Impact of Health Education Intervention On Knowledge And Prevalence Of Hypertension Among Market Traders In Southeast Nigeria

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Abstract

Background: Hypertension is a leading cause of morbidity and mortality in adult populations due to complications arising from late detection and poor blood pressure control. Health education has been proven to be an effective strategy in prevention and control of hypertension. However, its effectiveness among informal sector workers is under-explored. This study assessed the effect of health education on knowledge of hypertension and its prevalence among market traders in Southeast Nigeria.

Methods: The study was conducted in Abakaliki, Ebonyi State Southeast Nigeria using a non-randomized experimental study design comprising an intervention arm and a control arm. Systematic random sampling was used to select 376 adult market traders into the study. Baseline data were collected on participants' knowledge of hypertension using pretested structured interviewer-administered questionnaire and on their blood pressure status. The intervention group received health education on risk factors, complications, treatment, prevention and early detection of hypertension, while the control group did not. A post-study assessment was carried out after six months using the same study instruments. Bi-variate and multivariate analyses were carried out and statistical significance was set at $p < 0.05$

Results: The proportion of traders in the intervention group with good knowledge of hypertension increased from 20.7% to 80.7% post intervention ($p < 0.001$); the difference in the control group was not statistically significant. Prevalence of hypertension decreased by 9.8% ($p < 0.001$) from the baseline value of 38.8% in the intervention group but increased in the control group. Predictors of hypertension included having good knowledge of hypertension (AOR: 0.4; CI: 0.2-0.9), being ≥ 40 years (AOR: 2.9; CI: 1.3-6.4), and being single or unmarried (AOR: 2.4; CI: 1.1–5.9)

Conclusions: Blood pressure education intervention was effective in improving knowledge of hypertension and reducing prevalence of hypertension. This demonstrates the need to regularly educate market traders on the risk factors, complications, treatment, prevention and early detection of high blood pressure.

Background

Hypertension, also known as high blood pressure affects a significant adult population worldwide and is gradually assuming epidemic dimensions in sub-Saharan Africa with the dawn of demographic and epidemiologic transition.¹ For a while, hypertension was associated with economic development and so regarded as diseases of the rich, but is now seen to cut across socio-economic status affecting even the poorest countries of the world. Hypertension has been attributed in part to lifestyle changes such as urbanization which has been implicated for levels of stress and loss of family cohesion,^{2,3} and adoption of western lifestyle in form of diet and physical inactivity.^{3,4} Various factors have been linked to hypertension including rapid population growth, occupation,^{1,5} and lifestyle habits such as obesity, high-sodium and fat diets, tobacco use, alcohol consumption and sedentary lifestyle.^{6–8}

Hypertension affects nearly 26 percent of the adult population worldwide.¹ It is the most common cardiovascular disorder, causing approximately 7.1 million deaths annually and is ranked third as a cause of loss of disabilities adjusted life years (DALYs).¹ The burden of high blood pressure (HBP) in Africa is substantial¹ and high prevalence of hypertension has been reported in many studies in Nigeria.^{9,10} Hypertension

leads to substantial morbidity and mortality due to the associated wide range of complication including coronary artery disease, stroke, congestive heart failure and peripheral vascular diseases.³ It has been associated with high economic and healthcare cost due to expensive and prolonged treatment and hospitalization associated with its complications.^{3,11} Furthermore, pre-hypertension has emerged as an independent risk factor for cardiovascular diseases with associated increase in all-cause and cardiovascular mortality.³

A major challenge in addressing the health of workers in Africa is that they are mostly engaged in informal sector without adequate access to structured occupational health programmes and services; notwithstanding the United Nations Political Declaration on non-communicable diseases (NCDs) for private sector to promote enabling, safe and healthy working environment for workers⁹ Market traders are high-risk individuals for hypertension. This is because their work is mostly sedentary as they spend most hours of the day sitting down and often depend on salt-laden fast food while at work,^{9,10} and the busy nature of their work predisposes them to lots of stress and inadequate access to health care.⁴ Fortunately, studies have shown that health education strategy contributed to improved cardiac knowledge, adherence to lifestyle changes and medication and led to reduction in prevalence of hypertension among in groups.^{12,13} Also, Health-Belief-Model suggests understanding peoples' knowledge about disease as crucial means of understanding observed behaviours and guiding behavioural change.¹² Thus targeting traders with such health programme will help to reduce health disparities and contribute to the social, economic and welfare of the community at large.

Prevalence data are crucial for understanding the magnitude of a health condition, yet, insufficient data especially population-based data on hypertension among informal sector are still prevailing in Nigeria including Ebonyi State.⁷ More worrisome is that a significant number of hypertension are detected incidentally when admitted to hospital for unrelated diseases, and most consultations are with private health care practitioners where and patient education on risk factors and regular screening is rarely practiced.¹⁴ As early detection of chronic diseases impacts positively on the complication outcome, community based screening as opposed to clinic based screening can lead to large proportion of those affected being detected, allow for prompt intervention and avert complication outcomes. The study aimed to determine the effect of blood pressure education intervention on knowledge and prevalence of hypertension among adult market traders in Abakaliki, Nigeria

Methods

Study Area and study population

The study was carried out in Abakaliki Ebonyi State, located in Southeast Nigeria. The State has a population of 2,179,947 million based on the 2006 population census with annual growth rate of 2.82%.; 48% of the population are aged 18 years and above.¹⁵ Ebonyi State occupies a land mass of 5,932 km² and divided into three Senatorial zones with thirteen local government areas (LGA). Health services are provided through public health facilities organized into tertiary (2), secondary (13) and primary health centers (431), as well as private hospitals including missionary hospitals that are engaged in public private partnership with the State. Majority of residents of Abakaliki are traders, artisans and some civil servants.

There are fourteen registered markets comprising both general goods (8) and industrial (6) in Abakaliki metropolis. The general good markets house many stalls where varieties of goods are sold. Abakpa main market purposively selected as the intervention site is the oldest and largest general good market where both wholesale and retail trading is carried out. The market has 83 well-demarcated lines and 2922 serially numbered shops; each shop owned by one person who might run it alone or engage others as paid sales-persons or unpaid apprentices. The traders compulsorily belong to welfare association with 2837 registered members. They operate a cooperative/thrift organization with voluntary monthly contribution. The market is busy and runs from Monday through Saturday with traders transacting in their stalls and rarely required to move out in search of buyers or products to sell. There is a private hospital located close to the market- about a kilometer (km) away, which render primary care with 24hours service coverage. The Regional market selected as the control site is a general goods market located about 150 km away from the intervention site and has about 750 lock-up shops as well as large undeveloped open space for trading. The traders have an association formed by the registered members and run a welfare scheme. The market has a primary health centre located about 2 km to it.

The study population comprised of market traders from the two selected markets in Abakaliki metropolis. Those that qualified for inclusion into the study were adult market traders, that were registered members of the traders' association and gave informed consent to participate. Those excluded from the study were known hypertensive patients, currently on hypertension medication/treatment and pregnant women.

Study design and sampling

The study was a non-randomized experimental study with a control arm conducted in three phases: baseline survey, intervention and post-intervention survey.

The sample size of 144 was determined using the formula for comparing two independent proportions¹⁶ at standard normal deviate of 5%, level of significance 1.96, power 80%, and p1 and p2 of 11.8% and 3.0% (change in proportion of subjects with hypertension in intervention group and control group respectively).¹² This was doubled to account for two independent proportions analysis, adjusted to account for 10% attrition and further increased to 376 for robustness.

Systematic random sampling was used to recruit the eligible participants into the study. The list of the shops was used as sampling frame. Sampling interval was calculated as total number of shops (2922 and 750 for the intervention and control arm respectively) divided by calculated sample size (188); which gave 15 for the intervention arm and 4 for the control arm. The random start was determined by balloting from the first 15 and 4 shops in the intervention and control arm respectively. One eligible trader was recruited from each shop. Where there was more than one eligible trader, simple random sampling by balloting was used to select one participant.

Data collection methods

Preliminary activities

Advocacy visit was paid to the leadership of both markets to communicate the rationale for the study and seek their cooperation. Research assistants comprising of four resident doctors and four community health extension workers (CHEWs) were trained by the researcher on eligibility criteria, administering questionnaire, protocol for blood pressure (BP) measurement¹² and accurate recording of data using lectures and demonstrations.

Pretesting of the study instruments was carried out on twenty randomly selected persons in a non-participating market to check for validity and the questionnaires were modified based on observations.

Baseline survey

Baseline data was collected from both the intervention and control group using the structured questionnaires administered by CHEWs and blood pressure measurement by resident doctors, after getting written informed consent from the participants. Data collection was carried out in participants' shops to suit their convenience and reduce disrupting of their trading activities. English and Igbo language (where necessary) were used to communicate

Questionnaire

A structured questionnaire modified from a previous study¹⁷ which comprised of 7 items and 32 sub-questions was used to assess hypertension awareness, source of information and knowledge of hypertension. Questions (four items with twenty-four question options) on participants' ability to correctly identify the risk factor, complication, treatment and prevention of hypertension were used to assess knowledge level. Incorrect statements were coded inversely to the items. Participants were required to choose from among options; 'Yes' and 'No'. Each correct answer was scored 1 point and incorrect answer was scored 0 point.¹⁷ The maximum score was 24 and this was converted to percentage score and used for grading knowledge. Percentage score less than 50% was graded as poor knowledge and scores of 50% and above were graded as good knowledge.¹²

Blood pressure measurement

Two blood pressure (systolic and diastolic) measurements were taken from the arm (non-dominant hand) using mercury sphygmomanometer. The systolic blood pressure was taken as the first Korotkoff sound (phase 1) and diastolic blood pressure recorded at the disappearance of the sounds (phase 5).¹⁰ The first measurement was taken after the participant had rested for at least 10 min in a sitting position with the arm rested on a table such that the middle of the forearm was about the level of the heart. The second measurement was taken at the end of the interview. The mean of the 2 readings was used in the analysis to prevent error due to subject variation. Hypertension was defined as systolic blood pressure ≥ 140 mm Hg and/or diastolic blood pressure ≥ 90 mm Hg at two or more measurements¹⁸ and used to categorize blood pressure status as normal, pre-hypertension and hypertension.

Post-intervention survey

Six months after the intervention, data was collected from intervention and control groups with the same instruments used at baseline and by the same research assistants to prevent inter-observers' error. The post intervention survey aimed to assess changes in the variables (hypertension knowledge and blood pressure status) in both groups from the baseline values.

Intervention

After baseline data collection, blood pressure education was conducted for the intervention group by the researcher through lectures, leaflets and demonstrations. The lecture modules which was adapted from blood

pressure educational material¹⁸ contain i) comprehensive information on hypertension including risk factors, complication, treatment, ii) prevention/lifestyle modification practices such as weight reduction, reduced salt intake, alcohol reduction, increase fruits and vegetable consumption, quit smoking, regular physical activity, stress reduction and regular blood pressure monitoring. Also, self-blood pressure measurement was demonstrated. At the end of the program, the participants were expected to have better knowledge about hypertension and correct all myths and misconceptions, know how to modify risk behaviour, and carry out self-blood pressure measurement. Participants were divided into two groups for the programme which lasted for 5 hours and was repeated a second day for reinforcement. The intervention was communicated in English and Igbo and was conducted in the market hall to enable the traders fully participate.

Data analysis

Following data cleaning, 183 and 180 questionnaires were completely filled and appropriate for analysis giving response rate of 97.4% and 95.8% for the intervention and control arm respectively. Computer data processing was done using IBM Statistical Package for Social Sciences (SPSS) version 21 statistical software package. Frequency distribution tables were constructed and cross tabulations done to examine relationship between variables. Quantitative variables were presented as the mean and standard deviation and qualitative variables summarized as frequencies and proportions. To test for association, independent student t-test and paired t-test were used for comparison of mean differences between groups and within groups respectively. Chi square-test and McNemar test were used for comparison of differences in proportions between groups and within groups respectively. The level of statistical significance was set at $p < 0.05$ and confidence level at 95%. Variable from bivariate analysis with $p < 0.20$ were included in the logistic regression model to ascertain the predictors of hypertension.

Ethical consideration

Ethical approval was obtained from Research and Ethics committee (REC) of Federal Teaching Hospital Abakaliki (FETHA) Ebonyi State, Nigeria and Ebonyi State Ministry of Health Abakaliki. Permission was gotten from the leadership of the traders' associations. Participation was voluntary/optional and respondents were made to know that, and that they were at liberty to decline to participate or withdraw from the study with no consequences to them. Written informed consent was obtained after thorough explanation was given and understanding established. Confidentiality was assured to participants. Personal identifiable information like name were not captured except for information needed for identification of participants such as shop address and phone numbers and were coded accordingly for reference purposes. Participants were screened free. Participants in the control group were given health education on hypertension at the end of the study and the blood pressure status were addressed as observed.

Results

The finding of the showed that the mean age of respondents in the intervention group was 43.5 ± 14.3 years and 40.8 ± 14.6 years in the control group. There were more males in both groups 51.6% in the intervention group and 61.2% in the control group. Majority of the respondents in the intervention group (69.1%) and the control group (63.3%) were married. The respondents mostly had secondary education; 55.3% for the intervention group and 60.6% for the control group. Both groups are comparable for socio-demographic characteristics.

All the respondents in both groups have heard about hypertension giving awareness rate of 100%. The commonest source of information for both groups was the electronic media; radio was 34% and 43.6% for the intervention and control group respectively and television was 27.7% and 28.2% for intervention and control group respectively.

Table 1 shows that at baseline, the proportion that correctly identified any of the hypertension knowledge variables was low (< 50%). At post intervention stage, the proportion significantly increased (> 70%) in the intervention group compared to the control group ($p < 0.01$).

Table 1
Between group comparison of knowledge of hypertension before and after intervention

Between group comparison of knowledge of hypertension before and after intervention						
	Baseline			After intervention		
Variable	Intervention group	Control group	χ^2 test (p-value)	Intervention group	Control group	χ^2 test (p-value)
	N = 188	N = 188 n (%)		N = 183	N = 180	
	n (%)			n (%)	n (%)	
Risk factor						
Overweight /obesity	77(41.0)	77(41.0)	0.00(1.00)	148(80.9)	78(43.3)	54.42(<0.001)*
Smoking	87(46.3)	89(47.3)	0.43(0.83)	158(86.3)	89(49.4)	56.80(<0.001)*
Excessive alcohol	86(45.7)	80(42.6)	0.38(0.53)	149(81.4)	68(37.8)	71.88(<0.001)*
Diet high in fat	74(39.4)	62(33.0)	1.65(0.19)	140(76.5)	68(37.8)	55.61(<0.001)*
Increasing age	72(38.3)	62(33.0)	1.15(0.28)	156(85.2)	72(40.0)	79.52(<0.001)*
Stress	101(53.7)	86(45.7)	2.39(0.12)	159(86.9)	96(53.3)	48.87(<0.001)*
Family history of HBP	76(40.4)	83(44.1)	0.53(0.46)	144(78.7)	91(50.6)	31.46(<0.001)*
HBP is communicable	43(22.9)	47(25.0)	0.23(0.63)	143(78.1)	47(26.1)	98.48(<0.001)*
Complication						
Stroke	47 (25.0)	50 (26.6)	0.12(0.72)	144 (78.7)	54 (30.0)	86.76 (<0.001)*
Heart failure	45 (23.9)	54 (28.7)	1.11(0.29)	119 (65.0)	56 (31.1)	41.80 (<0.001)*
kidney disease	73 (38.8)	82 (43.6)	0.88(0.34)	144 (78.7)	79 (43.9)	46.38 (<0.001)*
Eye disease	71 (37.8)	76 (40.4)	0.27(0.59)	165 (90.2)	78(43.3)	87.92 (<0.001)*
Symptomless	31 (16.5)	45 (23.9)	3.23(0.07)	154(84.2)	39(21.7)	124.29(<0.001)*
Sudden death	43 (22.9)	46 (24.5)	0.13(0.71)	120 (65.6)	42 (23.3)	65.52 (<0.001)*
Treatment						

*Statistical significance (p <0.05)

	Baseline			After intervention		
HBP requires lifelong treatment	108(57.4)	96(51.1)	1.54(0.21)	131(71.6)	106(58.9)	6.45(0.01)*
Lifestyle modification is a treatment option	96(51.1)	82(43.6)	2.09(0.14)	140(76.5)	84(46.7)	34.18(<0.001)*
Medication is taken in absence of symptoms	55(29.3)	71(37.8)	3.05(0.08)	133(72.7)	57(31.7)	61.18(<0.001)*
Prevention						
Regular physical exercise	53(28.2)	62(33.3)	1.02(0.31)	135(73.8)	69(38.3)	46.29(<0.001)*
Maintain healthy weight	56(29.8)	59(31.4)	0.11(0.73)	127(69.4)	63(35.0)	43.04(<0.001)*
Avoid or quit smoking	56(29.8)	53(28.2)	0.11(0.73)	136(74.3)	55(30.6)	69.70(<0.001)*
Alcohol reduction	48(25.5)	62 (33.0)	2.51(0.11)	137(74.9)	68(37.8)	50.77(<0.001)*
Salt reduction	133(70.7)	129(68.6)	0.20(0.65)	180(98.4)	156(86.7)	18.02(<0.001)*
Eat fruits and vegetables regularly	40(21.3)	54(28.7)	2.78(0.09)	166(90.7)	59 (32.8)	129.24(<0.001)*
Regular BP check	62(33.0)	71(37.8)	0.94(0.33)	143(78.1)	71(39.4)	56.15(<0.001)*
*Statistical significance (p <0.05)						

Table 2 shows that the proportion of respondents with knowledge of hypertension significantly increased in all the variables at post intervention stage ($p < 0.001$) among the intervention group compared to the control group which had significant increase in only two preventive measure, salt reduction ($p < 0.001$) and regular BP check ((0.02).

Table 2
Comparative assessment of respondents' knowledge of hypertension within group

Variable	Intervention group			Control group		
	Pre inter vention N = 188 n (%)	Post inter vention N = 183 n (%)	Percentage difference (p-value)^	Beginning of study N = 188 n (%)	End of study N = 180 n (%)	Percentage difference (p-value)
Risk factor						
Overweight /obesity	77(41.0)	148(80.9)	30.9(<0.001)*	77(41.0)	78(43.3)	2.3(0.74)
Smoking	87(46.3)	158(86.3)	40.0(<0.001)*	89(47.3)	89(49.4)	2.1(0.81)
Excessive alcohol	86(45.7)	149(81.4)	35.7(<0.001)*	80(42.6)	68(37.8)	-4.8(0.36)
Diet high in fat	74(39.4)	140(76.5)	37.1(<0.001)*	62(33.0)	68(37.8)	4.8(0.32)
Increasing age	72(38.3)	156(85.2)	46.9(<0.001)*	62(33.0)	72(40.0)	7.0(0.20)
Stress	101(53.7)	159(86.9)	33.2(<0.001)*	86(45.7)	96(53.3)	7.6(0.21)
Family history of HBP	76(40.4)	144(78.7)	38.3(<0.001)*	83(44.1)	91(50.6)	6.5(0.32)
HBP is communicable	43(22.9)	143(78.1)	55.2(<0.001)*	47(25.0)	47(26.1)	1.1(0.80)
Complication						
Stroke	47(25.0)	144(78.7)	53.7(<0.001)*	50(26.6)	54(30.0)	3.4(0.45)
Heart failure	45(23.9)	119(65.0)	41.1(<0.001)*	54(28.7)	56(31.1)	2.4(0.78)
kidney disease	73(38.8)	144(78.7)	39.9(<0.001)*	82(43.6)	79(43.9)	0.3(0.89)
Eye disease	71(37.8)	165(90.2)	52.4(<0.001)*	76(40.4)	78(43.3)	2.9(0.58)
Symptomless	31(16.5)	154(84.2)	67.7(<0.001)*	45(23.9)	39(21.7)	-2.2(0.22)
Sudden death	43 (22.9)	120(65.6)	42.7(<0.001)*	46 (24.5)	42 (23.3)	-1.2(1.00)
Treatment						
^McNemar test *Statistical significance (p < 0.05)						

	Intervention group			Control group		
Hypertension requires lifelong treatment	108(57.4)	131(71.6)	14.2(<0.001)*	96(51.1)	106(58.9)	7.8(0.76)
Lifestyle modification is a treatment option	96(51.1)	140(76.5)	25.4(0.002)*	82(43.6)	84(46.7)	3.1(0.11)
Medication is taken in absence of symptoms	55(29.3)	133(72.7)	43.4(<0.001)*	71(37.8)	57(31.7)	-6.1(0.06)
Prevention						
Regular physical activity	53(28.2)	135(73.8)	45.6(<0.001)*	62(33.3)	69(38.3)	5.0(0.18)
Maintain healthy weight	56(29.8)	127(69.4)	39.6(<0.001)*	59(31.4)	63(35.0)	3.6(0.45)
Avoid or quit smoking	56(29.8)	136(74.3)	44.5(<0.001)*	53(28.2)	55(30.6)	2.4(0.73)
Alcohol reduction	48(25.5)	137(74.9)	49.4(<0.001)*	62(33.0)	68(37.8)	4.8(0.40)
Salt reduction	133(70.7)	180(98.4)	27.7(<0.001)*	129(68.6)	156(86.7)	18.1(<0.001)*
Eat fruits/vegetables regularly	40(21.3)	166(90.7)	69.4(<0.001)*	54(28.7)	59(32.8)	4.1(0.41)
Regular BP check	62(33.0)	143(78.1)	45.1(<0.001)*	71(37.8)	71(39.4)	1.6(0.02)*
^McNemar test *Statistical significance (p < 0.05)						

Table 3 shows the knowledge grade of hypertension among the studied sample. At baseline, the proportion of respondents with overall good knowledge was low; 20.7% and 23.4% for the intervention and control group respectively. After intervention, a significantly higher proportion of respondents in the intervention group (84.7%) had overall good knowledge ($p < 0.001$) compared to the control group (25.6%). Good knowledge of the discrete variables of hypertension- risk factors, complication, treatment and prevention also significantly increased in the intervention group ($p < 0.01$).

Table 3
Between group comparison of knowledge grade for hypertension before and after intervention

Knowledge grade for hypertension	At Baseline			After Intervention		
	Intervention group	Control group	χ^2 test (p-value)	Intervention group	Control group	χ^2 test (p-value)
	N = 188 n (%)	N = 188 n (%)		N = 183 n (%)	N = 180 n (%)	
Risk factor						
Good knowledge	78(41.5)	61(32.4)	3.29(0.06)	140(76.5)	65(36.1)	60.22(<0.001)*
Poor knowledge	110(58.5)	127(67.6)		43(23.5)	115(63.9)	
Complication						
Good knowledge	31(16.5)	42(22.3)	2.05(0.15)	116(63.4)	46(25.6)	52.55(<0.001)*
Poor knowledge	157(83.5)	146(77.7)		67(36.6)	134(74.4)	
Treatment						
Good knowledge	71(37.8)	61(32.4)	1.17(0.28)	124(67.8)	67(37.2)	33.94(<0.01)*
Poor knowledge	117(62.2)	127(67.6)		59(32.2)	113(62.8)	
Prevention						
Good knowledge	55(29.3)	55(29.3)	0.00(1.00)	135(73.8)	58(32.2)	62.91(<0.001)*
Poor knowledge	133(70.7)	133(70.7)		48(26.2)	122(67.8)	
Overall knowledge						
Good knowledge	39 (20.7)	44 (23.4)	0.38(0.53)	155 (84.7)	46 (25.6)	128.45(<0.001)*
Poor knowledge	149(79.3)	144(76.6)		28(15.3)	134(74.4)	
Mean percentage score						
Mean percentage score $\pm$ SD	36.6 $\pm$ 13.5	37.2 $\pm$ 14.2	[^] 0.42(0.67)	77.7 $\pm$ 18.0	37.5 $\pm$ 14.6	[^] 23.38(<0.001)*
Poor Knowledge (<50%); Good Knowledge ($\geq$ 50%); [^] t-test; *Statistical significance						

Table 4 shows that after the intervention, the proportion of respondents with overall good knowledge increased significantly by 66.0% among the intervention group ($p < 0.001$) compared to control group. Also, the proportion of participants with good knowledge of discrete components of hypertension (risk factors, complication, treatment and prevention) increased significantly in intervention group ($p < 0.001$) and not in the control group.

The mean percent score of 36.6 ± 13.5 at baseline increased significantly to 77.7 ± 18 in the intervention group at post intervention stage ($p < 0.001$) but no significant change was noted in the control group.

Table 4
Comparative assessment of respondents' knowledge grade of hypertension within groups

Intervention group				Control group		
Knowledge grade for hypertension	Pre intervention N = 188 n (%)	Post intervention N = 183 n (%)	Percentage difference (p-value for McNemar test)	Beginning of study N = 188 n (%)	End of study N = 180 n (%)	Percentage difference (p-value for McNemar test)
Risk factor						
Good	78(41.5)	140(76.5)	35.0(< 0.001)*	61(32.4)	65(36.1)	3.7(0.503)
Poor	110(58.5)	43(23.5)		127(67.6)	115(63.9)	
Complication						
Good	31(16.5)	116(63.4)	46.9(< 0.001)*	42 (22.3)	4 (25.6)	3.3(0.063)
Poor	157(83.5)	67(36.6)		146(77.7)	134(74.4)	
Treatment						
Good	71(37.8)	124(67.8)	30.0(< 0.001)*	61(32.4)	67(37.2)	4.8(0.167)
Poor	117(62.2)	59(32.2)		127(67.6)	113(62.8)	
Prevention						
Good	55(29.3)	135(73.8)	44.5(< 0.001)*	55(29.3)	58(32.2)	2.9(0.608)
Poor	133(70.7)	48(26.2)		133 70.7)	122(67.8)	
Overall knowledge						
Good	39(20.7)	155(84.7)	64.0(< 0.001)*	44 (23.4)	46 (25.6)	2.2(0.815)
Poor	149(79.30)	28(15.3)		144 (76.6)	134 (74.4)	
Mean percentage score						
Mean percentage score $\pm$ SD	36.6 ± 13.5	77.7 ± 18.0	$^{\wedge}22.8(< 0.001)^*$	37.2 ± 14.2	37.5 ± 14.6	$^{\wedge}0.2(0.812)$
Poor Knowledge (<50%); Good Knowledge ($\geq 50\%$); *Statistical significance; $^{\wedge}$ Paired t-test						

Table 5 shows that the proportion of participants that have hypertension at baseline is 38.8% and 36.3% in the intervention and control group respectively. This proportion decreased in the intervention group but increased in the control group after the intervention.

Table 5

Between group comparison of blood pressure status of respondents before and after the intervention

Variable	Baseline			After intervention		
	Intervention group	Control group	χ^2 test (p-value)	Intervention group	Control group	χ^2 test (p-value)
	N = 188	N = 188		N = 183	N = 180	
	n (%)	n (%)		n (%)	n (%)	
Blood Pressure status						
Normal	81(43.1)	88(46.8)	0.52(0.76)	93(50.8)	77(42.8)	4.45(0.10)
Pre-hypertensive	34(18.1)	32(17.0)		37(20.2)	32(17.8)	
Hypertensive	73(38.8)	68(36.2)		53(29.0)	71(39.4)	
Mean blood pressure						
Mean systolic BP (mmHg) $\pm$ SD	135.0 $\pm$ 20.5	131.7 $\pm$ 17.2	[^] 1.66(0.09)	130.3 $\pm$ 18.4	132.8 $\pm$ 17.2	[^] 1.32(0.18)
Mean Diastolic BP (mmHg) $\pm$ SD	82.8 $\pm$ 13.7	80.7 $\pm$ 12.9	[^] 1.47(0.14)	80.6 $\pm$ 11.9	81.2 $\pm$ 12.6	[^] 0.46(0.64)
*Statistical significance (p < 0.05); [^] t-test, BP blood pressure; SD standard deviation						

Table 6 shows that after the intervention, the proportion of participants with hypertension decreased significantly by 9.8% (p < 0.001) but increased in the control group although not statistically significant. Also, among the intervention group, the mean systolic and diastolic blood pressure decreased significantly (p < 0.05) after the intervention. In contrast, there was a statistically significant increase in mean systolic blood pressure in the control group.

Table 6
Comparative assessment of blood pressure status of participants within groups

Intervention group				Control group		
Variable	Pre-intervention N = 188 n (%)	Post-intervention N = 183 n (%)	Percentage difference (p-value for McNemar test)	Beginning of study N = 188 n (%)	End of study N = 180 n (%)	Percentage difference (p-value for McNemar test)
Blood Pressure status						
Hypertensive	73(38.8)	53(29.0)	9.8(< 0.001)*	68(36.2)	71(39.4)	3.2(0.06)
Non-hypertensive	115(61.2)	130(71.0)		120(63.8)	109(60.6)	
Mean blood pressure						
Mean Systolic BP(mmHg) ± SD	135.0 ± 20.5	130.3 ± 18.4	^4.75(< 0.001)*	131.7 ± 17.2	132.8 ± 17.2	^1.18(0.01)*
Mean Diastolic BP(mmHg) ± SD	82.8 ± 13.7	80.6 ± 11.9	^2.24(0.002)*	80.7 ± 12.9	81.2 ± 12.6	^0.55(0.16)
*Statistical significance (p < 0.05) ^Paired t-test; BP blood pressure; SD standard deviation						

Table 7 shows that the odds of having hypertension was 2.85 times higher in participants 40 years and above when compared to those below 40 years, 2.43 times higher in single participants compared to married participants, and 2.64 less likely among participants with good knowledge of hypertension when compared to those with poor knowledge.

Table 7
Logistic regression of factors associated with hypertension among intervention group at post intervention

Intervention				Logistic regression	
Variable	HBP	Normal BP	(p-value) for χ^2 test	Adjusted OR	95% CI
Age group					
≥ 40 years	40(40.4)	59(59.6)	< 0.001*	2.9	1.281–6.359*
< 40 years	13(15.5)	71(84.5)		1	
Gender					
Male	30(31.6)	65(68.4)	0.41	NA	
Female	23(26.1)	65(73.9)			
Marital status					
Single	8(14.0)	49(86.0)	0.003*	2.4	1.003–5.885*
Married	45(35.7)	81(64.3)		1	
Educational status					
<secondary	20(36.4)	35(63.6)	0.14	0.9	0.458–2.088
≥secondary	33(25.8)	95(74.2)		1	
Knowledge of HBP					
Good	40(25.8)	115(74.2)	0.02*	0.38	0.159–0.903*
Poor	13(46.4)	15(53.6)		1	
*Statistical significance (p< 0.05); OR Odds Ratio; NA variable with p-value >0.2 not included in logistic model					

Discussion

Prevalence of hypertension is high due to late detection and poor blood pressure control, with the resultant complications leading to high morbidity and mortality among adult population. As informal sectors like traders have insufficient access to structured health services, exploring the effectiveness of blood pressure education on knowledge of hypertension and blood pressure status is timely. Using a non-randomised experimental study design, this study assessed the effect of health education on knowledge and prevalence of hypertension among market traders in Abakaliki Ebonyi State, Southeastern Nigeria.

This study found that low proportion (one fifth) of the participants in the intervention and control group had overall good knowledge of hypertension at the beginning of the study. Knowledge of specific domains of hypertension like risk factors, complications, treatment and prevention was also low. This finding is comparable to similar studies of traders in Imo State Nigeria,¹⁹ and in sub-urban community of Auchi Edo State Nigeria²⁰ and Egypt²¹ where comprehensive knowledge was lacking. The poor knowledge may be due to limited access to

adequate health information as most informal sectors lack structured occupational health services.¹¹ Interestingly, all the participants had heard about hypertension (awareness rate of 100%) which can be explained by the high proportion of participants that have at least a secondary education, and coupled with the fact that the study was carried out in urban setting where effect of electronic media-their main source of information is better felt. Unfortunately, the high awareness did not reflect on their level of knowledge; meaning that awareness alone does not imply knowledge.

After the blood education intervention, a significant increase was noted in the mean knowledge score and in the proportion of participants with overall good knowledge of hypertension in the intervention group (64% increase) but not in the control group. This finding is in concordance with a quasi-experimental study conducted in Nigeria¹² where significant increase in knowledge level was reported after 3 months post programme. Similar studies carried out in China²² and Canada²³ also reported that the overall knowledge of hypertension significantly improved among those that received educational programme. This improvement in knowledge of hypertension indicates the effectiveness health education intervention and as such, should be sustained.

This study found more than a third of the sampled trades have hypertension (38.8% and 36.2% in the intervention and control groups respectively); indicating high prevalence. This finding is comparable to previous studies on market traders in Enugu¹⁰ and Lagos²⁴ which reported similar results. Much higher prevalence (66.4%) was reported in Ekiti, Southwestern Nigeria²⁵ which may be explained by the older age group (> 40 years) studied, as aging has been linked to higher risk of hypertension.²⁶ Contrary to our finding, similar studies have reported low prevalence of less than 20% among market traders in rural communities of Ijebu Ode, Ogun State²⁷ and Osun State Nigeria²⁸ which were attributed to minimal appearance of factors predisposing to western lifestyle in these rural communities.²⁸ The high prevalence of hypertension noted in this study may be attributed to presence of risk factors of hypertension such as sedentary lifestyle and high salt and fatty diets which is often associated with market traders.¹⁰ This finding indicates high burden of undiagnosed hypertension which needs to be addressed as early detection is linked to possible prompt treatment and aversion of complications.

After the intervention, there were significant decrease in mean systolic and diastolic blood pressure and in the prevalence of hypertension among the intervention group but not in the control group. Similar studies in Nigeria,¹² India²⁹ and China¹³ reported that blood pressure variables improved significantly after health education intervention. Another study which evaluated the impact of workplace health promotion program on employees' blood pressure reported that the systolic and diastolic blood pressure in the intervention subgroup decreased significantly, whereas no change was observed among the control group over the 6-year period.³⁰ This shows that adequate health education and screening programme on hypertension can enhance risk modification leading to improved blood pressure status, increase detection rate and reduce cardiovascular risks.

In this study, the odds of having hypertension was three times higher among those that are 40 years and above compared to those below 40 years. The finding is consistent with results of previous studies which reported that aging was associated with increased prevalence of hypertension.^{21,31} Age has been recognized as a non-modifiable risk factor attributing to increased cardiovascular risk such as hypertension,^{32,33} an assertion supported by studies among adults in Kenya³⁴ and occupational groups in India^{35,36} Potential reasons for this could be changes in the blood vessels causing arterial stiffness, decreased elasticity and vascular resistance which occurs with increasing age.^{37,38}

The study found that those that are single are two and half times more likely to have hypertension compared to those that are married. This finding is consistent with previous studies which reported that divorced, separated and never married individuals have higher prevalence of hypertension compared to their married counterpart.^{39,40,41} The mechanism underlying the effect of marital status on hypertension are not entirely understood. Studies suggested explanations including psycho-pathological factors, neuroendocrine pathway, biological mediators and health behaviour.⁴² Another study viewed that married men have better sleep, less stress, better moods and have better diet compared to never married men.⁴³

Those with good knowledge of hypertension were found to be three times less likely to have high blood pressure compared to those with poor knowledge. This finding is comparable to earlier studies in Nigeria³ and Pakistan⁴⁴ which reported good knowledge as predictor of hypertension. Sufficient knowledge about hypertension in patient has been associated with greater treatment adherence and better management and blood pressure control.^{45,46} Studies have shown that gaps in knowledge in the form of health illiteracy are key hindrances to effectively prevent and treat hypertension and facilitates individuals to progress to poor health outcomes.^{47,48} Our finding indicates that improving knowledge can have positive influence on beliefs, attitude and behaviour towards management and control of hypertension. Good knowledge of hypertension will go a long way in helping to decrease its prevalence in Nigeria and Africa as a whole since situations may not be different in other parts of the continents.

Limitations of the study

The main limitation of the study was the short duration for the study as one cannot tell to what extent the effects of the intervention can be sustained nor the long-term impact of the intervention on prevention and control of hypertension.

Conclusion And Recommendation

This study found that market traders have poor knowledge of hypertension which significantly increased after the intervention among the intervention group compared to control group. High prevalence of undiagnosed hypertension was noted among the participants which decreased in the intervention group but not in the control group. Aging, being single and good knowledge of hypertension were found to be predictors of hypertension.

The improvement in knowledge and blood pressure status of market traders found in this study demonstrates the effectiveness of the intervention. This underscores the need for health workers to sustain the programme through enlightenment campaigns, health outreaches and screening programmes. This could increase hypertension detection rate, provide easy access to health service and reduce hospital waiting time with its negative effect on productivity among market traders.

Abbreviations

BP Blood Pressure

CHEW Community Health Extension Workers

DALYS Disabilities Adjusted Life Years

FETHA Federal Teaching Hospital Abakaliki

HBP High Blood Pressure

KM Kilo Meter

LGA Local Government Area

NCDS Non Communicable Diseases

OR Odds Ratio

REC Research and Ethics Committee

SD Standard Deviation

SPSS Statistical Package for Social Science

Declarations

Ethical consideration

Ethical approval was obtained from Research and Ethics committee (REC) of Federal Teaching Hospital Abakaliki (FETHA) Ebonyi State, Nigeria and Ebonyi State Ministry of Health, Abakaliki. Written informed consent was obtained after thorough explanation was given and understanding established.

Availability of data and material

The dataset used for this study is readily available and can be obtained from the corresponding author on reasonable request.

Competing interest

The authors declare that they have no competing interest.

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Authors' contribution

IIE, EOO and LUO conceptualized and designed the study. IIE, CDU and INO were involved in the implementation of the project and data collection. COM and OEN participated in data entry and analysis. IIE wrote the first draft of the manuscript with intellectual contribution from LUO. All authors reviewed and approved the final manuscript.

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