Original Research Article

SCREENING FOR HYPERTENSION AND DIABETES IN AN UNDERSERVED POPULATION THROUGH COMMUNITY OUTREACH; A CASE OF RURAL COMMUNITY IN ENUGU STATE, NIGERIA

ABSTRACT

Introduction

Hypertension and Diabetes are the commonest co-morbidity of each other and are among the principal cause of the burden of non-communicable diseases in developing countries. It is important to identify patients with these conditions early in the disease process. This study was to determine the prevalence of elevated Blood Pressure (BP) and elevated Fasting Blood Sugar (FBS) as well as relate it to the characteristics of the study participants in a rural community in Enugu State, Nigeria.

Methods

Community based cross-sectional study in form of outreach was done. The study was conducted over 1 week period among participants aged 18 years and above. Proforma was used in collecting information on characteristics of participants including age, sex and occupation. Measurements of BP, FBS and BMI were done. Chi square test and Binary Logistic Regression were used for analysis.

Results

Majority of participants were aged > 45 years 127(56.7%), and females 139(62.1%),Mean(SD) 46.89((21.84) Elevated BP 55(24.6%), elevated FBS 42(18.8%), both elevated BP and FBS. 13(5.8%). higher proportion of those aged > 45 years had elevated BP 51(92.7%) and elevated FBS 37(88.1%). More Females had elevated BP 35(63.6%) and elevated FBS 28(66.7%).Predictors were; age >45 years for elevated BP (AOR 18.4; 95% CI 5.7-59.5) and for have elevated FBS (AOR 8.9; 95% CI 3.0-26.5).

Conclusion

Prevalence of raised BP and FBS as well as co-morbid condition was high. It was more among females and older age. Age was a predictor of both raised BP and FBS. This calls for interventional programmes that will assist in limiting the increasing burden of the diseases in rural communities

Keywords; Raised Blood Pressure, raised Blood sugar, Screening, Outreach, rural community

INTRODUCTION

Non-communicable diseases (NCD), essentially cardiovascular diseases like Hypertension, Diabetes, Cancer and chronic respiratory diseases, are responsible for about 68% (38 million) of the 56 million deaths that occurred globally during 2012.[1] Practically, 80% of these NCD deaths (29 million) occurred in low and middle-income countries (LMICs).[1] In addition, the African region of the world is experiencing a double epidemic of both communicable and non-communicable diseases. It is reported that in Sub-Saharan Africa, the menace of NCDs could surpass that of communicable diseases in the nearest future.[2]

Hypertension and diabetes are among the important diseases responsible the high burden of non-communicable diseases in developing countries.[2] Both have significantly contributed to medical morbidity and mortality. Hypertension is the commonest co-morbidity of diabetes and diabetes is the commonest co-morbidity of hypertension. They have common genetic predisposition, share risk factors, and have similar environmental influences as causative factors, and are interrelated. They bring about an enormous financial stress on individuals, families, communities and the health system of any country.[3] Worldwide, Diabetes is responsible for about USD 727 billion dollars in health expenditure and 12% of total expenditure on health of adults in 2017.[4] Fuelling the crisis is the upsurge in unhealthy lifestyle such as tobacco and alcohol consumption, the

reduction of physical activity and the changes in dietary intake due to westernization of our culture .[2]

In 2012, report according to The World Health Statistics was that one in three adults worldwide has an elevated Blood Pressure (BP) and one in 10 adults have diabetes.[5] The raised BP is responsible for about 50 percent of all deaths from stroke and heart disease.[5]. The percentage of deaths attributed to raised blood glucose in those aged 20–69 years in LMICs was 60.5% in men and 45.6% in women.[2] There was doubling in the prevalence of diabetes between 1980 and 2014. Approximately 425 million adults (20-79 years) were living with diabetes in 2017 and is projected that by 2045 this will rise to 629 million.[4] The International Diabetic Federation (IDF) statistics on diabetes reported that Nigeria has the largest population of people living with diabetes and impaired fasting glucose in Africa.[6] Hypertension is also the commonest cardiovascular disease reported in the country.[7] Findings from studies done in Nigeria documented that the prevalence of diabetes varies across different regions of the country with range from 2.2 - 9.8%.[8-11] In line with this, other similar studies reported varying prevalence rates of hypertension in various regions of the country.[8.12,13]

To reduce the prevalence and consequences of hypertension and diabetes a complimentary mixture of population-wide and individual interventions is required. Allowing persons to present at health facilities is not yielding desired result as majority of persons do not know that that they have these silent killers. Likewise, there might be an enormous burden of hypertension and diabetes mellitus among underserved rural dwellers in the country. It is important to identify patients with these conditions early in the disease process. Periodic outreaches will contribute to early detection of persons with such conditions. Prompt and effective referral following such detection help reduce morbidity and complications associated with the diseases. This study was to determine the prevalence of elevated Blood Pressure (BP) and elevated Fasting Blood Sugar

(FBS) among rural residents of a community in Enugu State Nigeria well as to find out the risk factors associated with these conditions.

METHODS

3.1. Study Area

This was at Abor, a rural community in Udi Local government of Enugu state, South East Nigeria. The community is about 30km to Enugu Metropolis They engage in farming, trading as well as civil/public services. There are no well established health facilities even though there is a primary health care facility.

Study Design and population

A Community based cross-sectional study in form of outreach was done. The study was conducted over 1 week period. All participants aged 18 years and above who gave informed consent were included in the study

Sampling Technique and Sample Size Determination

A total study was done. All participants who meet the inclusion criteria were recruited consecutively as they present for screening at the outreach venue throughout the period of study. A total of 224 patients were studied.

Data collection tools and method

1. Proforma was designed and used in collecting information on characteristics of participants including age, sex, occupation, recording BP, FBS and BMI
2. Measurements of BP, FBS and BMI were done using standard tools and observing standard procedure

Blood pressure: The BP was measured in the sitting position with an appropriate sized cuff encircling the left arm held at the level of the heart. This was measured using the OMRON Arm-type fully Automatic Digital Blood Pressure Monitor, Model BP - 103H. Raised BP was defined using Joint National Committee on Hypertension (JNC) 7 classification as systolic BP ≥ 140 mmHg and/or diastolic BP ≥ 90 mmHg

Blood sugar: One microliter (1 μL) of whole blood was collected and tested for blood glucose level using the Accu-chek active test strip and glucometer (Roche Diagnostics GmbH, Mannheim, Germany). Aseptic conditions were maintained throughout the procedure. Diabetes was defined as a fasting blood glucose > 110 mg/dl (6.1mmol/l)

Weight and height: the weight and height of the respondents were measured using a standardized Standiometer. Weight was measured to the nearest 0.5kg with the subject standing motionless on the calibrated scale without footwear. Height was measured with the subject standing in an erect position and head positioned so that the top of the external auditory meatus was level with the inferior margin of the bony orbit. The BMI of the subjects was calculated as weight in kilograms divided by height in meters squared.

Data Collection and analysis

Patient information were recorded by trained health workers to ensure accuracy of data. Measurements of BP and FBS were done by qualified medical doctors. IBM Statistical Package for Social Sciences Version 21 was used for data entry, editing and analysis. Results were presented in tables. Mean, Standard deviation, proportion and percentages were used as summary measures where appropriate. Chi square test was used to establish associations between

characteristics of participants with BP and FBS status. Binary Logistic Regression was done for variables significant variables (age). Level of confidence was at $p < 0.05$.

Action taken

Participants found to have elevated BP and/or FBS during the screening were provided education on appropriate lifestyle and dietary modifications, such as salt and fatty reduction as well as need for improved physical activity where not adequate. They were also instructed and referred to tertiary health care facilities.

RESULTS

Table 1: Characteristics of participants

Variables	Frequency	Percent(%)
Age (Yrs)		
≤ 45	97	43.3
>45	127	56.7
Mean(SD)	***46.89(21.84)***	
Gender		
Female	139	62.1
Male	85	37.9
Occupation		
Civil/public servant	63	28.1
Trading	30	13.4
Farming	40	17.9
Skilled worker	18	8.0
Unemployed/student	73	32.6
BMI		
<18.5	66	29.5
18.5-24.9	99	44.2
25-29.9	57	25.4

≥30	2	.9

Table 1 shows that majority of participants were aged > 45 years 127(56.7%) with mean age of 46.89 SD of 21.84 were females 139(62.1%), unemployed/students 73(32.6%) followed by Civil/public servants 63(28.1%) and 99(44.2%) had BMI of 18.5-24.9 mg/m^2

Table 2: Screening status of participants

Variables	Frequency	Percent(%)
Blood pressure (BP)		
Normal	169	75.4
Elevated	55	24.6
Fasting Blood Sugar (FBS)		
Normal	182	81.3
Elevated	42	18.8
Both BP and FBS		
No	211	94.2
Elevated	13	5.8

Table 2 shows that 55(24.6%) of participants had elevated Blood Pressure, 42(18.8%) had elevated Fasting Blood Sugar while 13(5.8%) both have elevated BP and FBS.

Table 3: Blood pressure and Fasting Blood Sugar disaggregated by Characteristics of participants

	Blood pressure		Fasting Blood Sugar	
	Normal	Elevated	Normal	Elevated
Variables	**Freq(%)**	**Freq(%)**	**Freq(%)**	**Freq(%)**
Age (Yrs)				
≤ 45	93(55.0)	4(7.3)	92(50.5)	5(11.9)
>45	76(45.0)	51(92.7)	90(49.5)	37(88.1)

Gender				
Female	104(61.5)	35(63.6)	111(61.0)	28(66.7)
Male	65(38.5)	20(36.4)	71(39.0)	14(33.3)
Occupation				
Civil/public servant	41(24.3)	22(40.0)	44(24.2)	19(45.2)
Trading	26(15.4)	4(7.3)	24(13.2)	6(14.3)
Farming	26(15.4)	14(25.5)	33(18.1)	7(16.7)
Skilled worker	14(8.3)	4(7.3)	17(9.3)	1(2.4)
Unemployed/student	62(36.7)	11(20.0)	64(35.2)	9(21.4)
BMI				
<18.5	54(32.0)	12(21.8)	56(30.8)	10(23.8)
18.5-24.9	77(45.6)	22(40.0)	81(44.5)	18(42.9)
25-29.9	37(21.9)	20(36.4)	43(23.6)	14(33.3)
≥30	1(0.6)	1(1.8)	2(1.1)	0(0.0)

Table 3 shows that higher proportion of those aged > 45 years had elevated Blood pressure 51(92.7%) and elevated FBS 37(88.1%). More Females had elevated Blood pressure 35(63.6%) and elevated FBS 28(66.7%).. More Civil/public servants had elevated Blood pressure 22(40.0%) and elevated FBS 19(45.2%). Higher proportion of those that had BMI of 18.5-24.918.5-24.9 mg/m^2 had elevated Blood pressure 22(40.0%) and elevated FBS 18(42.9%).

Table 4: Relationship of Characteristics of participants with Blood Pressure and Fasting Blood Sugar

	BLOOD PRESSURE			
	Normal	**Elevated**	**χ^2(p value)**	**AOR (95% CI of AOR)**
Variables	**Freq(%)**	**Freq(%)**		
Age (Yrs)				
≤ 45	93(95.9)	4(4.1)	38.547(<0.001)	1
>45	76(59.8)	51(40.2)		18.36(5.66-59.54)
Gender				
Female	104(74.8)	35(25.2)	0.078(0.781)	NA
Male	65(76.5)	20(23.5)		
Occupation				

Civil/public servant	41(65.1)	22(34.9)		
Trading	26(86.7)	4(13.3)	11.648(0.020)	NA
Farming	26(65.0)	14(35.0)		
Skilled worker	14(77.8)	4(22.2)		
Unemployed/student	62(84.9)	11(15.1)		
BMI				
<18.5	54(81.8)	12(18.2)		
18.5-24.9	77(77.8)	22(22.2)	5.850(0.119)	NA
25-29.9	37(64.9)	20(35.1)		
≥30	1(50.0)	1(50.0)		
FASTING BLOOD SUGAR				
	Normal	**Elevated**		
Age (Yrs)				
≤ 45	92(94.8)	5(5.2)	20.757(<0.001)	1
>45	90(70.9)	37(29.1)		8.92(3.00-26.52)
Gender				
Female	111(79.9)	28(20.1)	0.467(0.494)	NA
Male	71(83.5)	14(16.5)		
Occupation				
Civil/public servant	44(69.8)	19(30.2)		
Trading	24(80.0)	6(20.0)	9.487(0.050)	NA
Farming	33(82.5)	7(17.5)		
Skilled worker	17(94.4)	1(5.6)		
Unemployed/student	64(87.7)	9(12.3)		
BMI				
<18.5	56(84.8)	10(15.8)		
18.5-24.9	81(81.8)	18(18.2)	FT(0.454)	NA
25-29.9	43(75.4)	14(24.6)		
≥30	2(100.0)	0(0.0)		

Table 4 shows that there were statistically significant association of blood pressure with age (χ^2 = 38.547, $p < 0.001$), Occupation (χ^2 = 11.648, p = 0.020). However there were no statistically significant association of blood pressure with gender (χ^2 = 0.078, p = 0.781). and BMI (χ^2 = 5.850, p = 0.119). Also, there were statistically significant association of Fasting blood sugar with age (χ^2 = 20.757, $p < 0.001$). However there were no statistically significant association of blood pressure with gender (χ^2 = 0.467, p = 0.494), Occupation (χ^2 = 9.487, p = 0.050) and BMI (**FT**, p = 0.454).

Those aged >45 years were about 18 times (AOR 18.4; 95% CI 5.7-59.5 likely to have elevated BP than those aged ≤ 45 years. Also those aged >45 years were about 9 times (AOR 8.9; 95% CI 3.0-26.5 likely to have elevated BP than those aged ≤ 45 years.

DISCUSSION

Hypertension and Diabetes are the commonest co-morbidity of each other. They have common genetic predisposition, share risk factors, and have similar environmental influences as causative factors, and are interrelated[14] Both elevated Blood Pressure and elevated Fasting Blood Sugar occur more with advancing age. Result from this study reported that majority of participants were aged > 45 years and females. This is expected as most rural areas are inhabited by retired workers and older persons due urban migration in the country for greener pasture. Majority being were females can be partly explained by the better health seeking behavior of females compared to males.

It was also noted that generally, 24.6% of participants had elevated Blood Pressure, 18.8% had elevated Fasting Blood Sugar and 5.8% had both elevated BP and FBS. The reported prevalence for elevated Blood Pressure was lower than the 42.0%, 44.5% and 46.4% reported respectively different studies in South Eastern Nigeria.[15-17] It is similar to reports from other studies.[12,13] The observed differences may be due differences in sampling technique and location of the study as most of those previous studies were in urban areas whose life style is different from rural communities. However, these finding is revealing as it shows that hypertension, DM and co morbid condition are of high prevalence in rural communities in Nigeria. This calls for interventional programmes including; persistent health education, enlightenment campaigns and

community surveillance programmes to aid reduce this growing burden of the diseases in rural communities.

Based on Gender, 25.2% females and 23.5% males had elevated Blood Pressure, 20.1% females and 16.5% males had elevated Fasting Blood Sugar, 5.0% females and 7.1% males had both elevated BP and FBS. More Females equally had elevated Blood pressure 63.6% and elevated FBS 66.7%. The higher prevalence among females were also documented in previous similar studies.[12,20-23]. However, there was discordance with many other previous reports. A study involving review of studies on hypertension over five decades reported a similar prevalence in men and women with range in prevalence of 8% to 46.45%.[13] A Meta analysis of the prevalence of hypertension from population based studies in south western Nigeria reported a higher prevalence in men than women with prevalence ranging from 12.4% to 34.8%.[12] Another study documented prevalence of HTN of 22% (25.9% in males and 20% in females). Similarly other studies had similar findings of higher prevalence among males.[18-21] The findings from this study can partly be explained by fact that women are generally more likely than men to say they are unwell.

Findings also show that those aged >45 years were about 18 times likely to have elevated BP than those aged ≤ 45 years as well as about 9 times likely to have elevated BP than those aged ≤ 45 years. Also Higher proportion of those aged > 45 years had elevated Blood pressure 92.7% and elevated FBS 88.1%. A study done in Mali documented that OR increases with age from 2.06 (30–44 years) to 7.25 (60 and more).[22] This is similar to finding in other studies in Africa.[23-25] In Ibadan South West Nigeria, a study revealed that hypertension was significantly associated with being in age groups 30-49 years (OR 2.258, 95% CI: 1.311 - 3.884), ≥50 years (OR 7.145, 95% CI: 3.644 - 14.011).[26] In the United States, the estimated percentage of people having

diagnosed or undiagnosed diabetes was increasing with age. In the age group of 20-44 years, about 3.7% people had diabetes; in the age group 45-64 years about 13.7%; and age group of ≥ 65 years about 26.9% had diabetes.[27] The study done in Bali showed that the prevalence of raised blood sugar and DM were more than twice higher in the elderly than in the younger age group.[28] A study done in China documented that Fasting and random blood glucose level rose by 0.15 mmol/L, while 2-hour post-prandial blood glucose level rose by 0.26 mmol/L per decade-increase in age.[29] Several reports have documented that age is the strongest risk factor for CVD like Hypertension. In the United States, CVD was the leading cause of death for persons 65 years of age and over in 2007. It was responsible for 28% of deaths in this age group.[30]

These findings from current study could possibly be as a result of participants' occupation and residence. Almost all rural dwellers engage in minor farming even if is around their houses Since a high proportion of participants were farmers and traders, trekking long distances to the farm or the farm work itself constituted increased physical activity. Sedentary lifestyle as a a key modifiable factor for both diseases may be rare in these rural communities Age of participants may equally be a factor as these conditions are more with advancing age which is where majority of respondents belong to. The implication of this finding is that since most persons with these conditions do not know that they have the disease, there is the likelihood that they die suddenly with their relatives ascribing it to supernatural things. Then for others that may present at health facility, they are likely to come when complications of their condition has occurred.

Recently the numbers of elders are on the increase worldwide with sharp rise in the developing countries. This has impacted on the prevalence of metabolic diseases (impaired fasting glycemia, DM) and Cardio vascular Diseases including Hypertension. This may be as a result of their age, process of aging itself or remotely through several other age-related risk factors. Some of such

documented factors include; central obesity, mitochondrial dysfunction, lipid metabolisms disorders, inflammation, β-cell dysfunction, insulin resistance and metabolic syndrome.[28,31]

CONCLUSION

Prevalence of raised BP and FBS as well as co-morbid condition was high and in line with findings from other studies. It was more among females and older age. Age was a predictor of both raised BP and FBS. **I**t shows that hypertension, DM and co morbid condition are emerging danger even in rural communities in Nigeria. This calls for interventional programmes including mouth outreaches, persistent health education, enlightenment campaigns and community surveillance programmes to aid reduce this growing burden of the diseases in rural communities.

Ethical consideration

The Health Research and Ethics committee of University of Nigeria Teaching Hospital, Enugu gave ethical clearance. Permission was equally obtained from traditional rulers of constituents communities.

Consent:

Informed consent was obtained from participants. They were ensured of voluntary participation and confidentiality of their information.

CONFLICT OF INTEREST

Authors declare no conflict of interest

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