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The Influence of Regular Exercise on Hypertension among Older Adults in Owerri North LGA Imo State

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Abstract

Hypertension is a major public health challenge worldwide. It is the most important risk factor for cardiovascular disease. This study aimed to investigate the influence of regular exercise on hypertension morbidity among older adults in Owerri North LGA Imo State, Nigeria. The study was a community based interventional study with quasi experimental design. The study population comprised of older adults residing in Owerri North LGA who were 65 years of age and above and the 50 years and above adults with chronic diseases. There were a total of 396 subjects that were randomly sampled and included in the study Questionnaire was used to obtain demographic and lifestyle information. Hypertension was defined as Systolic blood pressure (SBP) ≥ 140 and/or Diastolic blood pressure (DBP) ≥ 90mm Hg or currently on anti-hypertensive medication. Exercise session was assigned to the participants after initial health measures. Data were analyzed in SPSS Version 25 using descriptive statistics, Chi-square test was performed at 5% significant level to test for the associating factors. The overall prevalence of hypertension was 35.9%. Hypertension was found to be associated with some factors of socio-demographics such as age ($p< 0.0001$, $\chi^2=97.21$), sex ($p = 0.014$, $\chi^2 =6.10$), marital status ($p<0.0001$, $\chi^2 =35.996$) and education level ($p<0.0001$, $\chi^2 =37.178$). An increasing trend was found in age from 6.5% for the under 30 to 57.3% for the over 60 subjects. Hypertension was lower (27.1%) in males than in females (38.6%) in the area, while it was quite very high among the separated and widowed at 60% each. Subjects with low level of education recorded higher rate of hypertension among them (non-formal =61.5%, primary education level =46.2%). Significant associations were found between hypertension and lifestyle factors on alcohol intake ($p= 0.019$, $\chi^2 =9.940$) and Body Mass Index (BMI) ($p < 0.0001$, $\chi^2 =24.104$). Those who consume alcohol everyday recorded a high hypertension prevalent of 41.1%. The prevalence of hypertension was apparently lower for the underweight (28.6%) and the normal weight subjects (25.4%) but higher for the overweight (42.4%), obese (49.1%) and the severely obese (42.1%). For work related factors, employment duration was found to be a significant factor of hypertension ($p < 0.001$, $\chi^2 =13.572$) as well as Job satisfaction ($p < 0.001$, $\chi^2 = 26.93$) in this study. In conclusion, this study revealed a high prevalence of hypertension among adults in study area which underscores the need for urgent interventions for prevention and early detection of hypertension, especially among those aged ≥30 years and the overweight or obese.

Keywords: Older Adults, Diastolic Blood Pressure, Systolic Blood Pressure, Hypertension, Body Mass Index (BMI)

1. Introduction

Hypertension is one of the most common non-communicable diseases of public health concern around the globe. The rate of the disease spread is constantly on the increase all around the world. Hypertension has been estimated to have affected up to one billion adults globally while the disease rate was projected to rise up to 30% globally by 2025 (Kearney, 2005) [13]. It is responsible to global annual deaths of up to 10.7 million and global disease burdens accounts for 20.9% (approximately 212 million) of global disability adjusted life years (DALYs) (Mensah, 2018) [9].

The burden of hypertension is on the rise in developing nations especially in many sub-Saharan African countries where the rate of increase in non-communicable diseases is on the verge of taking over from the communicable. The increasing prevalence of the disease and its burdens in the sub-Saharan area has been attributed to the increase in the life style transitional practices in most developing, and the increase in the number of older adults in the population (Adebusoye *et al.,* 2011) [1]. However, lack of exercise along with other factors were identified as the risk of hypertension in Africa (Essouma *et al.*, 2015) [8].

In Nigeria, hypertension is the most frequent diagnosed cardiovascular disorder, constituting up to 25% of medical admission emergencies in the country (Ajai *et at*., 2016; Ugwuja 2015 [22]). Hypertension is a serious concern because it is asymptomatic so that many people with the disease do know initially and may not seek medical help.

Hypertension is an age associated disease, that affects up to two third of the 65 years old and above. In Nigeria, the prevalence of hypertension among Nigerian elderly has been found as 44.7% and engaging in little or no physical activity compared has higher risk of the disease (Egbewale *et al.,* 2019) [7].

At the occurrence of hypertension or high blood pressure, the blood pressure in the arteries will be elevated and that will require that heart should work harder than normal to circulate blood through the blood vessels. The detection and control of hypertension is a major public health challenge that should be frequently addressed especially among older adults. Yet the control and prevention of the disease among older adults could be complex when not carefully handled. The use of pharmaceutical approach such as taking antihypertensive medications for prevention and management of the disease is well known but could as well heighten the risk of side effects exposure to other diseases on adults (Whelton *et al.,* 2018) [20]. Non pharmaceutical approach is another way to help in addressing the concerns of sided effects from medication. This approach includes diet and lifestyle modifications such as engagement in physical exercise. The World Health Organizations (WHO) recommended that adult should be engaged in some levels of physical activity for the prevention of hypertension and other chronic diseases such as cardiovascular diseases and stroke (WHO, 2022) [21].

As hypertension risk increases with age, engaging on some exercise could help to prevent high blood pressure or control it among those that already have the disease. It has been demonstrated that exercising on a regular basis has many health benefits against high blood pressure and is capable of reducing the systolic blood pressure by 5 mmHg (Alpsoy 2020; Schroeder *et al.,* 2019) [3, 19]. Older adults are recommended to increase their rate of physical activity to 300 minutes per week, or engage in 150 minutes of vigorous physical activity per week (WHO, 2022) [21].

On the other hand, another study found only a few associations between physical activity and blood pressure when adjusting for confounding factors (Papathanasiou *et al.,* 2015) [15]. It has been reported that clarity may be required on the type and level of relationship between physical activity and incidence of hypertension (Pouliou *et al.,* 2012) [17].

Individuals with hypertension are more susceptible to poor brain and cognition matters (Iadecola *et al.,* 2016), but physical exercise is quite relevant to prevent and reduce hypertension induced cognitive losses in humans (Rêgo *et al.,* 2019) [18].

Study Design

The study was designed as a community based quasi experimental study involving older adults in Owerri North LGA. It was an intervention study using physical exercise an intervention to investigates the effect on blood pressure.

Area of Study

This study was performed in Owerri North Local Government Area (LGA) in Imo State Nigeria. Owerri North LGA was created in 1976 and has its headquarters at Uratta, it is a large LGA with total population of 175395 people 2006 (National population commission, National bureau of statistics of Nigeria, 2007) and covers an area of 198 kilometers. The LGA has 21 autonomous communities namely: Agbala, Akwakuma, Amakaoha, Awaka, Azaraubo, Egbu, Emekuku, Emii, Ezimba, Iheteoha, Ihitta Ogada, Naze, Obibiezena, Obibi Uratta, Orji, Ulakwo, Umuakalika, Owalla, Azara-Ubo, Umuakalikwu, Egbelu Obube.

The indigenes of Owerri North Local Government are predominately Igbo speaking inhabitants called the Ibos and theconstitute about 98% majority Christian and worshippers officially Sundays. They engage in several occupations such as civil service, farming and trading.

Population of Study

The population for this study comprised of older adults of age 65 years and above as well as adults of 50 to 64 years who have been diagnosed with hypertension as recommended (Pescatello *et al.,* 2004) [16].

Of all adults in Owerri North Local Government Area of Imo State within the age bracket of 45years to 75years. The total population of adults within this age bracket is 37,300 (17,650 male and 19,650 female) (National population commission of Nigeria, 2006).

Sample and Sampling Technique

Sample Size

The sample size is three hundred and ninety-six (396). The sample size was determined using Taro Yamane's (1967:886) formula for determination of sample size.

Sampling Technique

Random sampling technique was used in this study. The LGA of study was divided into autonomous communities and up to 40% of the autonomous communities were randomly selected. The selected communities include Agbala, Amakaohia, Egbu, Emekuku, Naze. Obibiezena, and Ulakwo, systematic sampling was used to arrive at the eventual selection of the participants (56 each from six villages and 60 from the remaining one village). The participants were invited at a community gathering and were required to enter their names in a book register upon arrival. The register was used to establish the required sampling number in the systematic sampling. The population of the older adults in each LGA was considered in getting the number of samples from each autonomous community.

Instrument for Data Collection

The instrument used for the study include the questionnaire for information on socio-demographics and the International Physical Activity Questionnaire-(IPAQ) for assessment of the level of exercise performed.\ Data collection time was mostly during the morning and day hours. The importance of the study was explained to participants and that was followed by a request for informed consent to participate in the exercise.

Other instruments include sphygmomanometer for blood pressure measurements, tapes for height measurement and scale for weigh measures.

Validity of Instrument

To ensure the validity of the instrument, the questionnaire

was submitted to the supervisor and two other experts in the field of public health, who vetted the instrument to ensure appropriateness in relation to language, clarity, adequacy of content and ability to elicit accurate information in relation to the purpose of the study. Their constructive suggestion and corrections were used to modify the final version of the instrument.

The instrument for BP and clinical measures were not subjected to validity since they are already certified instruments.

Reliability of Instrument

Test- retest method was used to test the reliability of the instrument questionnaire. Twenty copies of the structured questionnaire was distributed to twenty adults with similar characteristics with the study group but from a autonomous communities not included in the study. The process was repeated after a week and the results were scaled and compared for consistency test using Cronbach's Alpha test. A reliability coefficient of 0.70 was obtained.

2. Method of Data Collection

Data collection processes took about three months. It was collected in two different phases comprising of the pre intervention stage and the post intervention stage. In each case, the subjects were examined of their blood pressure level and were given a questionnaire to complete. Some literate ones were allowed to complete the questionnaire themselves. It takes about 10 minutes to complete the questionnaire.

The blood pressure measurement was taken three times at few interval gaps of 2 minutes and the average of the last two measurements were compiled for data analysis. During the time intervals, the participants were guided to fill up the questionnaires.

Outcome Measure

The primary outcome measure for high blood pressure is the blood pressure diagnosis output comprising of measurements of systolic blood pressure (SBP) and diastolic blood pressure (DBP). Diagnosis of hypertension was based on 2003, joint national committee WHO criteria on high blood pressure (Chobanian, *et al.*, 2003) [5], which defined hypertension as systolic blood pressure of > 140mmHg and /or diastolic pressure > 90mmHg or a blood pressure below this level for individuals previously diagnosed of hypertension but are placed on hypertensive drugs or on therapy.

The measurement for height was performed with a tape while the participants were standing, while for the weights, they were requested to stand on a measurement weight. The height was measured in meters while the weight was measured in kg. Both height and weight were used to estimate the body mass index (BMI).

Research protocol

The study was in three phases; pre-intervention, intervention and post-intervention. At Pre-intervention phase, the participants were assessed of their physical exercise, followed by blood pressure measure as well as measurement for clinical parameters. The respondents' socio-demographic characteristics were obtained through a questionnaire.

At intervention phase: The participants who signed the consent form participated in the study. They were offered education on the importance and benefits of continuous regular physical exercise. That was followed by a 5 minutes demonstration session of brisk walking. Eventually they were assigned of the following physical exercises.

1. A moderate exercise (brisk walking) of 30 minutes per day for a total number of three times per week in the mornings.
2. Encouragement to be engaged in a light exercise such as evening time walking for 30minutes for up to three times in a week.
3. Up to 8-10 hours of daily activities were compressed to 90 minutes of light intensity exercise per week. This includes walking activities to a reasonable walkable distance that they often go by car, or by the use of bicycle or motorcycle, or gardening work.

They were asked to time themselves with a wrist watch to make such that they completed up to the allotted time.

Follow-up: Participants were constantly reminded of the exercise through their mobile phones and were met at the end of each week to access their progress and challenges.

The post-intervention stage, was performed at the 12th week of the intervention. Each participant in this study were gathered again and were assessed with the same international physical activity questionnaire. The clinical parameters were also recorded as done in the pre-intervention stage.

Data Analysis Method

All data collected were analyzed using the Statistical Package for Social Sciences (SPSS) version 25. Analysis was done at both pre-intervention and post-interventional levels between the intervention and control groups. Frequency tables, cross tabulations and chart were generated to show relationship between variables. Mean, and standard deviations were computed for continuous variables. Test of significance was performed using Pearson's Chi-Square and Student's t- test. The paired difference in hypertension at pre and post intervention was tested using McNemer test. The probability value (*P)* was used to establish the significant level such that *P* of value less than 5% were considered statistically significant.

Ethical Consideration:

Ethical approval was obtained from the SOHT ethics review and research committee of Federal University of Technology Owerri. Participation in the study was made voluntary and informed consents were obtained all the participants, while their confidentiality was well maintained.

3. Results

Characteristics of the Study Participants

There were a total of 396 older adults that participated in the study. The mean age of the participants was 64.1 years at a standard deviation of 7.1 years, the youngest person was of 52 years old and the oldest person used in the study was 83years old. The oldest age group (70 years and above) contained the least number of participants (74: 18.7%). There were 157 (30.6%) belonging to age group 50- 59 years, 165 (41.7%) that fall within the age group 60-69.

Females were 217 (54.8%) in all while the males were 179 (45.2%). the overwhelm majority of the participants were married (358 (90.4%), 7(1.8%) were divorced, 30 (7.6^) were widowed and only one person (1: 0.3%) was found

single.

In terms of education level, all the participants had formal education. A total of 168 (42, 4%) had primary education level, 165 (41.7%) studied up to secondary education level, 63 (%) had tertiary education level. On the job type, 176 (44.4%) were office workers, 75 (18.9%) were engaged with trading activities while 23 (5.8%) were farmers up to 111 (28%) indicated that they no longer work.

Table 1: Characteristics of the Study Participants

Characteristics	Frequency	Percent
Age (mean st,dev =64,1± 7.11)		
50 -59	157	39.6
60-69	165	41.7
70+	74	18.7
Total	396	100.0
Gender		
Male	179	45.2
Female	217	54.8
Total	396	100.0
Marital Status		
Married	358	90.4
Single	1	.3
Divorced	357	1.8
Widowed	30	7.6
Total	396	100.0
Education Level		
Primary	168	42.4
Secondary	165	41.7
Tertiary	63	15.9
Total	396	100.0
Job Type		
Office Job	176	44.4
Trading	75	18.9
Farming	23	5.8
None	111	28.0
Others	11	2.8
Total	396	100.0

Patterns of Physical Exercise Practiced and Health Status among the study Participants

On Table 2, greater majority of the participants (379: 95.7%) indicated that they do have any form of physical exercise, while 1% responded "Never". A total of 257 (64.9%) responded that they very frequently involve in rigorous exercise.

Those who indicated that they have been diagnosed of high blood pressure were 227 (69.9%), while slightly above half (207: 52.3%) responded positive for being on drug to control hypertension. Up to 161 (40.7%) were on blood pressure control drug at present.

In terms of having any other chronic non communicable health condition such as diabetes, Ulcers, cancers, obesity, and others, 109 (27.5%) responded positively while 149 (37.6%) responded that they have family history of the chronic on communicable health conditions.

Table 2: Patterns of Physical Exercise Practiced and Health Status among the study Participants

Assessment Item	Frequency	Percent
Any form of physical exercise		
Yes	379	95.7
No	13	3.3
Never	4	1.0
Total	396	100.0
Involvement in rigorous exercise		
Very frequently	257	64.9
Not frequently	117	29.5
Never	22	5.6
Total	396	100
Have diagnosed of high blood pressure		
Yes	277	69.9
No	119	30.1
Total	396	100.0
Ever been placed on any drug to control your blood pressure		
Yes	207	52.3
No	189	47.7
Total	396	100.0
Being on any blood pressure control drug at present		
Yes	161	40.7
No	235	59.3
Total	396	100.0
Do you have any other chronic non communicable health condition? (Such as Diabetes, Ulcers, Cancers, obesity, etc.)		
Yes	109	27.5
No	287	72.5
Total	396	100.0
Do you have family history of any of the above-mentioned health conditions?		
Yes	149	37.6
No	247	62.4
Total	396	100.0

Prevalence of Hypertension before and after Intervention

On Table 3 clear majority of the subjects were found to have developed hypertension at pre intervention stage. Those who have hypertension at pre-intervention test were 284 (71%) while none hypertensives were 112 (28.3%). At post intervention, the subjects with hypertension were 231 (58.3%) while 165 (41.7%) were free from the disease.

Table 3: Hypertension Status of the Study Participants (Before and After Intervention)

	Pre Intervention		Post Intervention	
	Frequency	**Percent**	**Frequency**	**Percent**
Non-hypertensive	112	28.3	165	41.7
Hypertensive	284	71.7	231	58.3
Total	396	100.0	396	100.0

In figure, the prevalence of hypertension was found as and 58.3% respectively for the pre and post intervention groups. It shows that the rate of the disease was reduced as a result of exercise interventions.

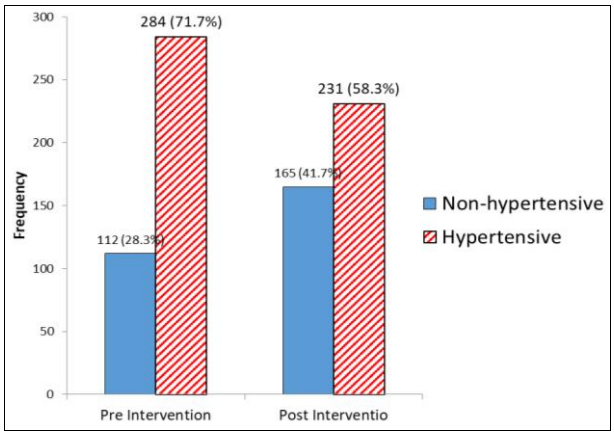

Fig 1: Bar Chart showing differences in Hypertension Status of the Study Participants at pre and post Intervention

Influence of Exercise on Body Mass Index (BMI): Differences in BMI at Pre and Post Intervention

Table 4 represents the BMI classifications at pre and post exercise intervention for the group studied. Clearly the table shows that there were 144 (36.4%) who had normal BMI at pre intervention but that increased to 173 (43.7% at post intervention. It also shows that overweight reduced slightly from 137 (34.6%) during pre intervention to 126 (31.6%) at post intervention, while the number of obese came down from 115 (29.0%) to 98 (24.7%) respectively from pre to post interventions. It clearly shows that the three months exercise was able to reverse some of the obese and overweight to normal weigh.

Table 4: BMI Classifications at pre and post exercise among older adults in Owerri North

	Pre Intervention		Post Intervention	
BMT Class	**Frequency**	**Percent**	**Frequency**	**Percent**
Normal	144	36.4	173	43.7
Overweight	137	34.6	125	31.6
Obese	115	29.0	98	24.7
Total	396	100.0	396	100.0

The statistical test for the influence of exercise on BMI at pre and post intervention stages is on Table 5. The table shows that the mean BMI reduced from 26.77kg/m^2 (standard deviation = 4.909) at pre intervention to 26.01kg/m^2 (standard deviation = 5.072) at post intervention, leading to a difference of 0.76(kg/m^2). The difference is however found to be highly significant at 5% level (P< 0.0001, t= 5.802, df =395). The result is a clear indication the exercise intervention had significant effect on the body mass index of among the elderly group studied.

Table 5: The statistical test for the influence of exercise on BMI at pre and post intervention stages

BMI Class (kg/m^2)	N	Mean	Std. Deviation	Mean Std Error	Lower CI	Upper CI	t (df)	*P*
Pre BMI	396	26.77	4.909	0.247				
Post BMI	396	26.01	5.072	0.255				
Difference		0.76	2.593	0.130	0.500	1.012	5.802 (395)	0.0001

Influence of Exercise on Hypertension among the Study Group in BMI at Pre and Post Intervention

The influence of regular exercise on hypertension among older adults in Owerri North LGA is represented on Table 6. It shows that up to 68 (37.4%) who were hypertensive at preintervention stage became non hypertensive at post intervention. The observed paired difference was found to be significant in Mc Namar Chi square test for paired proportions (P = 0.0001), signifying that the present study was able to establish that physical exercise is capable of reducing blood pressure among older adults.

Table 6: The influence of regular exercise on hypertension among older adults in Owerri North LGA

	Post Intervention						
Pre-Intervebtion	Non-hypertensive		Hypertensive		Total		*P**
Non-hypertensive	114	62,6%	29	13.3%	143	36.1%	
Hypertensive	68	37.4%	185	86.4%	253	63.9%	
Total	182	100.0%	214	100.0%	396	100.0%	0.0001

Mc Namar Chi square Test Performed for paired proportions

4. Discussion

There was a significant reduction in the level of blood pressure control from pre-intervention to post-intervention in the study. This significant reduction in this study was noted following a twelve week of moderate and light intensity exercises. There are several studies and meta-analysis that examined the relationship between physical exercise and blood pressure control, for instance, a study done by Bell and colleague revealed an appreciable reduction in both the SBP and DBP after a 12 weeks of physical exercise (Ike, 2009). This was further demonstrated by Huang and colleagues in meta-analysis 2013, where the effect of aerobic exercise training had a statistical significant effect on both SBP and DBP (Huang *et al*, 2003). These findings were similar to that obtained in this index study which revealed that a positive relationship exist between blood pressure control and physical exercise. This was probably as a result of the encouragement given to the participants to engage in both the structured moderate and light intensity exercises and to improve on their baseline physical activities. More so, the level of compliance among respondents in this study could be attributable to the close follow-up, bi-weekly phone calls by the author to encourage them.

Pre-intervention showed good SB and DBP control rates and this was higher than 33% found in a descriptive cross-sectional study in a semi-urban community in Umuahia, South-East Nigeria (Cornelissen and Smart, 2013). In a similar manner it was higher than 5.0% (males) and 17.5% (females), found by Ekwunife *et al* in Nsukka in a household survey on prevalence, awareness and control of hypertension (Ekwunife, 2010).

5. Conclusion

This study revealed that engaging in regular physical exercise as a non-pharmacological modality is an important step in hypertension management and prevention and had positive influence in lowering blood pressure. The key findings in this study:

The prevalence rate of hypertension is quite high among older adults but can be reduced with physical exercise.

Many of the study group are already involved in form of exercise yet the rate of hypertension morbidity is high in the area, indicating that they may not be engaging in the exercise in a manner adequate to regulate the disease.

Many of them are already involved in form of drug control for hypertension yet the rate of hypertension morbidity is high in the area, indicating that the use of drug may not represent the most needed treatment for hypertension.

BMI control among older adults in an important step towards the control of hypertension.

- The post-intervention level of physical exercise improved significantly in lowering hypertension among older adults.
- In general, it is apt to conclude in this study that strong positive relationship between physical exercise and blood pressure control.

6. Recommendations

The following are hereby recommended:

1. Healthcare workers should routinely educate their patients on the benefit of regular physical exercise on their blood pressure control.
2. Further researches should be conducted on the effect of physical exercise on blood pressure control as a non-pharmacological management of hypertension to breach the gap between the pharmacological and non-pharmacological management of hypertension.
3. Studies on the combined effect of lifestyle modifications on blood pressure control needed to be conducted in a bid to further breach the gap between pharmacological and non-pharmacological management of hypertension.

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