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Research Article

Influence of Socio-Demographic Factors on Hypertension: A Health Education Hypertension Intervention Study of Adults in Mbaitoli Lga Imo State Nigeria

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Abstract

Hypertension is one of the most common non-communicable diseases of public health concern around the globe. The burden of the disease 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 present study was aimed at investigating the effect of health education intervention on the burden of undiagnosed hypertension among adults in Mbaitoli LGA Imo State Nigeria. The study was designed as a two-arm intervention study comprising of the control group and the Intervention. Six communities were selected from the LGA and were randomly classified into control and intervention groups with each containing three communities. The intervention group received educational intervention combined with counseling and hypertension management recommended by the World Health Organization for noncommunicable diseases model. This include 3-hour sessions of didactic lectures followed by interactive group activities and exercises, The sessions were facilitated by nurses and physicians and were conducted six times every week for six months. The target was to create awareness about undiagnosed hypertension and to develop skills to implement a healthy lifestyle capable or reducing the prevalence of undiagnosed hypertension. The control group just received health talk about hypertension which lasted for about 30 minutes only. Both groups were assessed at baseline and at post intervention and data obtained were analysed using descriptive and inferential techniques, including t-test, chi-square test and logistic regression. The result shows that hypertension rate only reduces slightly in the control group but recorded significantly reduction in the intervention group (35.9% to 27.9%, P= 0.04). the mean SBP was not significant at the control group (Baseline: 143.2 ± 9.8, post-intervention: 142.7 ± 9.5) but reduced significantly (P < 0.0001) for the intervention group (Baseline: 141.5 ±11.8; post-intervention: 132.7 ± 8.9). There in lifestyle adjustments against HBP (Baseline: 5.93 ± 6.67; post-intervention: 7.17 ± 7.32; P <0.039). The study is a clear indication that many adults are vulnerable to the burdens of undiagnosed hypertension and an organized health educational intervention programme on undiagnosed hypertension targeting lifestyle adjustments should be encouraged at the community to minimize the burden of hypertension in the society.

Keywords: *influence, socio-demographic, hypertension, Imo State Nigeria.*

INTRODUCTION

Hypertension is one of the most common non-communicable diseases of public health concern around the globe. It is a worldwide health problem associated with an increased risk of cardiovascular morbidity and mortality arising from environmental, economic and genetic factors [1]. Hypertension has earlier been estimated to have affected up to 1.28 billion adults aged 30 -79 years globally of which 46% among them are unaware of their hypertensive condition [2] The rate of the disease spread was also recently estimated to be constantly on the increase with up to 20% of adults being affected by hypertension worldwide [3].

Globally, hypertension is a major cause of premature death in adult and up to two-thirds are in low- and middle-income countries. It has been judged as among the greatest health problems facing low and middle income countries and continues to be major contributory factors in the development of many chronic diseases including diabetes, renal failures. It is also a problem disease among adults in some high income countries. For instance, it has been estimated that close to one half of adult population in the United States are hypertensive. Hypertension has been ranked very high by the Global burden of disease study as the leading cause of lost years of quality of life. It is responsible for the global annual deaths of up to 10.7 million and its global disease burdens accounts of 20.9% (approximately 212 million) of global disability adjusted life years (DALYs) (Mensah, 2018). In 2016, high systolic blood pressure was reported by the Global Burden of Disease Risk Factors Collaborators as a leading cause of global disease burden in both men and women [4].

During the occurrence of hypertension or high blood pressure, the blood pressure in the arteries will be elevated and that requires the heart to work harder than normal to circulate blood through the blood vessels. Earlier sstudies have addressed the circumstances behind blood pressure fluctuations in humans during the day and found that blood pressure seemed to follow a circadian pattern, reaching a peak in the morning shortly after wakening and arising [5].

The dangerous thing about hypertension is that even when it has not been diagnosed in the patients, it may still grow slowly unnoticed. Since hypertension could grow on an asymptomatic condition, many people may be unaware that they have it, while it progresses to complications (WHO, 2021; WHO, 2023). This asymptomatic nature of hypertension makes it a major disease of grave health concerns since many people with the disease may not be initially aware that they have the disease and also may not seek medical help. Consequently, many people around the globe have undiagnosed high blood pressure [6].

Whether diagnosed or undiagnosed, hypertension has been rated as the disease with the greatest global burden, of global disability adjusted life. It is an age related disease that affects up to two third of the elderly and also among adults who are living sedentary lifestyle without engaging on some physical activity to lessen the risk of the disease [7].

Hypertension in adult has high negative impact on the economy and the quality of life of individuals. Individuals with hypertension are more susceptible to poor brain and cognition matters. The burden of the disease 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 [8].

In terms of cost, hypertension has high burden of cost on health systems. In 2001, high BP costs approximated 10% of the global health expenditures. The cost burden has been quite high in the low-and middle-income countries (LMICs), where higher prevalence of the diseases is being recorded. A recent study showed that BP has decreased in high-income countries over four decades, whereas it rises in LMICs [9].

In Nigeria, the average monthly cost for care of hypertension has been estimated as between US$19.35-US$44.35. Similar high cost has been reported in some other countries such as in Colombia. Elsewhere in the United States, the annual health-care expenditures for hypertension are approximately $131 billion [10].

The burden of undiagnosed hypertension has risen in the sub-Saharan area and has been attributed to factors relating to increase in the poor life style practices in most African countries and other developing nations and the increase in the number of older adults in the population [11].

In Nigeria hypertension occurrence in Nigeria is the most frequent diagnosed cardiovascular disorder, constituting up to 25% of medical admission emergencies in the country. Tackling the rising burden of hypertension in Nigeria and other countries of the sub-sahara African region is most likely a cost-effective approach to curbing the societal and economic impact of cardiovascular disease in the region. Such an approach would involve concerted efforts to improve early detection of hypertension, increase hypertension awareness in the community, and improve access to affordable healthcare for those with the condition. Therefore, addressing undiagnosed hypertension among adults in Nigeria should be of high health concerns. Research on undiagnosed hypertension among adults in Nigeria is scanty. Therefore, focusing on undiagnosed hypertension among adults could serve as a possible way of attracting effective change in adult behaviors and also on policies that could make way for a healthier society [12].

In Mbaitoli LGA Imo State Nigeria and likewise other similar communities in Nigeria, many adults especially the low and middle income earners are constantly exposed to the risk of hypertension while getting involved in daily activities such as civil duties, farming, business service and commercial activities to eke a living. They are faced with the pressure to meet up with high cost of living in the country amid their poor income earning source which most of times is insufficient to cater for their household needs. As a result, many adults living in the LGA are faced with hardship and

stressful life, and that makes it difficult for them to save part of their earnings to pay for cost requirements needed in giving attention to their health needs [13].

Therefore, it is expected that this study will cover the gap existing on the paucity of research covering the burden on Socio-demographic Factors of undiagnosed hypertension in Mbaitoli Local Government Area Nigeria, and most importantly draw attention on how to tackle the rising rate of the disease in the area.

MATERIALS AND METHODS

Area of Study

This study was performed in Mbaitoli Local Government Area (LGA) in Imo State Nigeria.

Study Design

The study was as a community based interventional participatory research initiative study involving adults in Mbaitoli Local Government Area. It was a designed as a 6-month experimental study involving pre-intervention (baseline) to post-intervention assessment on knowledge and lifestyle adjustment for preventive practices intervention targeting hypertension risk factors. Measurements were taken at baseline, and later after at least 6 months after the intervention has been deployed.

Population of Study

The study population comprised of adult males and females in Mbaitoli LGA Imo State. The adult in the LGA is about 29567which are made up of adult males and females residing within the LGA.

Sample Size and Sampling Method

Sample size

The study sample size (n) was calculated using Cochran method which is an appropriate sample size technique for a study of this nature (Cochran, 1963). The formula is given as follows;

$$n = \frac{Z^2 \text{ X } p(1-p)}{e^2}$$

n = required sample size

Z = standard normal at confidence level at 95% (

p = known prevalence of hypertension

e =margin of error at

A meta analysis study (Ogah, *et al*; 2012), gave the pooled prevalence of hypertension in Nigeria as 22.5%. 50% for undiagnosed hypertension. Going by this prevalence, it can be suggested that a sample size of 268 participants would be appropriate for a study of this kind (see sample size calculation below).

Z = confidence level at 95% (standard value Z = 1.96 from table)

p = known prevalence of hypertension (at 11.2% =0.112)

e = margin of error at 5% (standard value of 0.05).

Formula, $n = \frac{Z^2 \text{ X } p(1-p)}{e^2}$

$$n = \frac{1.96^2 \text{ X } 0.226 \ (1-0.226)}{0.05^2}, \qquad n = \frac{3.8416 \text{ X } 0.174375}{0.0025}$$

$$n = \frac{0.669878}{0.0025}$$

n= 267.95 (or 268, by approximation).

Thus, to allow for 10% attrition gives a sample size of not less than 290 participants was obtained. This study therefore used a total sample size of 290 participants deemed adequate enough to power the study.

Instruments for Data Collection

The blood pressure levels of respondents were examined using an electronic sphygmomanometer. A standard weight scale (in kilograms) was used for weight measures and a meter stand use for height measurement.

One type of questionnaire booklet was designed and administered to respondents as well as oral interviews to non literate respondents. The questionnaire was divided into sections A to D.

Section A part of the questionnaire contained the biodata of respondents such as age, gender, marital status, educational qualification. This section contained four (4) open and closed ended questions.

On Section C, the various biological and lifestyle factors of hypertension were assessed from respondents. They include; family history, level of salt consumption, physical activity, smoking, dietary pattern, level of alcohol consumption, use of oral contraceptive.

Section B was used to investigate the knowledge about hypertension, while section D what on the lifestyle preventive practices about the disease. The information contained in both sections were assessed at both at pre and post intervention study period to establish the effects of the study intervention on awareness and perception about the disease.

Validation of Instruments

The questionnaire instrument was validated through face validity. The questionnaire was carefully constructed to meet the requirements of the study and was approved by the study supervisor.

The instruments used for measurements in this study were up to the standard recommended by health professionals. For instance, Sphygmomanometer was used to assess the measurement of blood pressure, while weight scale and tape were respectively used for weight and height. These instruments were not validated since they are already certified instruments and have been in use for a long period of time.

To assess the knowledge and of hypertension, lifestyle modification and control practices, the study adopted a modified structured questionnaire from World Health Organization (WHO), on Hypertension Knowledge-Level Scale (HK-LS). Questions on knowledge of hypertension were modified and adapted from the validated questionnaires. For this study, a mean knowledge score of at least half the maximum obtainable scores for hypertension; 6.0 was were considered to indicate adequate knowledge while a score less than that was considered to indicate poor knowledge.

Physical activity was assessed using the Short International Physical Activity Questionnaire Form (IPAQ-SF). Based on the IPAQ-SF, respondents were required to indicate frequency and duration of walking, moderate intensity, vigorous-intensity and sitting activity performed forat least 10 min duration per session in the last seven consecutive day period. the questions were asked for during the pre- and post-intervention phases. The use of the IPAQ-SF was justified considering that it has been successfully validated in a Nigerian study. Having less than 150 min of moderate-intensity physical activity per week, less than 75 min of vigorous-intensity physical activity per week, or a combination of both was used to identify physical inactivity as recommended in the World health organization 2020 guidelines on physical activity.

Reliability of Instrument

The HK-LS study tool is a global standardized tool which was designed and reported by sultan *et al.* in 2012. It was not checked for reliability since its reliability and content validity of the scale were obtained as 0.82 and 60.3% respectively. Other contents of the questionnaire instrument was tested for reliability which was performed through pilot testing.

An initial sample of only 25 randomly selected participants was obtained from the LGA but from the communities that were not included in the study. The questionnaire was administered to the selected sample and the process was repeated after 5 days. The two results obtained were scaled and tested for reliability using Crombach alpha, a reliable coefficient of 0.84 was obtained. Instrument used for diagnosis of blood pressure as well as instruments for measurement of weight and height were not assessed for reliability. This is because, the instruments have earlier been in use and certified reliable.

Ethical Considerations/ Informed Consent

The ethical approval of this study was obtained from the school of Health Ethical Committee, Imo State University, Owerri, Nigeria. This study has the approval of the department of public health, Imo state University Owerri. Also, an approval was obtained from the Mbaitoli LGA authorities. An oral informed consent was also obtained from the participants before they were allowed to participate in the study.

Data Collection through Questionnaire

The questionnaire was administered to respondents after an informed consent was obtained. The literate respondents were allowed to fill the questionnaire themselves but the non-literate respondents were assisted by translating the questions in their local language and their responses were filled. Each questionnaire takes about 5 minutes to be completed. Sociodemographic information as well as information on awareness, and lifestyle correlates of hypertension was obtained from the questionnaire.

Statistical Analysis

Statistical data analysis was performed using Microsoft Office Excel 2010 and IBM Data obtained were coded and analyzed using the Statistical Package for Social Science (SPSS) software version 27 (IBM corp. released 2012. IBM SPSS statistics for widows, version 27 Armonk, NY: IBM Corp).

All tests were performed at 5% level of significance. In all, probability value (p) was used to interpret whether the factors are significant or not; hence $p < 0.05$ were considered significant.

RESULTS

Demographic Characteristics of the Subjects among the control group and the intervention group

There were a total of 580 subjects (290 each) utilized at baseline for control and intervention groups in the study. The overall estimated mean age of the study participants was 48.2 years at a standard deviation of 15.9 years, the youngest person was of 25 years old and the oldest person used in the study was 86years old.

In table 1, the baseline socio demographic characteristics of the study participants were presented. For the Intervention data, the largest age class was the class of 60 years and above with a total of 82 (28.3%) of the participants, followed by age class 50-59 with 59 (20.3%) of the subjects. The least class of less than 30 contained 46 (15.9%) participants (Table 1). Similarly in the control data, the class with the lowest frequency of the participants is the less than 30 years while those as from 60 years and above comprised of the largest class (80: 27.6%), followed by the 50 -59 years at a frequency of 64 (22.1%).

There were a more females than males in both the Intervention group (male =113: 39.0%; female= 177: 61.0%) and the control group (male =120: 41.4%; female= 170: 58.6%), of which majority were married in both groups {(Intervention: married =190 (65.5%); control: married = 186 (64.1%)}.

In terms of education level, at baseline data, 90 (32,1%) and 182 (45.5%) respectively had primary and secondary education levels in the intervention group, while there were respectively 86 (29.7%) and 127 (43.8%) primary and secondary education level participants for the control group. The characteristics showed that large number of the subjects were farmers [Intervention group: 128(44.1); Control group: 122 (42.1)]. Those who were traders or dealing with business activities were 105 (36.2%) for the intervention group, and 99 (34.1%) for the control group.

The body mass index (BMI) status of the subjects were such that in the intervention group we have 7 (2.4%) under weights, 126 (43.5%) normal BMI, 85 (29.3%) overweighs and 53 (18.3%) obese and also 19 (6.6%) severely obese. The control group also has similar distribution of the study group in relation to BMI with normal BMI group containing the largest number of participants (126: 43.4%), followed by the overweight (81:27.9%) and the obese (61:21.0%).

Table 1: Baseline Socio demographic Characteristics of the Subjects

		Intervention Group	Control Group
Factor	**Factor Class**	**Frequency (%, n=290)**	**Percent (n=290)**
Age in years (mean ± S.d= 48.2 ± 15.9)	< 30	46 (15.9)	42 (14,5)
	30 – 39	50 (17,2)	54 (18.6)
	40 – 49	53 (18.3)	50 (17.2)
	50 -59	59 (20.3)	64 (22.1)
	60+	82 (28.3)	80 (27.6)
Sex	Male	113 (39.0)	120 (41.4)
	Female	177 (61.0)	170 (58,6)
Marital	Married	190 (65.5)	186 (64.1)
	Single	45 (15.5)	51 (17.6)
	Separated/ divorced	5 (1.7)	9 (3.1)
	Widow	50 (17.2)	44 (15.2)
Education Level	Primary	93 (32.1)	86 (29.7)
	Secondary	132 (45.5)	127 (43.8)
	Tertiary	39 (13.4)	54 (18.6)
	Non-formal	26 (9.0)	23 (7.9)
Occupation	Public servants	24 (8.3)	33 (11.4)
	Artisans	21 (7.2)	23 (7.9)
	Trading/Business	105 (36.2)	99 (34.1)
	Farming	128 (44.1)	122 (42.1)
	Driving	10 (3.4)	8 (2.8)
	None	2 (0.7)	5 (1.7)
BMI (kg/m^2)	Underweight (<18.5)	7 (2.4)	5 (1.7)
	Normal (18.5-24.9)	126 (43.5)	126 (43.4)
	Overweight (25.0-29.9)	85 (29.3)	81 (27.9)
	Obese (30.0- 34.9)	53 (18.3)	61 (21.0)
	Severely Obese (≥ 35.0)	19 (6.6)	17 (5.9)

Influence of Socio-demographic Factors on undiagnosed HBP among Control Groups

Table 2 shows that for the control group, the baseline significant associating socio demographic factors of undiagnosed hypertension include age ($p< 0.0001$, $\chi^2=59.71$), marital status ($p < 0.0001$, $\chi^2 = 21.37$), and education level ($p < 0.0001$, $\chi^2=28.20$). The prevalence of undiagnosed hypertension was higher among those who were at least 60 years of age at 62.5%, followed by the 50 – 59 years at 48.4%. It was lowest among the 30 -39 years (9.3%) and the under 30s (9.5%).

The rate was higher among the widowed (63.6%) and the separated (55.6%) compared to the married (28.0%) and the singles (37.3%). Hypertension rate was lower among secondary education level (20.5%) and the tertiary education level (38.9%) groups compared to the rate among the primary level (48.8%) and the level for non formal education (65.2%).

Sex of the participants did not show significant association with undiagnosed hypertension but the rate was found to be relatively higher among males (45.8%) than among females (34.7%). Similarly occupation was not found significant in this study, but the rate for undiagnosed hypertension was high among drivers (50%) and public servants (48.5%).

Table 2: Influence of Socio-demographic Factors on Hypertension among the Control Group

Socio-demographic Factors	Total	Non-hypertensive		Hypertensive		Statistical Test	
		number	%	number	%	χ^2	p value
Age (in years)							
< 30	42	38	90.5	4	9.5		
30 – 39	54	49	90.7	5	9.3		
40 – 49	50	36	72.0	14	28.0		
50 -59	64	33	51.6	31	48.4		
60+	80	30	37.5	50	62.5		
Total	290	186	64.1	104	35.9	59.71	< 0.0001
Sex							
Male	120	65	54.2	55	45.8		
Female	170	111	65.3	59	34.7		
Total	290	176	60.7	114	39.3	3.651	0.056
Marital Status							
Married	186	134	72.0	52	28.0		
Single	51	32	62.7	19	37.3		
Separated / divorced	9	4	44.4	5	55.6		
Widowed	44	16	36.4	28	63.6		
Total	290	186	64.1	104	35.9	21.37	< 0.0001
Education Level							
Primary	86	44	51.2	42	48.8		
Secondary	127	101	79.5	26	20.5		
Tertiary	54	33	61.1	21	38.9		
Non-formal	23	8	34.8	15	65.2		
Total	290	186	64.1	104	35.9	28.20	< 0.0001
Occupation							
Public servants	33	17	51.5	18	48.5		
Artisans	23	17	73.9	6	26.1		
Trading/Business	99	73	73.7	26	26.3		
Farming	122	76	62.3	46	37.7		
Driving	8	4	50.0	4	50.0		
None	5	2	40.0	3	60.0		
Total	290	186	64.1	104	35.9	9.338	0.096

Influence of Socio-demographic Factors on undiagnosed HBP among the Intervention Group

Table 3 represents the baseline relationship between socio-demographic factors and undiagnosed hypertension for the intervention group. The baseline prevalence of hypertension was found to be increasing with age among the adults in Mbaitoli LGA. For those who were below 30 years, the prevalence was found to be 6.5%, and that increased to 14% and 34% respectively for the 30-39 years and the 40-49 years and reached 57.3% for the over 60 years subjects (Table 4b). The age was found as a significant factor of hypertension in this study ($p < 0.0001$, $\chi^2=97.21$).

The prevalence of hypertension in Mbaitoli LGA was found to be lower in males with 29.9% (35 of 117) compared to the females with 49.9% (69 of 1709). Sex was not found as a significant factor of hypertension in this study ($p = 0.082$, $\chi^2 =3.02$). The hypertension rate was found to be significantly higher ($p<0.0001$, $\chi^2 =36.0$) among married people at 31.6% compared to the rate for singles at 24.4%. The separated or divorced and the widowed recorded high prevalence of hypertension disease at 60.0% each.

The rate of occurrence of hypertension in Mbaitoli LGA increases with decrease in education level. The lowest prevalence obtained (25.6%) was found in people who attained tertiary education which increased to 26.5% for people who attained secondary education and 46.2% in people who have primary education respectively. The highest prevalence was found among people who have no formal education 61.5% (16 of 26). Clearly education level was established as a significant factor of hypertension ($p<0.0001$, $\chi^2=37.18$) in this study.

In terms of occupation among the people of Mbaitoli LGA, the prevalence of hypertension was highest among public servants at 45.8%, it was found to be 40.0% among drivers, and 38.3% among farmers. Traders/business people and 23.8% among artisans have prevalence of 33.3% and 23.8% respectively. However, occupation was not evidently established as a significant factor of hypertension in this study ($p<0.138$, $\chi^2 = 8.348$), hence the results obtained are likely to have occurred by chance (Table 3).

Table 3: Influence of Socio-demographic Factors on Hypertension among Intervention Group

Socio-demographic Factors	Total	Non-hypertensive		Hypertensive		Statistical Test	
		Number	%	number	%	χ^2	p value
Age (in years)							
< 30	46	43	93.5	3	6.5		
30 – 39	50	43	86.0	7	14.0		
40 – 49	53	35	66.0	18	34.0		
50 -59	59	30	50.8	29	49.2		
60+	82	35	42.7	47	57.3		
Total	290	186	64.1	104	35.9	97.21	< 0.0001
Sex							
Male	117	82	70.1	35	29.9		
Female	173	104	60.1	69	39.9		
Total	290	186	64.1	104	35.9	3.02	0.082
Marital Status							
Married	190	130	68.4	60	31.6		
Single	45	34	75.6	11	24.4		
Separated / divorced	5	2	40.0	3	60.0		
Widowed	50	20	40.0	30	60.0		
Total	290	186	64.1	104	35.9	36.00	< 0.0001
Education Level							
Primary	93	50	53.8	43	46.2		
Secondary	132	97	73.5	35	26.5		
Tertiary	39	29	74.4	10	25.6		
Non-formal	26	10	38.5	16	61.5		
Total	290	186	64.1	104	35.9	37.18	< 0.0001
Occupation							
Public servants	24	13	54.2	11	45.8		
Artisans	21	16	76.2	5	23.8		
Trading/Business	105	70	66.7	35	33.3		
Farming	128	79	61.7	49	38.3		
Driving	10	6	60.0	4	40.0		
None	2	2	100	0	0.0		
Total	290	186	64.1	104	35.9	8.35	0.138

Effects of Study Intervention on SBP and DBP Outcome Measures for undiagnosed Blood Pressure

Table 4 represents the effects of intervention on outcome measures such as Systolic blood pressure (SBP), diastolic blood pressure (DBP) and body mass index (BMI) for undiagnosed blood pressure.

For the control group, the mean outcomes only changed slightly from baseline to post-intervention. For instance, the mean SBP reduced from 143.2 mmHg at baseline to 142.7mmHg at post intervention, recording a mean difference of 0.5mmHg only. The mean differences from baseline to post-intervention were 1.2mmHg for DBP (87.7 to 86.5mmHg) and 0.4 kg/m^2 for BMI (27.1 to 26.7). No significant difference was found in mean between the baseline mean and the post intervention mean in the control group (P>0.05).

For the intervention group, it can be observe from the table that the SBP reduced from 141.5mmHg to 132.7mmHg (baseline to post intervention), while the mean DBP also reduced from 88.8mmHg to 80.1mmHg. Significant difference was established in this study in the mean SBP (P <0.0001, t=10.13) and the mean DBP (P<0.0001, t=26.35). Also, average the body mass index was found to have reduced to 24.6 kg/m^2 at post intervention for 26.7 kg/m^2 at baseline, and the difference was also found significant (P<0.0001, t=7.12). It therefore implies that the introduction of combined education, counseling and management strategies reduces the fear of consequences of undiagnosed hypertension-, when properly implemented.

Table 4. Effects of Study Intervention on Blood Pressure Outcome Measures

Outcome measure	Baseline mean (SD)	Post-Intervention mean (SD)	Mean difference (Post –Baseline)	*T*	*P*
Control Group					
Systolic blood pressure, mm Hg	143.2 (9.8)	142.7 (9.5)	−0.5	1.85	0.065
Diastolic blood pressure, mm Hg	87.7 (7.1)	86.5 (6.9)	−1.2	1.68	0.093
BMI, (kg/m^2)	27.1 (3.7)	26.7 (3.6)	−0.4	1.32	0.187
Intervention Group					
Systolic blood pressure, mm Hg	141.5 (11.8)	132.7 (8.9)	−8.8	10.13	<0.001
Diastolic blood pressure, mm Hg	88.8 (7.2)	80.1 (5.5)	−8.7	26.35	<0.001
BMI, (kg/m^2)	26.7 (3.6)	24.6 (3.5)	−1.9	7.12	<0.001

Note: Independent sample t-test was conducted at 5% level of significance

Study Pre and Post Intervention Classification of Hypertension among intervention group

Considering that significant effect was found on the intervention group, a further classification of the level of undiagnosed hypertension found among adults in Mbaitoli LGA at intervention group is shown on Table 5. Among the hypertensive subjects found at pre-intervention, 48 (47.6%) have stage 1 hypertension, 33 (34.1%) have stage 2 hypertension while 18 (18.3%) have severe or urgency hypertension. At post-intervention, more than half of the undiagnosed hypertension found in the study occurred at the first stage of the disease (stage1= 56%, stage 2 =29.6%, stage 3= 14.3%). Statistical test indicates that significant difference was found between the two blood pressure measures (P<0.0001, Chi-square (χ^2)=18.46), which indicates that the intervention was found significant in BP reduction for the undiagnosed hypertension.

Table 5: Baseline and Post-intervention High Blood Pressure Classification among Adults in Mbaitoli LGA

SBP (DBP) Status	Undiagnosed Hypertension Class	Baseline	Post Intervention-
≥ 140 <160 (≥ 90 <100)	Stage 1 HBP	48 (47.6%)	51 (56.0%)
>160<180 (> 100< 110)	Stage 2 HBP	33 (34.1%)	27 (29.6%)
>180 (>110)	Severe or Urgency Hypertension	18 (18.3%)	13 (14.3%)
Total		104 (100%)	91(100%)
Statistical Test		P=0.0000, Chi-square (χ^2)=18.46	

Discussion

In this study, significant socio-demographic risk factors of baseline hypertension were age, marital status, and education. The correlation of socio-demographic factors in relation to hypertension has been described in previous studies and positive association has been established with many of the factors [14]. In terms of age, undiagnosed hypertension was found higher among the older age group than among the younger age which is not a surprise considering that older adults are always affected more with risk factors of hypertension. This finding is consistent with [15] for which undiagnosed hypertension was found to be associated with increasing age (OR:1.02, CI:1.01–1.03), Also [16] found greater risk of hypertension (up to 3:1) among the 55years old compared to the 18 -34 years of age (AOR = 3.14, 95% CI = 1.51–6.52).However, a study in England found that younger adults were most likely to have undiagnosed hypertension. It therefore implies the actual effects of age to undiagnosed hypertension could be challenging to the population under study.

Marital status of the participants was also found as a significant factor for undiagnosed hypertension which was also significant with another study finding in Nigeria [4], but found higher prevalence of hypertension among the married than among the divorced / widowed, which is inconsistent with this study. Similar to this study, education was also found as a significant factor of hypertension [7]. The less educated was found with greater risk of hypertension which showed consistent with another Nigerian study finding [15]. These relationships are important because socio demographic factors such as the marital status of the patients, body mass index and family history of hypertension been reported to have shown effects on knowledge about hypertension [2]

In the present study, undiagnosed hypertensive rate was higher in females than in males though sex was not an established significant factor of hypertension in this study. undiagnosed hypertensive rate was also higher among females than the rate among males, which appeared consistent with the findings of this study. This could be possible considering that males are more likely to spend on health insurance than females. On the contrary [16], found hypertensive rate to be higher among males than the rate among females, but similar to this study finding, sex was also not an established significant factor of hypertension in [17]. It has also been argued that females tend to attend to their health needs or respond to health calls quicker than males [18]. However, the sex difference in hypertensive rate could be as a result of population differences and calls for more gender associated undiagnosed hypertension studies. Occupation was a significant risk factor of undiagnosed hypertension [19] but was not found significant in this study.

The study demonstrated the effectiveness of combined health education, counseling and BP management intervention on outcome measures such as Systolic blood pressure (SBP), diastolic blood pressure (DBP) and body mass index (BMI) for undiagnosed blood pressure. The study yielded significant effects in mean reduction in SBP, DBP and BMI at post intervention. This finding is consistent with the reported finding on the impact of education and counseling on SBP, DBP and BMI [20] Therefore the study has succeeded in making an addition to the growing evidence on the effectiveness of interventions using health education and counseling strategies in hypertension prevention and control in especially for low-income countries.

The study also demonstrated the effectiveness of combined health education interventions in knowledge about undiagnosed hypertension and hypertension preventive practices.

Conclusion

The results in this study showed that many adults in the society are still vulnerable to hypertension and adequate knowledge about hypertension as relates to meaning, risk factors, complications and lifestyle adjustment preventive strategies is still lacking among adults especially in the community level The knowledge could be improved with educational support intervention to reduce the burden of hypertension.

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