5.172	0.160
<b>ATTITUDE</b>	<b>Age</b>	42.504	0.405	34.088	0.651
	<b>Parity</b>	9.356	0.499	2.405	0.966
	<b>Education al level</b>	18.287	0.194	2.405	0.966
	<b>Monthly Income</b>	2.559	0.862	0.791	0.940
	<b>Alternative income</b>	1.169	0.741	27.679	0.000
<b>PRACTICE</b>	<b>Age</b>	19.766	0.473	29.947	0.052
	<b>Parity</b>	11.015	0.051	6.348	0.175
	<b>Education al level</b>	6.765	0.454	6.348	0.175
	<b>Monthly Income</b>	2.234	0.525	3.424	0.181
	<b>Alternative income</b>	0.410	0.814	6.260	0.100

#### IV. DISCUSSION

This study found that the pregnant women studied lacked good knowledge towards exercise in the prevention of osteoporosis. Irrespective of the fact that many of the pregnant women claimed to have heard of osteoporosis in pregnancy, only an average number knew the risks or the causes of osteoporosis in pregnancy. Some of the women knew that exercises/physical activities could help to improve bone health. From those who had heard of osteoporosis, antenatal classes were their most frequent source of information. Although many of the women considered it necessary to exercise during pregnancy and some were willing to exercise, many identified to increase flexibility as major reason why they would exercise. A good number of the women were already engaging in brisk walking exercises 3-4 times weekly but very few engaged in muscle strengthening exercises, balance training or stair climbing which are exercises that also contribute to improvements in muscle strength, reduce risk of falling and work directly on the legs through weight bearing to improve bone mineral density. It is important to note that most of the women walking as an exercise program which improves femoral BMD may not improve the spine BMD. A comprehensive exercise program would therefore include resistance, aerobic (weight-bearing) and impact exercises for an enhancement of spine BMD [26]. Majority of the pregnant women who exercised did so based on self-prescription which may not yield expected benefits. Significant associations were found between only between the attitude of the women and having another source of income.

Poor knowledge and poor practice were worse among the rural women although they had a better attitude towards exercising. Our findings agree with some other studies that reported poor levels of KAP towards osteoporosis prevention [27,28]. However, higher levels of KAP have been reported by some other studies [29,30] regarding osteoporosis prevention. The pregnant women mainly heard of osteoporosis during antenatal classes. Previous studies have reported media as the most frequent source of information about



osteoporosis [29,30,31,32]. The women lacked adequate knowledge of the exercises that could be done to improve bone health and prevent osteoporosis. Although many of the women were practicing exercises/physical activities which differs from the findings of some previous studies [30,31], only a few did so to maintain bone mineral density, reduce risk of falling or reduce risk of fracture. Impact exercises are recognized as beneficial for the stimulation of bone tissue, however, variables such as muscle strength, type of muscle contraction, duration and intensity of exercises are also determinants to induce changes in bone metabolism. Bone generating exercises are recommended to prevent osteoporosis however, activities aimed at developing muscle strength and body balance as well as improving proprioception ought to be encouraged in order to prevent falls and fractures [26]. Both the urban and rural dwelling women had a moderately positive attitude towards exercising for osteoporosis prevention mildly similar to prevention attitude levels recorded in previous studies [31]. This finding however differed from the report of another study in Saudi Arabia [30]. No significant relationship was found between age and KAP in our study which is in agreement with some previous reports[33,34]. Educational level has been reported to be positively related to knowledge [33] even though our study's finding is different. No relationship was found between income and knowledge in this study and likewise ElTohami et al [30]. Age and attitude were not found to be related unlike the report of a Thai study [35] that showed significant association between age and attitude. Similar to ElTohami et al [30] educational level and attitude association was statistically insignificant. Having an alternative source of income was the only variable significantly related to attitude. No relationships were found between any of the variables and Knowledge and Practice. Findings herein suggest that efforts ought to be intensified to educate pregnant women in Enugu, Nigeria on the roles of exercise in osteoporosis prevention.

## V. CONCLUSION

Osteoporosis remains a major disease affecting women worldwide. Although osteoporosis may be considered not to be very popular during pregnancy, major losses in BMD may lead to osteoporosis later in life. Pregnant women in Enugu, Nigeria require adequate education on pregnancy associated osteoporosis risk reduction through exercises in order to improve their knowledge, attitude and practice especially considering the high incidence of falls during pregnancy which may lead to fractures. Educational programs on osteoporosis prevention through exercises, improvement of Antenatal Classes educational content as well as future studies in the study area are recommended.

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*Cite this Article: Ikele Chioma Nneka, Ikele Ikenna Theophilus, Ihekwe Peace Udochi, Ojukwu Chidiebele Petronilla, Nwannadi Vivian Ifeyinwa, Ugwu Sandra Ugonne, Okide Onyinye Victoria, Okeke Adaobi Pearl, Madueke Pamela Somke (2021). Pregnancy Associated Osteoporosis: Knowledge Attitude and Practice of Exercise among Pregnant women in a selected Nigerian community. International Journal of Current Science Research and Review, 4(8), 1022-1031*