Undiagnosed Hypertension and Diabetes: Concordance between Self-Reported and Actual Profile among Traders in Nigerian Market

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Abstract

Background: Hypertension and diabetes rank high among cardiovascular risk factors, and in Africa, many affected persons are undiagnosed. Urban market traders are constrained from regular clinic visits by the fear of revenue loss occasioned by their absence from the stores, contributing to the reportedly high rates of undiagnosed and poorly treated cardiovascular conditions. This study determined the rate of undiagnosed hypertension and diabetes among traders in an urban market in Calabar, Nigeria. **Methods:** In this cross-sectional study, we used an interviewer-administered questionnaire to collect data from 105 traders at Marian market Calabar, including information on demographic characteristics and self-reported statuses regarding hypertension and diabetes. Subsequently, blood pressure and random blood sugar values were measured. **Results:** Forty-three (41.0%) of the respondents correctly reported their statuses regarding hypertension and 93.3% of the respondents correctly reported their statuses regarding diabetes. 62 (59%) and 7 (6.7%) of them had hitherto undiagnosed hypertension and diabetes, respectively. Only two (9.5%) out of those with a self-reported history of hypertension had normal blood pressure values. There was no agreement between the self-reported and actual profiles of hypertension among the respondents (kappa = 0.000, $P = 0.008$), and a weak level of agreement between the self-reported and actual profiles of diabetes among the respondents (kappa = 0.559, $P < 0.001$). Educational level was the identified predictor of correct self-report of status regarding hypertension ($P = 0.031$); **Conclusion:** There was a high rate of undiagnosed hypertension and, to a lesser extent, diabetes among this set of urban market traders.

Keywords: Cardiovascular risk factors, diabetes, diagnosis, hypertension, traders

Introduction

Hypertension and diabetes rank high among cardiovascular risk factors with the most increase in prevalence in the Sub-Saharan region over the past few decades.[1] A majority of the global burden of non communicable diseases (NCDs) is already occurring in low-income and middle-income countries at present, with cardiovascular diseases (CVDs) accounting for a significant proportion.[2-5] Africans` mortality rates from CVDs such as heart attack and stroke are higher compared to other ethnic groups.[6] The situation is expected to worsen as estimates indicate that the increasing burden of CVD in the coming years will be borne largely by developing countries, as the incidence of CVDs among the developing countries is on the increase contrary to the decreasing trend observed in developed countries.[7] Unfortunately, the health-care systems available in these developing countries, especially in Africa, do not have the requisite levels of preparedness and resources to deal with the increasing morbidity and mortality burden of CVDs.[8-10]

Hypertension is a chronic medical condition in which there is sustained increase in arterial blood pressure.[11,12] It is the most relevant modifiable cardiovascular risk factor and a major global public health challenge.[13,14] The prevalence of

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hypertension is expected to rise by up to 60% in developing countries from 2000 to 2025.[15] Africa has the highest proportion of people affected by hypertension, with many of them undiagnosed and thus mostly untreated or poorly controlled.[16] Nigeria, the most populous country in Africa, contributes a sizeable portion of the total prevalence of hypertension in the continent.[17] Frequently, diabetes and hypertension comorbidity exists with mutual, reciprocal exacerbations as they share common disease pathways.[18-20]

Globally, the incidence of diabetes was estimated to have risen from 108 million to 422 million over the period spanning from 1980 to 2014.[21] Diabetes affects males and females equally, with no evidence of gender-related predisposition.[22] Hypertension and diabetes rank among the top-most modifiable cardiovascular risk factors responsible for mortality associated with NCDs in Africa.[23-26] Alteration in lifestyles such as the adoption of Westernized diet, sedentary living, and changes in population demographics associated with urbanization have been linked to the increase in the rates of diabetes and other NCDs.[27-29]

One of the sustainable development goals (SDGs) is to achieve the reduction of the mortality from NCDs, in the year 2030, by one-third of the level it was in 2015.[30] Accomplishing this goal would need, among other measures, the identification of those who are more at risk in the general population, exploring and monitoring the predictors, and informed adoption of effective measures to beneficially modify the prevalent modifiable risk factors in a given setting.

Some attempts have been made to assess the rate of cardiovascular risk factors in diverse workplace environments.[31,32] The workplace is an integral aspect of the social life of adults, as they spend remarkable portions of their waking hours and productive years in their places of work. Self-employed members of the informal labor sector are unlikely to benefit from the preemployment and periodic medical screening schedules available to those in the organized formal sector in the developing countries saddled with a low rate of awareness of hypertension and blood pressure control.[33] Urban market traders readily fit into the description of such a disadvantaged set. The nature of their work as traders usually involves uninterrupted long work hours with little or no time for rest and leisure. The engaging nature of their work also denies them ample opportunity for regular exercises and promote sedentary living. During their extensive work hours, they lack opportunities for regular medical check-up visits to ascertain their health status, which they are often unaware of, due to the fear of the loss of revenue occasioned by their absence. These constraints contribute to the reported high rate of undiagnosed and poorly treated cardiovascular conditions.[15] Thus, many of the traders are likely to be unaware of their actual cardiovascular risk status, predisposing them to unanticipated cardiovascular complications.

This study is aimed to assess undiagnosed hypertension and diabetes among traders in an urban market in the southern part of Nigeria, determine the agreement between the self-reported and actual profiles regarding hypertension and diabetes, and also identify the predictors of correct awareness of self-statuses regarding hypertension and diabetes. The study hypothesis was that there was no difference between self-reported and actual profile of hypertension and diabetes among urban market traders in Calabar, located in southern Nigeria.

Methods

Study area

The study was conducted at Marian market; an open urban market in Calabar located in the southern parts of Nigeria, during a voluntary health survey in the month of November 2019. The market has about 900 stalls and opens for business during the weekdays and on Saturdays. Calabar is the capital city of Cross River state, famed as a major tourist destination in the country. The population of the city was put at 186,607 for males and 184,415 for females during the last national population census.[34]

Study design

This was a cross-sectional survey which first documented self-reported statuses of hypertension and diabetes and subsequently evaluated for the presence of both conditions among the participants.

Study population

The participants were recruited from traders at the aforementioned market who met the study eligibility criteria. The inclusion criteria for selecting the participants were traders aged 18 years and above who had been conducting their businesses in the market for a period of 6 months and beyond; those who conduct their trading activities in the stalls within the market; those that spend up to 8 hours daily for at least five days per week, trading in the market.

Pregnant women were excluded in a bid to eliminate contributions from pregnancy-induced hypertension and gestational diabetes. Those who do not conduct their business in stalls were excluded.

Sample size determination

This was derived using the formula for estimating simple proportion:[35]

$No = z^2pq/d^2$; where z = standard normal deviate usually set at 1.96, P is the prevalence of hypertension from a previous Nigerian study with a value of 9.7%,[36] $q = 1 - p$, and d = degree of accuracy desired, set at 0.05.

For studies with finite population less than ten thousand:[35]

$Nf = No/1 + No/N$: Where Nf = Minimum sample size for a population less than 10,000; No = Minimum sample size for a population greater than 10,000; N = Actual target population size (There are about 900 stalls in the market).

Substituting the above values, No = 136.

To derive the sample size from the traders (<10,000) who operate in stalls (about 900 stalls) in the urban market: $Nf = No/1 + No/900 = 136/1 + 136/900 = 118.16$.

Hence, the sample size was adjusted to 118 participants.

Sampling method

The traders who met the study inclusion criteria were serially recruited.

Data collection

During this survey conducted over two days in the first week of November 2019, we used a structured interviewer-administered questionnaire to collect data from the consenting participants, including information on their demographic characteristics and self-reported statuses regarding hypertension and diabetes. Subsequently, their blood pressure and random blood sugar values were measured to determine the presence of hypertension and diabetes, respectively.

Blood pressure measurement

This was done with the use of a mercury sphygmomanometer (Accoson, United Kingdom) and a stethoscope (Littmann Lightweight II SE, USA). Each participant was seated comfortably in a chair beside a table on which the sphygmomanometer was placed and adjusted to keep the mercury base at the heart level of the participant. The sphygmomanometer cuff with a size appropriate for the participant's upper arm circumference was wrapped around the upper arm of their right arm. Following the inflation of the cuff to a pressure value of 20mmhg beyond a prior determined value at which the radial pulse became non palpable, the cuff was gradually deflated at the rate of 1 to 2 mmHg per second, with the diaphragm of the stethoscope placed over the brachial artery to listen for the Korotkoff sounds. We used Korotkoff sounds phase 1 and phase 5 to identify the systolic blood pressure and diastolic blood pressure, respectively. Two blood pressure readings were taken 5 min apart for each participant, and the average values documented.

Random blood sugar estimation

The measurement of capillary blood glucose following a needle prick on the tip of the left ring finger was done with the use of a rapid test glucometer machine (Accu-Check Aviva Plus, Roche Diabetes Care, Inc., USA).

Definition of terms

The following definitions were adopted for the study:

Hypertension

Systolic blood pressure value greater than or equal to 140mmHg and or diastolic blood pressure value greater than or equal to 90mmHg.

Systolic blood pressure values of 120 to 139 mmHg and or diastolic blood pressure values of 80 to 89 mmHg were regarded as prehypertension.[37]

Diabetes mellitus

Random blood sugar values of 200 mg/dl (11.1 mmol/L) and above. Random blood sugar values of 140–199 mg/dl (7.8–11 mmol/L) were regarded as prediabetes.[38,39]

Ethical consideration

Approval for the study was obtained from the Ethics and Research Committee of the State Ministry of Health. Permission to use the market was sought from the head of the local traders union. The study was conducted in compliance with the Helsinki declaration of 1975 as revised in 1983 and 2013. The nature and benefits of the survey were explained to the participants, and they were assured of confidentiality. Those discovered to have increased blood pressure and blood sugar values were counselled on dietary and lifestyle changes and referred to nearby primary health-care facilities.

Data analysis

The analysis of data was performed with version 22 of the statistical package for social sciences (SPSS) software (IBM Corp., Armonk, N.Y., USA). Continuous variables were presented as means and standard deviations, and categorical variables reported as proportions. For Inferential statistics, the Chi-square test was used to test the significance of the association between two categorical variables and the Student's *t*-test to test significance between continuous variables. Kappa coefficient was used to determine levels of agreement between the self-reported and identified the occurrence of hypertension and diabetes. The predictors of correct self-report of hypertension and diabetes profiles were determined with binary logistic regression analysis. Two-tailed *P* values were computed, with the level of statistical significance set at $P \leq 0.05$.

Results

The response rate was 89%, with 105 participants fully completing the study. Thirty-three (31.4%) and seventy-two (68.6%) of the traders who participated in the survey were males and females, respectively. The mean age of the respondents was 42.4 ± 12.49 years, with sex-specific mean ages of 43.6 ± 15.26 years and 41.8 ± 11.07 years, for the male and female respondents, respectively ($P = 0.492$). Relevant demographic characteristics of the respondents are shown in Table 1.

Forty-three (41.0%) of the respondents comprising 10 males and 33 females correctly reported their statuses regarding hypertension ($P = 0.133$). Sixty-two (59%) of the respondents, comprising 73.8% of those who did not report that they were hypertensive, were newly discovered to be hypertensive. Nineteen (23.5%) out of the 81 respondents who recorded elevated blood pressure values diagnostic of hypertension were among those who had self-reported to be hypertensive. Only two (9.5%) out of those with a prior history of hypertension had blood pressure values within the normal range, suggesting a high rate of poor blood pressure control among those who knew that they were hypertensive.

Ninety-eight (93.3%) of the respondents comprising 32 males and 66 females correctly reported their statuses regarding diabetes ($P = 0.312$). Seven (6.7%) of the traders, comprising 7.0% of those who did not report that they were diabetic, were newly discovered to be diabetic in the course of our study. One of the eight respondents who had elevated blood

Table 1: The demographic, hypertension and diabetes profiles of the respondents

Variables	Male (n=33), n (%)	Female (n=72), n (%)	Total (n=105), n (%)	P
Age group (years)				
≤20	2 (6.1)	2 (2.8)	4 (3.8)	0.314
21-40	12 (36.4)	35 (48.6)	47 (44.8)	
41-60	15 (45.5)	32 (44.4)	47 (44.8)	
>60	4 (12.1)	3 (4.2)	7 (6.7)	
Educational level				
No formal education	2 (6.1)	12 (16.7)	14 (13.3)	0.191
Primary	8 (24.2)	11 (15.3)	19 (18.1)	
Secondary	13 (39.4)	22 (30.6)	35 (33.3)	
Tertiary	9 (27.3)	17 (23.6)	26 (24.8)	
Postgraduate	1 (3.0)	10 (13.9)	11 (10.5)	
Monthly income (Naira)				
<10,000	5 (15.2)	8 (11.1)	13 (12.4)	0.973
10,000-19,999	6 (18.2)	15 (20.8)	21 (20.0)	
20,000-29,999	5 (15.2)	9 (12.5)	14 (13.3)	
30,000-39,999	5 (15.2)	9 (12.5)	14 (13.3)	
40,000-49,999	3 (9.1)	8 (11.1)	11 (10.5)	
>50,000	9 (25.9)	23 (31.9)	32 (30.5)	
Prehypertension	1 (3.0)	6 (8.3)	7 (6.7)	0.875
Hypertension				
Overall	28 (84.8)	55 (76.4)	83 (79.0)	0.323
As measured	28 (84.8)	53 (73.6)	81 (77.1)	0.203
Self-reported	5 (15.2)	16 (22.2)	21 (20.0)	0.400
Newly diagnosed	23 (69.7)	39 (54.2)	62 (59.0)	0.133
Prediabetes	1 (3.0)	3 (4.2)	4 (3.8)	0.778
Diabetes				
Overall	2 (6.1)	10 (13.9)	12 (11.4)	0.242
As identified	1 (3.0)	7 (9.7)	8 (7.6)	0.230
Self-reported	1 (3.0)	4 (5.6)	5 (4.8)	0.573
Newly diagnosed	1 (3.0)	6 (8.3)	7 (6.7)	0.312

sugar levels, diagnostic of diabetes, was among those who self-reported to having a prior diagnosis of diabetes. Four out of those five respondents with prior history of diabetes had normal blood sugar levels suggesting a good rate of blood sugar control among those respondents who knew that they were diabetic. The profile of hypertension and diabetes among the respondents are also shown in Table 1.

Twelve (11.4%) of the respondents were found to have elevated blood pressure and blood sugar levels indicating diagnostic of hypertension and diabetes comorbidity. Six (5.7%) of the traders were newly discovered to have hypertension and diabetes comorbidity.

Out of the five respondents who gave a self-report of being diabetic, four were also among those who self-reported to be hypertensive, constituting 19.0% of those with prior history of hypertension; whereas, the remaining one of the respondents who self-reported to be diabetic was newly diagnosed to be hypertensive during the survey. An additional two (9.5%) of those who gave a history of hypertension were newly discovered to have co-existing diabetes in the course of our survey.

There was no agreement between the self-reported and actual profiles of hypertension among the respondents (kappa = 0.000, P = 0.008). There was a moderate level of agreement between the self-reported and actual profiles of diabetes among the respondents (kappa = 0.559, P < 0.001).

Educational level was the identified predictor of correct self-report of status regarding hypertension (P = 0.031); whereas, no determinant was identified for correct self-report of diabetes status by the traders. Tables 2 and 3, respectively.

Discussion

The preponderance of female participants in the health survey reinforces the previously established pattern of preferential attendance to health-related activities, which indicates that women are more likely than men to actively participate in health promotion campaigns in our communities.[40,41] This knowledge should be exploited in the design and organization of health promotion outreaches to optimize the attainment of desired effects. Besides the behavioral tendency aforementioned, previous health surveys involving traders in the market place had opined that women constitute a greater proportion of open market traders than men.[32]

Table 2: Predictors of correctly self-reported hypertension profile

Variable	B co-efficient	Significance
Age (years)	0.019	0.292
Sex	−0.693	0.138
Educational level	0.423	0.031
Monthly income	−0.030	0.799
Co-morbid Htn /DM	1.665	0.157
Correct DM self-reported status	2.102	0.143
Constant	−3.881	0.024

Dependent variable: Correct self-report of hypertension status, Htn: Hypertension, DM: Diabetes

Table 3: Predictors of correctly self-reported diabetes profile

Variable	*B* co-efficient	Significance
Age in years	0.071	0.330
Sex	0.075	0.971
Educational level	0.722	0.404
Monthly income	−0.751	0.343
Co-morbid Htn/DM	−23.261	0.995
Correct Htn self-reported status	2.769	0.129
Constant	19.907	0.996

Dependent variable: Correct self-report of diabetes status, Htn: Hypertension, DM: Diabetes

Our observation that less than half of the respondents knew their blood pressure status regarding hypertension, and the large proportion of persons discovered to be hypertensive among those who had reported themselves to be normotensive in this survey, corroborates reports of the existence of a high proportion of undiagnosed hypertension in the sub-Saharan African region.[16] Hypertension has been termed the "silent killer" due to its surreptitious nature; as it shows no early symptoms and is the single most significant risk factor for heart disease, aneurysm, stroke, chronic kidney disease, and hypertensive retinopathy.[42,43]

Although we had expected to find some respondents with unrecognized hypertension, on the basis of previous reports from various sources regarding hypertension in the African region, the remarkably high proportion of hitherto undiagnosed hypertension we found among them was an eye-opener. In fact, the extent of lack of awareness regarding their blood pressure profile was such that we found no level of agreement between the self-reported and actual profiles of hypertension among the traders. Even among the few who knew they were hypertensive, only a small proportion appeared to have a good control of their blood pressure. This situation is unacceptable, considering that hypertension is already a high ranking cause of morbidity and mortality in the region.[14,44] The situation is made more dire by the anticipated disproportionately increasing burden of hypertension and other CVDs in this part of the world.[14]

As we noted earlier, available health-care systems in the resource-constrained African setting do not have adequate level of capacity to cope with the increasing morbidity and mortality burden of CVDs.[7-9] This leaves the investment in preventive measures as a cheaper and more practicable alternative in the region grappling with competing demands for limited resources.

A majority of the respondents knew their status regarding diabetes, and most of those who self-reported to be diabetic appeared to have good glycemic control. However, the survey also revealed some persons with diabetes among those who hitherto did not know their status, having self-reported that they were not diabetic. We obtained some level of agreement, although weak, between the self-reported and actual profiles of diabetes among the respondents.

We thought it somewhat puzzling to observe that being aware of one's profile regarding diabetes did not translate to a better awareness of hypertension status and vice versa; suggesting a general lack of health consciousness among the traders. Perhaps, the seemingly better self-reported knowledge of diabetes profile was occasioned by symptom manifestations, which compelled clinic visits for diagnosis. Although diabetes can be insidious in onset, the symptomatic manifestation such as polyuria can hardly be overlooked by persons who had developed the disease. The impact of symptom manifestation on health-seeking behavior possibly explains the appreciable level of awareness of self-status regarding diabetes among the participants. On the other hand, hypertension is also insidious in onset but largely asymptomatic before the affectation of target organs and the onset of complications, earning it the moniker "the silent killer." The surreptitious nature of hypertension could have influenced the prevailing ignorance of self-status regarding hypertension among the traders.

The survey highlighted the importance of education to the attainment of health-care goals. Despite the high rate of poor awareness of blood pressure profile, having a higher level of education was the identified predictor of correct self-reported status regarding hypertension among the traders.

It is pertinent to recognize the limitations posed by the diagnostic methods we adopted in the study. Blood glucose meters generally have lower levels of accuracy than standard laboratory reference tests, and are considered to have limited values for screening purposes.[45,46] Such devices are accepted as accurate if 95% of the blood glucose results obtained are within 15% of standard laboratory reference measurement.[47] However, the test strips are sensitive to various factors such as temperature, humidity, and contaminants in the test area that could affect the results.[48,49] Similarly, some have raised concerns regarding the accuracy of digital blood pressure devices.[50] Besides, ambulatory and home blood pressure monitoring is recommended to confirm hypertension after initial screening.[51] Our choice of diagnostic methods was partly informed by the ease of usage considering the time constraints posed by the circumstances of the study setting; as the respondents were limited in the time devoted to study participation, in the face of competing time demands from attending to their customers, and other aspects of their trading activities.

We posit that the unacceptably high proportion of respondents, who were unaware of their cardiovascular risk profiles regarding hypertension, and to a lesser extent, diabetes, betrays the poor health screening habits in the general population. Indeed, the health ministry at the various tiers of government in the country lack recommended health screening schedule for the middle-aged and elderly population contrary to the disposition toward the more successful immunization program for the under-fives. Currently, the federal government financed National Health Insurance Scheme which is heavily skewed in favour of workers in the formal sector, has no provisions for health screening and other preventive measures of disease control.

To achieve the SDG of decreasing NCDs,[30] of which CVDs constitute a large proportion,[2-4] requires a pragmatic adaptation of local health policies to meet the peculiar health challenges in our communities.

Conclusion

This study revealed a high rate of undiagnosed hypertension and, to a lesser extent, diabetes among this set of urban market traders. Being highly educated was the identified predictor of correct awareness of self-status regarding hypertension and diabetes profiles. Even among the few who knew that they were hypertensive, a higher proportion had poor control of their blood pressure.

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Conflicts of interest

There are no conflicts of interest.

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