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Original Research Article

Prevalence and risk factors of hypertension and diabetes mellitus in riverine communities in Nigeria's Niger delta: implications for community-based interventions

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ABSTRACT

Background: The global burden of non-communicable diseases is enormous, especially in low- and middle-income countries. This study assessed the prevalence of hypertension and diabetes mellitus and associated factors among adult residents of riverine communities in Niger delta region of Nigeria.
Methods: A community-based descriptive cross-sectional study. Adults aged 18 years and above residing in riverine communities who attended a free medical outreach programme were screened for hypertension and diabetes mellitus. Anthropometry and measurements were done using standard methods. Data was analysed using SPSS version 26.
Results: Of the 1597 participants, 1066 (66.6%) were females, 470 (29.4%) overweight and 356 (22.3%) were obese. Their mean age was 41.0±14.5 years. The prevalence of hypertension diabetes mellitus and hypercholesterolemia was 37.6%, 3.9% and 65.6% respectively. Significant predictors of hypertension were age ≥40 years (OR =3.86, CI: 2.59-5.75, p<0.001), male sex (OR=1.78, CI: 1.19-2.65, p=0.005), overweight (OR=1.92, CI: 1.19-3.11, p=0.008) and obesity (OR=1.73, CI: 1.05-2.85, p=0.032). No statistically significant association between demographic characteristics and diabetes mellitus was observed.
Conclusions: The high prevalence of hypertension and diabetes mellitus in the riverine communities calls for an urgent need to set up community based noncommunicable diseases prevention programmes and then develop and implement effective targeted interventions to help residents of the riverine communities diagnosed with these conditions to better manage the disease.

Keywords: Diabetes mellitus, Hypertension, Niger delta, Nigeria, Prevalence, Riverine communities

INTRODUCTION

The burden of non-communicable diseases (NCDs) is enormous globally, especially in low- and middle-income countries where 77% of all NCD deaths occur.[1] The World Health Statistics 2023 describes NCDs as an ever-increasing health threat for future generations because the deaths caused annually by NCDs have grown consistently and is now claiming nearly three quarters of all lives lost each year.[2] The main types of NCDs are cardiovascular diseases (such as hypertension, heart attacks and stroke), cancers, chronic respiratory diseases, and diabetes. Most sub-Saharan African countries including Nigeria hitherto known for a huge burden of communicable diseases are now being ravaged with a double burden of both communicable and NCDs.

The prevalence of hypertension varies across regions and country income groups. The World Health Organization (WHO) African region has the highest prevalence of hypertension (27%) while the WHO regions of the America has the lowest prevalence of hypertension

(18%).[3] In 2018, a systematic review and meta-analysis of NCDs and its risk factors in Nigeria estimated the prevalence of hypertension to be 31.2% (men 29.5%, women 31.1%).[4] Similarly, a systematic review and meta-analysis of community-based studies in the Niger delta region of Nigeria showed the prevalence of hypertension of 32.0% and 24.07% for rural population and urban areas respectively.[5] Several other studies across Nigeria have reported the prevalence of hypertension ranging from 15% to as high as 55.9%.[6-12] The public health significance of hypertension is the number of many undiagnosed cases in the population. An estimated 46% of adults with hypertension are unaware that they have the condition and less than half of adults (42%) with the disease are diagnosed and treated, hence it is referred to as a silent killer.[3]

Diabetes mellitus is another NCD that constitutes a major public health issue which has reached an alarming level. The International Diabetes Federation (IDF) Atlas 2021 reports that 10.5% of the adult population (20-79 years) has diabetes globally, with almost half unaware that they are living with the condition.[13] The African region tops the world in undiagnosed diabetes as only 46% of people living with diabetes in the African region know their status.[14] This qualifies diabetes as another silent killer in the African region. In Nigeria, a systemic review and meta-analysis of studies conducted from 1990 to 2017 showed the pooled prevalence of diabetes of 5.77%. This pooled prevalence when disaggregated according to the six geopolitical zone showed 9.8% in the south-south zone, 5.9% in northeast zone, 5.5% in southwest zone, 4.6% in southeast zone, 3.8% in northcentral zone and 3.0% in northwest zone.[15] More recently, WHO estimated the prevalence of diabetes in Nigeria to be 4.3%.[16] With the population of Nigeria estimated to be over 200 million, it therefore means that over eight million people are living with diabetes in Nigeria.[17] Also worrisome is the huge burden of prediabetes (a borderline glycemic status associated with both higher incidence of cardiovascular disease as well as higher risk of progression to diabetes) in Nigeria. A systemic review and meta-analysis of studies conducted from 2000 to 2019 showed the pooled prevalence of prediabetes of 13.2% and 10.4% using the American Diabetes Association (ADA) and WHO criteria respectively.[18] Again, this translates to over 26 million prediabetic people in Nigeria. A previous study in selected rural communities in Bayelsa state, in the Niger delta region of Nigeria reported a prevalence of 8.4% and 3.7% for diabetes and prediabetes respectively, among adults aged 40 years and above.[19]

Most studies conducted on the prevalence and risk factors of hypertension and diabetes mellitus in the Niger delta region were in upland areas and with emphasis on rural-urban dichotomy. Only few studies have been conducted on the subject matter in riverine communities. Therefore, this study was carried out to determine the prevalence and associated factors of hypertension and diabetes mellitus among adult residents of riverine communities in Delta state, in the Niger delta region of Nigeria.

METHODS

Study design, area, and population

This community based cross-sectional study was carried out in seven riverine communities in Burutu local government area (LGA) of Delta state, Nigeria. The communities include: Ogulagha, Yobebe, Sokebolou, Obotobo 1, Obotobo 2, Yokri, and Odimodi. Burutu LGA lies on the coast of the Niger Delta on two sides of the Forcados River, a channel of the river Niger, 30 kilometers upstream from the Bight of Benin. The study was part of the health in motion medical outreach programmes of the Shell Petroleum Development Company of Nigeria Limited (SPDC) which held from 10th to 18th May 2023. Health in Motion is a mobile community health outreach programme that takes free medical services to communities across the Niger delta and in other parts of Nigeria. The main occupation of the inhabitants of these riverine communities is fishing, hunting, and farming. Only adult residents of the communities aged 18 years and above were included in the study.

Data collection

Data collection involved the recording of the age and sex of the participants, measurements, and analysis of blood samples.

Anthropometry

The weight and height of the participants was measured using a standardized stadiometer. Weight was measured to the nearest 0.5 kg with the participant standing motionless on the calibrated scale without footwear. Height was measured with the participant 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 participants was calculated as weight in kilograms divided by height in meters squared. The BMI was then used to classify the participants as follows: underweight (BMI<18.5), normal weight (BMI 18.5-24.9), overweight (BMI 25.0-29.9) and obese (BMI≥30) according to WHO.[20]

Blood pressure

Blood pressure (BP) was measured using the automatic blood pressure monitor, model: A and D Medical TM-2657P. The BP was measured with the participant in a sitting position.

Hypertension was defined as systolic BP≥140 mmHg and/or diastolic BP≥90 mmHg according to the Joint National Committee on Hypertension (JNC) 7 classification.[21]

Blood sugar and cholesterol

The random blood sugar (RBS) and blood cholesterol levels were measured using the ACCU ANSWER isaw® 4-in-1 Multi Monitor, Model: L8M-01. Aseptic conditions were maintained throughout the procedure. Diabetes mellitus was defined as a random blood glucose >200 mg/dl (11.1 mmol/L), while hypercholesterolemia was defined as blood cholesterol level ≥200 mg/dl (5.2 mmol/l).[22,23]

Data analysis

The data collected were checked for completeness, coded, and analyzed using the IBM SPSS version 26 statistical software (IBM Corp, Armonk, NY, USA). Continuous variables were summarized using means and standard deviations while categorical variables were summarized using proportions. The primary outcome variables were systolic BP, diastolic BP, random blood glucose (RBS) level and blood cholesterol level, while age, sex, and BMI were the independent variables. Bivariate analysis using the independent t-test for mean differences of the continuous variables, and Pearson's chi square for association between the independent and outcome variables were carried out. The level of statistical significance was set at p value <0.05. A logistic regression model was fitted for all variables with p values <0.2 in the chi square test of association to determine significant predictors of the outcome variables at 95% confidence interval.

Ethical consideration

The Chairman of Burutu LGA, the King of Ogulagha Kingdom, and the paramount rulers of the respective riverine communities gave permission to carry out the Health in Motion programme.

RESULTS

The complete data of 1597 participants from the community outreach programme, whose age ranged from 18 to 95 years were analyzed. Their mean age was 41.0±14.5 years with a higher proportion of them in the age group of 18-29 years and 30-39 years, 285 (24.1%) and 395 (24.8%) respectively. Two-third, 1066 (66.6%) were female, 705 (44.2%) had normal BMI while 356 (22.3%) were obese (Table 1).

The mean systolic BP and diastolic BP of the male participants, 136.9±21.8 mmHg, and 78.4±13.6 mmHg respectively, were higher than that of their female counterparts, 128.2±23.4 mmHg and 76.0±13.5 mmHg respectively. These differences were statistically significant (p<0.001 and p=0.001 respectively). The mean cholesterol level of the female participants, 217.6±41.6 mg/dl was higher than that of their male counterparts, 208±36.3 mg/dl. This difference was statistically significant (p<0.01). For diabetes mellitus, the mean RBS of the female participants, 109.4±43.9 mg/dl was slightly higher than that of their male counterparts, 108.8±43.2 mg/dl. However, this difference was not statistically significant (p=0.860). Table 2 shows the prevalence of hypertension, diabetes mellitus and hypercholesterolemia in the riverine communities. Almost a third 516 (32.2%) were hypertensive, only 28 (3.9%) were diabetic while approximately two-thirds 363 (65.6%) had hypercholesterolemia.

Table 1: Age, sex, and body mass index distribution of the respondents.

Variables (n=1597)	Frequency	Percent
Age group (years)		
18-29	385	24.1
30-39	395	24.8
40-49	370	23.2
50-59	259	16.2
60 and above	187	11.7
Sex		
Female	1064	66.6
Male	533	33.4
Body mass index		
Underweight	66	04.1
Normal	705	44.2
Overweight	470	29.4
Obese	356	22.3

Mean age =41.0±14.5 years, median age =40.0 years, (range 18 to 95 years)

Table 2: Prevalence of hypertension, diabetes mellitus and hypercholesterolemia in the Niger delta communities.

Variables	Frequency	Percent
Hypertension (n=1597)	516	32.3
Systolic hypertension (n=1597)	498	31.2
Diastolic hypertension (n=1597)	278	17.4
Diabetes mellitus (n=720)	28	3.9
Hypercholesterolemia (n=553)	363	65.6

The bivariate analysis of the association between the demographic characteristics of the participants and the prevalence of hypertension and diabetes mellitus is shown in Tables 3 and 4 respectively. A higher prevalence of hypertension was recorded among participants aged 40 years and above, 393 (48.2%). This association was statistically significant (p<0.001). Similarly, there was a statistically significant association between sex and the prevalence of hypertension (p<0.001) as a higher proportion of male participants, 218 (40.9%) were hypertensive when compared to their female counterparts, 298 (28.0%). Increasing BMI was also statistically associated with the prevalence of hypertension (p<0.001). There was no statistically significant association between hypercholesterolemia and the prevalence of hypertension (p=0.134). Similarly, there was no statistically significant association between the demographic characteristics of the participants and the prevalence of diabetes mellitus.

Table 3: Demographic characteristics and hypertensive status of respondents.

Variables	Hypertension		χ^2	P value
	Yes (%)	No (%)		
Age group (years)				
<40	123 (15.7)	658 (84.3)	191.691	<0.001
≥40	393 (48.2)	423 (51.8)		
Sex				
Female	298 (28.0)	766 (72.0)	26.990	<0.001
Male	218 (40.9)	315 (59.1)		
Body mass index				
Underweight	12 (18.2)	54 (81.8)	33.565	<0.001
Normal	195 (27.7)	510 (72.3)		
Overweight	154 (32.8)	316 (67.2)		
Obese	155 (43.5)	201 (56.5)		
Hypercholesterolemia				
Yes	138 (38.0)	225 (62.0)	2.294	0.134
No	60 (31.6)	130 (68.4)		

Table 4: Demographic characteristics and diabetes mellitus status of respondents.

Variables	Diabetes mellitus		χ^2	P value
	Yes (%)	No (%)		
Age group (years)				
≤40	13 (3.9)	318 (96.1)	0.002	0.961
>40	15 (3.9)	374 (96.1)		
Sex				
Female	16 (3.5)	437 (96.5)	0.416	0.519
Male	12 (4.5)	255 (95.5)		
Body mass index				
Underweight	0 (0.0)	25 (100)	3.630	0.304
Normal	14 (4.3)	314 (95.7)		
Overweight	5 (2.4)	202 (97.6)		
Obese	9 (5.6)	151 (94.4)		
Hypercholesterolemia				
No	8 (4.4)	319 (95.6)	0.013	0.908
Yes	14 (4.2)	173 (95.8)		

Table 5: Logistic regression model for the predictors of hypertension in the Niger delta communities.

Variables	Odds ratio	95% CI	P value
Age group (years)			
<40*	–	–	–
≥40	3.86	2.59-5.75	<0.001
Sex			
Female*	–	–	–
Male	1.78	1.19-2.65	0.005
Body mass index			
Underweight*	–	–	–
Normal	1.73	0.49-6.01	0.390
Overweight	1.92	1.19-3.11	0.008
Obese		1.05-2.85	0.032
Hypercholesterolemia			
No*	–	–	–
Yes	1.34	0.90-2.01	0.145

*Reference category, CI = Confidence interval

Logistic regression analysis showed that participants aged 40 years and above have four-fold increased odds of being hypertensive when compared to those aged below 40 years (OR=3.86, 95% Cl: 2.59-5.75). Males (OR=1.73, 95% Cl: 1.19-2.65), overweight (OR=1.92, 95% Cl: 1.19-3.11) and obese (OR=1.73, 95% Cl: 1.05-2.85) participants had two-fold increased odds of being hypertensive (Table 5).

DISCUSSION

There has been a progressive increase in the prevalence of hypertension and diabetes mellitus in Nigeria and the burden is expected to increase even further. The huge burden of these NCDs seen in this study is considered a major public health issue in the riverine communities of the Niger delta region. The prevalence of hypertension and diabetes mellitus was higher among residents who were aged 40 years and above, the males and the obese. In this study two-thirds of the participants were females and this could be responsible for more than half of them being either overweight or obese. However, even though the health in motion programme was a free medical outreach, male participation was poor. This corroborates the reports of studies which showed that adult females have better health seeking behaviour in Nigeria.[24,25] The implication of this finding is that there may be a large pool of residents of the riverine communities who are either hypertensive, diabetic or prediabetic but unaware of their condition, undiagnosed and therefore untreated, and this portends danger to the health of the population.

The high prevalence of hypertension (32.2%) seen in this study was higher than the African region prevalence of 27%.[3] This may be attributable to the fact that more than half of the participants were aged 40 years and above, overweight/obese and the high level of hypercholesterolemia (65.6%). Increasing age, BMI≥25, and hypercholesterolemia are known precursors and risk factors for hypertension as has been reported in previous studies.[8-10,26] The diet of the residents of these riverine communities may have contributed to high BMI and hypercholesterolemia. This underscores the need for further evaluation of the diet composition and dietary habits/patterns of residents of riverine communities in Niger Delta. The prevalence of hypertension in this study was lower than what was found in a community outreach programme in the neighbouring Edo state (37.6%), but far higher than that of rural communities in Bayelsa state (8.4%), another neighbouring state.[19,27]

The prevalence of hypertension and diabetes mellitus were significantly higher in the male participants when compared to their female counterparts. In addition to nonmodifiable risk factors such as increasing age and sex, males are more likely to engage in lifestyle factors such as tobacco smoking and alcohol consumption which may predispose them to higher risk of developing hypertension and diabetes mellitus and, this may have explained the findings of this study. This situation, coupled with poor health seeking behaviour can compromise the health status of male residents of these riverine communities. The incidence of stroke attributable to diabetes mellitus has been rising steadily especially in southern Nigeria.[28] This calls for urgent health education on prevention measures for hypertension and diabetes mellitus targeted specifically for males in the riverine communities to salvage their already compromised health status.

In this study, age 40 years and above, male sex, overweight and obesity were significant predictors of hypertension. Several studies in Nigeria have reported similar findings.[7,8,11,12,29] Although, there were no identifiable predictors of diabetes mellitus in this study, the prevalence was higher among the male and obese participants. The co-existence of hypertension and diabetes mellitus increases the risk of morbidity and mortality from cardiovascular disease especially in individuals with poorly controlled BP. These individuals are also more vulnerable to community acquired infections.[30] It has been reported that the presence of hypertension predict future diabetes mellitus, and the incidence of hypertension also increases significantly in the presence of diabetes mellitus. In other words, the development of hypertension and diabetes mellitus predict each other over time.[31] Another worrisome concern that needs urgent attention and intervention is the fact that, with the high prevalence of hypertension, diabetes mellitus and hypercholesterolemia in this study, the residents of the riverine communities may be prone to metabolic syndrome thus increasing their risk of coronary heart disease, heart failure, stroke, cancers, and other serious health problems. The incidence of metabolic syndrome is increasing in developing countries including Nigeria.[33,34] There is need for further studies to determine the prevalence of metabolic syndrome among adult residents of riverine communities in the Niger delta region of Nigeria.

There are some limitations of the study. The diagnosis of hypertension was based on only one BP measurement while that of diabetes mellitus was based on the result of one random blood sugar. Also, the number of participants tested for blood sugar were fewer in comparison with those who had BP measurement due to constraint with the blood sugar kits. However, this study has sounded the alarm on the magnitude of the burden of hypertension and diabetes mellitus in the Niger delta region. It has also generated baseline data for future population-based studies on NCDs in the riverine communities of Niger delta.

CONCLUSION

The prevalence of hypertension and diabetes among adult residents of riverine communities in the Niger delta region of Nigeria was high. There was preponderance of hypercholesterolemia which is a risk factor for both hypertension and diabetes mellitus. The complications of these NCDs and associated risk factors has serious

implications on the health status of residents of the riverine communities. There is an urgent need to set up community based NCD prevention programmes and then develop and implement effective targeted interventions to help residents of the riverine communities diagnosed with these conditions to better manage the disease and its resulting complications.

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