


# BMJ Open Assessment of the level of knowledge, awareness and management of hypertension and diabetes among adults in Imo and Kaduna states, Nigeria: a cross-sectional study

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## ABSTRACT

**Objectives** This study was designed to assess levels of awareness, knowledge, attitude and practices relating to hypertension and diabetes among adults aged 35 years resident in selected communities in Imo and Kaduna states, Nigeria.

**Design** A descriptive cross-sectional study.

**Setting** Selected communities across 14 local government areas in Imo and Kaduna states were included.

**Participants** In total, 824 adults, aged 35 years or older and resident in selected communities where the Access-N project was being implemented in Imo and Kaduna states participated in the study.

**Primary and secondary outcome measures** The study assessed the level of hypertension and diabetes knowledge among the participants. Regular blood pressure (BP) and glucose screening practices were also examined as outcome measures.

**Results** The mean age of the respondents was 48.32 years. In total, 778 (94.4%) and 746 (90.5%) of the respondents were aware of hypertension and diabetes, respectively. The mean hypertension and diabetes knowledge scores ( $\pm$ SD) were 4.99 ( $\pm$ 1.99) and 8.02 ( $\pm$ 2.61), respectively. A total of 326 (41.9%) respondents aware of hypertension had a good knowledge of hypertension while 477 (63.9%) of those aware of diabetes had a good knowledge of diabetes. Levels of hypertension and diabetes knowledge were found to be associated with physical activity and the level of education of the respondents. About two-thirds (62.6%) and less than half (41.5%) of the respondents, respectively check their BP and blood glucose (BG) levels regularly (at least once yearly). Statistically significant associations were observed between age and regular BP and BG level checks.

**Conclusions** Despite the high awareness rate of hypertension and diabetes observed in this study and a relatively good knowledge about the two conditions, unhealthy lifestyle practices and non-regular routine screening abounds among the respondents. Thus, there is a need to improve access to quality information about hypertension and diabetes aimed at motivating adoption of healthy behaviours.

## Strengths and limitations of this study

- This study is the first to provide context to hypertension and diabetes knowledge and awareness across the two regions (southern and northern) of Nigeria represented by Imo and Kaduna states, respectively.
- In this study, the factors that contribute to the level of hypertension and diabetes knowledge, and screening for both conditions were explored among only adult population (at least 35 years old).
- This study did not explore the relationship between the level of hypertension and diabetes knowledge, practices and the prevalence of the two conditions in the study areas.

## INTRODUCTION

Non-communicable diseases (NCDs) are chronic lifelong illnesses<sup>1</sup> and about 41 million people die globally as a result every year. While NCDs are often attributed to affluence and old age, data show that 37% of deaths attributable to NCDs occur among persons of all socioeconomic strata and aged 30–69 years.<sup>1</sup> Generally, it is believed that NCDs affect high-income populations, however, low/middle-income countries (LMICs) are currently experiencing an epidemiological transition from communicable diseases to NCDs. For instance, there is a rising trend in NCD prevalence among LMICs, where more than 75% (32 million) of deaths due to NCDs globally occur. While each year, 85% of deaths due to NCDs among 30–69 years old globally are from LMICs.<sup>1</sup>

Hypertension and diabetes are among the most common types of NCDs that affect people across the globe. It is estimated that 1.13 billion people worldwide have hypertension while 422 million persons were living with diabetes at the end of 2016.<sup>2 3</sup> These two conditions

directly resulted in almost 20 million deaths in 2016 alone.<sup>2,3</sup> Hypertension is one of the risk factors for diabetes; a disease which is a major cause of blindness, kidney failure, heart attacks, stroke and lower limb amputation.<sup>4</sup> By 2030, it is estimated that there would be 39.1 million cases of hypertension among people aged 20 years and above in Nigeria with a prevalence of 30.8%. This is a notable increase from the 20.8 million cases estimated in 2010.<sup>5</sup> Similarly, almost 1.6 million cases of diabetes are estimated to be in Nigeria and the figures are expected to at least double by the end of 2040.<sup>6</sup> These suggest that there is an alarming rising trend of the two conditions in the country and thus, efforts must be geared towards decreasing this trend at all levels.

Although, blood pressure (BP) and glucose levels might begin to rise earlier in life, the risk of hypertension and diabetes are higher in middle age. According to a systematic review, the prevalence of hypertension in Nigeria ranges between 2.1% and 47.2% among adults.<sup>7</sup> More recent studies in the country have reported adults hypertension prevalence between 26.8% and as high as 51.3%.<sup>8–11</sup> The mean ages of the respondents included adults in their late thirties and early forties. Men were reported to have a higher prevalence of between 6.2% and 48.9% compared with a prevalence between 10% and 47.3% among women. Prevalence in rural areas ranged between 4.8% and 43%, while it ranged between 9.5% and 51.6% in urban areas.<sup>7</sup> The WHO Global Report on Diabetes puts the prevalence of Diabetes in Nigeria at 4.3%; 4.4% among men and 4.3% among women.<sup>12</sup> Studies in the country have reported similar and even higher prevalence.<sup>6, 13, 14</sup> A systematic review of studies on the prevalence of Diabetes in Nigeria suggested that about 11.2 million Nigerians (1 out of every 17 adults) are living with the disease.<sup>15</sup>

Despite this high prevalence, the average awareness rate of hypertension in Nigeria is low at 17.4%.<sup>5</sup> Recent cross-sectional studies conducted in Nigeria among residents of rural communities and secondary school students revealed a higher awareness rate of hypertension and diabetes, at least 75% among respondents.<sup>16, 17</sup> However, these studies did not adequately explore the factors that contribute to knowledge as well as routine screening for the two conditions. In order to address the rising incidence and prevalence of hypertension and diabetes in Nigeria, it is important to assess the current understanding and perceptions about both conditions among the public. Few studies in Nigeria have explored the level of knowledge of hypertension and diabetes among Nigerians especially at the community level. This study was conducted as a baseline assessment for the 'Improving access to NCDs management in Nigeria' (Access-N) project being implemented by Society for Family Health, Nigeria a project which aims at improving community knowledge, adoption of healthy lifestyle, care seeking behaviour and access to quality services for hypertension and type 2 diabetes in Imo and Kaduna states of Nigeria. This study therefore sought to assess level of awareness, knowledge, attitude and practices relating to hypertension and diabetes among adults aged 35 years and above who were resident in selected communities

in Imo and Kaduna states prior to roll out of Access-N interventions.

## MATERIALS AND METHODS

### Approach

Access-N is a health promotion project which focuses on two NCDs—hypertension and type 2 diabetes. The project disseminates information on the determinants of these diseases, how to prevent the diseases and available treatment options. The project aims to empower communities to make informed and healthy choices, improve care seeking behaviour, facilitate access and linkage to products and services, working with the private and public health sectors.

The project is being implemented in Imo and Kaduna states. These two states are among the 36 states in Nigeria. Imo state is located in the south eastern part of the country with a population of over 5 million residents spread across 27 local government areas (LGAs) while Kaduna state is in the north-western region and serves as home for more than 8 million individuals across 23 LGAs.<sup>18</sup> The project covers seven LGAs in each state; In Imo state, the LGAs covered include Owerri North, Aboh Mbaise, Obowo, Oru West, Oguta, Njaba and Ngor Okpala LGAs while in Kaduna state, the LGAs include Kaduna North, Kaduna South, Sabon Gari, Igabi, Chikun and Kachia LGAs.

This study was a descriptive cross-sectional study aimed at determining the baseline knowledge, beliefs, perceptions and practices in the project communities prior to the commencement of project interventions.

### Study population

Adult residents aged at least 35 years in the selected communities of the 14 Access-N LGAs in Imo and Kaduna states constituted the study population.

### Sample size estimation

The minimum sample size for this study was calculated as follows:

$$N = \frac{(Z)^2 p(1-p)}{d^2} \text{ (Kish }^{19}, 1965)$$

Where N is the sample size, Z is the level of significance at 95% confidence level which is 1.96, 'p' is the awareness rate of hypertension among adults 18 years and above in Nigeria, which is 17.4%,<sup>5</sup> and d is the tolerance for error (0.05).

$$N = 1.96^2 \times 0.174 \times 0.826 / 0.05^2 \\ N = 220.85$$

Adjusting for a 10% non-response rate

$$N_{\text{new}} = n / (10.10) \\ = 220.85 / 0.9 \\ = 245.4 \approx 246$$

Using a design effect of 2.0 to adjust the sample size:

$$n = 246 \times 2.0 = 492$$

Thus, the minimum sample size was estimated as 492.

### Sampling technique

A multi-stage sampling method was adopted as described in the following sections.

#### Stage 1: selection of catchment area

For the purpose of this study and the Access-N project, a catchment area was defined as an area in an LGA where the project's intervention will be implemented. The catchment areas included in Kaduna state were Kachia town, Sabon Gari, Tudun Wada, Rigachikun, Sabon Tasha, Zaria and Kabala while in Imo state, the catchment areas were Emekuku, Uvuru, Umulogho, Mgbidi, Oguta, Nkume and Logara areas.

#### Stage 2: selection of dwelling structure/households

The Access-N participating health facilities were identified as the starting point in each LGA. A direction (north, south, west or east) of the starting point was randomly selected from the starting points and data collection took place in that particular direction until the last house on that street was reached and then data collection continued in the next street until the minimum target sample size in the catchment area for the particular LGA was met. The target sample size was evenly distributed across the catchment areas, that is,  $492/14 \approx 36$  respondents per catchment area. The first dwelling structure was selected using the day's code method (the summation of the digits of the day's date to get a single digit, eg, on the first day of the month, the day code is 01,  $0+1=1$ , this meant that interviews started at the first house on a particular street). If the structure has more than one household (family), the household to begin from was randomly selected by balloting. Every fifth house was visited in a low-density area and every tenth house in a densely populated area to ensure wide coverage of the catchment area.

#### Stage 3: selection of respondents

Not more than two eligible respondents (men or women aged 35 years and above) were randomly selected for interviews using a Kish selection grid regardless of the population density of a household except in a clustered location. In a clustered location, such as a marketplace, not more than 10% of the total estimated population of eligible respondents in such locations were randomly selected and interviewed.

In total, a sample of 824 residents in the selected communities in Imo and Kaduna states were interviewed. The same eligibility criteria and sampling methodology were used in both states.

#### Study tool

Data were collected using interviewer-administered, semi-structured questionnaire. The questionnaire was divided into four broad sections which include: (i) personal information of the respondents; (ii) awareness and lifestyle related factors for hypertension and diabetes adapted from WHO STEPS survey tool<sup>20</sup>; (iii) hypertension and diabetes awareness of respondents; (iv) knowledge of hypertension and diabetes of respondents. Questions on

knowledge of hypertension and diabetes were modified and adapted from validated questionnaires—16 questions from the STARR County Diabetes Test<sup>21</sup> and 12 questions from the Hypertension Knowledge Test (HKT)<sup>22</sup> following a pretest; see online supplemental appendix 1. These questionnaires have been used in African settings including a Nigerian study, among non-hypertensive and non-diabetic populations.<sup>23–26</sup> For this study, a mean knowledge score of at least half the maximum obtainable scores for hypertension and diabetes; 6.0 and 8.0, respectively were considered to indicate adequate knowledge of the two conditions, respectively while a score less than these were considered to indicate poor knowledge.

#### Data analysis

Data were analysed using SPSS V.20.0. Quantitative data were summarised as means $\pm$ SD, while qualitative data were summarised as frequencies and percentages. Associations between variables were analysed using  $\chi^2$  test; and a p value of  $<0.05$  was considered statistically significant.

For each of the items in the adapted STARR County Diabetes test and the HKT tools, a score of 1 was assigned to correct responses and 0 was assigned to the wrong and 'don't know' responses. Thus, a maximum obtainable score of 16 and 12, respectively for each respondent. The mean knowledge scores for hypertension and diabetes were further categorised as 'good' or 'poor' level of knowledge. For hypertension knowledge, mean scores of 8 and above were categorised as 'good' level of knowledge while scores below 8 were categorised as 'poor' level of knowledge whereas for diabetes knowledge, a mean score of at least 6 was categorised as 'good' level of knowledge while a score below 6 was categorised as 'poor' knowledge.

The respondents who indicated that they check their BP or blood glucose (BG) level at least every year were categorised as regular checkers while those who stated otherwise were categorised as non-regular checkers.

#### Patient and public involvement

The participants were not involved in the development of the research question, outcome measures, design, recruitment and conduct of this study.

## RESULTS

### Sociodemographic characteristics of respondents

The overall response rate in this study was 90.0%; 824 of the 915 eligible participants agreed to participate in the study. Out of the 824 respondents, the majority (367, 44.5%) of the respondents were between the age range of 35–44 years, while 240 (29.1%) were between 45 and 54 years old. The mean age of the respondents was 48.32 years. About half of participants (405, 49.2%) were men while 419 (50.8%) were women. More than half, 471 (57.2%) were resident in Imo state while the rest, 353 (42.8%) were resident in Kaduna state. In terms of educational attainment, 320 (38.8%) had secondary education, 242 (29.4%) had tertiary education while 18 (2.2%) and 87 (10.6%) had Qu'ranic

**Table 1** Sociodemographic characteristics of respondents

Variable (N=824)	Frequency	Percentage
<b>Age (years)</b>		
35–44	367	44.5
45–54	240	29.1
55–64	142	17.2
65 and above	75	9.1
<b>Gender</b>		
Male	405	49.2
Female	419	50.8
<b>State of residence</b>		
Imo	471	57.2
Kaduna	353	42.8
<b>Marital status</b>		
Single	87	10.6
Married	651	79.0
Divorced	17	2.1
Widowed	65	7.9
Separated	4	0.5
<b>Religion</b>		
Christianity	559	67.8
Islam	260	31.6
Others	5	0.6
<b>Highest level of education</b>		
No education	87	10.6
Primary	157	19.1
Secondary	320	38.8
Tertiary	242	29.4
Qur'anic school	18	2.2
<b>Employment status</b>		
Unemployed	125	15.2
Employed	695	84.3
<b>Average monthly income (Naira)</b>		
Below N50 000	554	67.2
N50 000–<N100 000	226	27.4
N100 000–<N200 000	38	4.6
N200 000 and above	6	0.7

and no education, respectively. [Table 1](#) shows the sociodemographic characteristics of the respondents.

### Awareness & lifestyle related practices regarding Hypertension & Diabetes

In total, 778 (94.4%) and 746 (90.5%) of the respondents were aware of hypertension and diabetes, respectively. Among the Imo state residents, 468 (99.4%) of them compared with 310 (87.8%) of the Kaduna state residents has ever heard about hypertension while 466 (98.9%) of the Imo residents compared with 280 (79.3%)

of the Kaduna state respondents have ever heard of diabetes. Less than half (303, 36.8%) of the respondents were alcohol consumers; 271 (89.4%) of whom are resident in Imo state while the rest 32 (10.6%) were resident in Kaduna state. Majority (244, 80.5%) of the alcohol consumers consume at least a bottle of alcohol either daily or weekly as a minimum. Other lifestyle related practices and risk factors for hypertension and diabetes among the respondents are presented in [table 2](#).

### Knowledge of hypertension and diabetes: causes, risk factors, symptoms, complications, prevention and control measures

Stress was reported as a cause of hypertension by 625 (80.3%) of the respondents who were aware of hypertension (356 in Imo and 269 in Kaduna) while 343 (44.1%) of those aware of hypertension stated that it is caused by ageing and 89 (25.9%) of them stated that it is caused by abuse of drugs. Among the 746 respondents who were aware of diabetes, genetics was stated as a cause of diabetes by 455 (61.0%); 285 in Imo and 170 in Kaduna, while 206 (27.6%) of them stated that it is caused as result of insulin resistance (134 in Imo and 72 in Kaduna) and 205 (27.5%) respondents attributed diabetes to ageing. Genetics and high salt intake were indicated as risk factors for developing hypertension among 362 (46.5%) and 372 (47.8%), respectively of the respondents who were aware of hypertension. The perceived causes, risk factors, symptoms, complications and possible prevention/control measures for hypertension and diabetes identified by the respondents who were aware of the two conditions are presented in [table 3](#).

### Knowledge of hypertension and diabetes across sociodemographic characteristics and lifestyle practices

Using the knowledge assessment tools earlier described the respondents' knowledge of hypertension and diabetes (for those aware of the two conditions) was assessed. The mean hypertension knowledge score ( $\pm$ SD) was 4.99 ( $\pm$ 1.99) while the mean diabetes knowledge score was 8.02 ( $\pm$ 2.61). In total, 326 (41.9%) of the respondents who were aware of hypertension had a good knowledge of hypertension while 477 (63.9%) of those aware of diabetes had a good knowledge of diabetes.

Across the age groups, less than 50% of the respondents had a good knowledge of hypertension. More of the respondents aged 45–54 years (105, 45.1%) had a good knowledge of hypertension compared to the other age groups. On the other hand, more than half of the respondents across all age groups (and as high as 68.1% of those aged 65 years and above) showed a good knowledge of diabetes. However, no statistically significant association was found between age and level of hypertension or diabetes knowledge.

The results also showed that a higher proportion of the male respondents (43.3%) had a good knowledge of hypertension compared with the female respondents (40.6%). This was similar to the findings for level of diabetes knowledge where 64.5% of the male respondents

**Table 2** Awareness and lifestyle related practices regarding hypertension and diabetes among respondents

Variable	Frequency	Percentage
Heard about hypertension (N=824)		
Yes	778	94.4
No	46	5.6
Heard about diabetes (N=824)		
Yes	746	90.5
No	78	9.5
Do you currently take alcohol? (N=824)		
Yes	303	36.8
No	521	63.2
Frequency of alcohol consumption among current alcoholics (n=303)		
Occasionally (less than 1 week per month)	59	19.5
Frequently (daily/weekly)	244	80.5
Do you currently smoke? (N=824)		
Yes	66	8.0
No	758	92.0
Frequency of Smoking among current smokers (n=66)		
Occasionally (less than 1 week per month)	26	39.4
Frequently (daily/weekly)	40	60.6
Do you add salt to your food on the table? (N=824)		
Yes	174	21.1
No	650	78.9
Engage in a form of exercise (at least 5 min per week) (N=824)		
Yes	619	75.1
No	205	24.9
Weekly fruits consumption (N=824)		
0–3 days	551	66.9
4–7 days	273	33.1
Weekly vegetables consumption (N=824)		
0–3 days	334	40.5
4–7 days	490	59.5
Family history of hypertension (N=824)		
Yes	363	44.1
No	461	55.9
Family history of diabetes (N=824)		
Yes	171	20.8
No	653	79.3

compared with 63.4% of the female respondents showed a good knowledge, although no statistically significant association was found. Significant association was found between level of hypertension knowledge and level of education ( $\chi^2=59.35$ ,  $p\leq 0.001$ ), employment status ( $\chi^2=8.86$ ,  $p=0.003$ ), physical activity ( $\chi^2=10.08$ ,  $p=0.001$ ),

**Table 3** Respondents' knowledge of hypertension and diabetes: causes, risk factors, signs, complications, prevention and control measures

Item	Hypertension (n=778) (%)	Item	Diabetes (n=746) (%)
<b>Causes</b>		<b>Causes</b>	
Stress	625 (80.3)	Insulin resistance	206 (27.6)
Old age	343 (44.1)	Drug abuse	70 (9.4)
Drug abuse	89 (11.4)	Witchcraft*	59 (7.9)
Anxiety	65 (8.4)	Old age	205 (27.5)
*Witchcraft*	62 (8.0)	Stress	200 (26.8)
Unknown	42 (5.4)	Hereditary	455 (61.0)
		Excess Sugar Intake	122 (16.4)
<b>Risk factors</b>		<b>Risk factors</b>	
Hereditary	362 (46.5)	Hereditary	463 (62.1)
Smoking	87 (11.2)	Smoking	45 (6.0)
Obesity	291 (37.4)	Obesity	261 (35.0)
High fat intake	221 (28.4)	High fat intake	171 (22.9)
Excess alcohol intake	186 (23.9)	Excess alcohol intake	210 (28.2)
High salt intake	372 (47.8)	High salt intake	73 (9.8)
Don't Know	81 (10.4)	Don't know	59 (7.9)
<b>Symptoms</b>		<b>Symptoms</b>	
Headache	657 (84.4)	Frequent urination	550 (73.7)
Dizziness	449 (57.7)	Non-healing wounds	375 (50.3)
Palpitations	434 (55.8)	No signs	34 (4.6)
Poor vision	222 (28.5)		
Don't know	39 (5.0)		
No signs	12 (1.5)		
<b>Complications</b>		<b>Complications</b>	
Stroke	547 (70.3)	Stroke	306 (41.0)
Death	529 (68.0)	Heart failure	208 (27.9)
Heart failure	362 (46.5)	Kidney failure	253 (33.9)
Loss of sight	131 (16.8)	Loss of sight	174 (23.3)
Kidney failure	76 (9.8)	Foot ulcer	243 (32.6)
Don't know	36 (4.6)	Death	528 (70.8)
		Don't know	32 (4.3)
<b>Prevention/control</b>		<b>Prevention/control</b>	
Minimising salt intake	425 (54.6)	Minimising salt intake	139 (18.6)
Reducing intake of fatty foods	253 (32.5)	Reducing intake of fatty foods	219 (29.4)

Continued

Table 3 Continued

Item	Hypertension (n=778) (%)	Item	Diabetes (n=746) (%)
Avoiding excessive intake of alcohol	202 (26.0)	Avoiding excessive intake of alcohol	225 (30.2)
Avoiding smoking	105 (13.5)	Avoiding smoking	73 (9.8)
Regular exercise	447 (57.5)	Regular exercise	462 (61.9)
Taking antihypertensive (drugs)	481 (61.8)	Taking antidiabetics (drugs)	464 (62.2)
Avoiding anxiety	33 (4.2)	Avoiding excess sugar	74 (9.9)
Prayer	6 (0.8)	Don't know	32 (4.3)
Don't know	50 (6.4)		

\*Statistical significance was set at a p-value <0.05

family history of hypertension ( $\chi^2=9.61$ ,  $p=0.002$ ) and family history of diabetes ( $\chi^2=11.80$ ,  $p=0.001$ ). Similarly, Level of education ( $\chi^2=56.09$ ,  $p\leq 0.001$ ), physical activity ( $\chi^2=16.94$ ,  $p\leq 0.001$ ) and adding salt to food on the table ( $\chi^2=12.02$ ,  $p=0.001$ ), respectively, showed statistically significant association with level of diabetes knowledge as seen in table 4.

#### Awareness of hypertension and diabetes status and related management practices

Six hundred and forty-nine (78.8%) of the respondents had ever been screened for high BP by a healthcare provider at some point in time in their life; 393 (60.6%) of them were among the Imo state residents while 256 (39.4%) of them were among the Kaduna state residents. More than half (357, 54.8%) of those who had checked their BP in the past did so between 0 and 3 months prior to the study. One hundred and eighty-seven (22.7%) of the respondents had been diagnosed with hypertension in the past by a healthcare provider; 99 (52.9%) of them were among the Imo state residents while 88 (47.1%) of them were among the Kaduna state residents.

Slightly more than half of the respondents (471, 57.2%) had screened for BG levels; 316 (67.1%) of them were among the Imo state residents while 155 (32.9%) of them were among the Kaduna state residents as shown in table 5.

#### Regular BP/BG check among respondents

In total, 62.6% (516) of respondents check their BP level regularly (at least once yearly) while 41.5% (342) of respondents check their BS level regularly (at least once yearly); 222 (47.1%) of the Imo state residents compared with 120 (34.0%) of the Kaduna state residents ( $\chi^2=14.35$ ,  $p\leq 0.001$ ). According to table 6, the proportion of the

respondents that check their BP level regularly across each age group are as follows; 35–44 years (56.7%), 45–54 years (60.8%), 55–64 years (76.1%), 65 years and above (72.0%). Regular BS check was practiced by 36.5% of respondents aged 35–44 years; 42.9% of those aged 45–44 years; 48.6% of those aged 55–64 years and 52.0% of those at least 65 years old. Statistically significant association was observed between age and regular BP and BG level checks ( $\chi^2=19.64$ ,  $p\leq 0.001$  and  $\chi^2=8.21$ ,  $p=0.042$ , respectively).

Asides age, other variables that were associated with regular BP level check included; level of education ( $\chi^2=30.68$ ,  $p\leq 0.001$ ), Average monthly income ( $\chi^2=17.06$ ,  $p\leq 0.001$ ), Current alcohol consumption ( $\chi^2=4.53$ ,  $p\leq 0.033$ ), family history of hypertension and diabetes ( $\chi^2=11.18$ ,  $p=0.001$  and  $\chi^2=12.51$ ,  $p\leq 0.001$ , respectively) and hypertension knowledge ( $\chi^2=17.87$ ,  $p\leq 0.001$ ) while state of residence ( $\chi^2=14.35$ ,  $p\leq 0.001$ ), level of education ( $\chi^2=25.36$ ,  $p\leq 0.001$ ), average monthly income ( $\chi^2=19.64$ ,  $p\leq 0.001$  and  $\chi^2=19.64$ ), family history of diabetes ( $\chi^2=23.88$ ,  $p\leq 0.001$ ) and hypertension knowledge ( $\chi^2=13.34$ ,  $p\leq 0.001$ ) were also associated with regular BG check.

#### DISCUSSION

At least 9 out of every 10 respondents were aware of both hypertension and diabetes. This is similar to findings in a study by Amadi *et al*<sup>16</sup> where 96% and 92% of the respondents were aware of hypertension and diabetes and another study among secondary school students<sup>27</sup> where about 86% of study respondents were aware of diabetes. The estimated increasing prevalence of the two conditions in the country could be a major reason for the observed high awareness rate; according to WHO, there are increasing cases of diabetes globally from 108 million in 1980 to 422 million in 2014 and with about 1.13 billion people globally currently living with hypertension,<sup>1</sup> the possibility of one or more persons related to the respondents having been diagnosed of either conditions is higher. Similarly, as observed in this study, a significant proportion of the respondents have a direct family history of hypertension or diabetes (44.1% and 20.8% for hypertension and diabetes, respectively).

The major risk factors for cardiovascular diseases and diabetes as identified by the WHO include smoking, harmful alcohol consumption, unhealthy diets and physical inactivity.<sup>28 29</sup> One of these risk factors, harmful alcohol consumption, which is regarded as a modifiable risk factor, was found to be prevalent among our respondents. More than a third of study respondents were alcohol consumers and the rate/frequency of consumption among them was high. Relatively, the general prevalence of harmful alcohol consumption among adults (18 years and above) in Nigeria is 13%.<sup>1</sup> A higher prevalence was observed in this study where about 3 out of every 10 respondents frequently consume alcohol. A study conducted in south eastern

**Table 4** Respondents characteristics and level of hypertension and diabetes knowledge

Variable	Hypertension knowledge (n=778)			Diabetes knowledge (n=746)		
	Good (%) (n=326)	Poor (%) (n=452)	X <sup>2</sup> (P value)	Good (%) (n=477)	Poor (%) (n=269)	X <sup>2</sup> (P value)
<b>Age (years)</b>			<b>3.16 (0.367)</b>			<b>4.39 (0.222)</b>
35–44	143 (42.6)	193 (57.4)		213 (66.4)	108 (33.6)	
45–54	105 (45.1)	128 (54.9)		142 (63.4)	82 (36.6)	
55–64	48 (35.8)	86 (64.2)		73 (56.6)	56 (43.4)	
65 and above	30 (40.0)	45 (60.0)		49 (68.1)	23 (31.9)	
<b>Gender</b>			<b>0.58 (0.445)</b>			<b>0.11 (0.744)</b>
Male	167 (43.3)	219 (56.7)		240 (64.5)	132 (35.5)	
Female	159 (40.6)	233 (59.4)		237 (63.4)	137 (36.6)	
<b>State of residence</b>			<b>2.16 (0.142)</b>			<b>0.39 (0.532)</b>
Imo	206 (44.0)	262 (56.0)		294 (63.1)	172 (36.9)	
Kaduna	120 (38.7)	190 (61.3)		183 (65.4)	97 (34.6)	
<b>Highest level of education</b>			<b>59.35 (&lt;0.001)*</b>			<b>56.09 (&lt;0.001)*</b>
No Education	10 (14.1)	61 (85.9)		29 (50.9)	28 (49.1)	
Primary	56 (39.7)	85 (60.3)		67 (48.9)	70 (51.1)	
Secondary	119 (37.7)	197 (62.3)		192 (62.1)	117 (37.9)	
Tertiary	138 (59.5)	94 (40.5)		186 (80.9)	44 (19.1)	
Qur'anic school	3 (16.7)	15 (83.3)		3 (23.1)	10 (76.9)	
<b>Employment Status</b>			<b>8.86 (0.003)*</b>			<b>1.02 (0.313)</b>
Unemployed	30 (28.6)	75 (71.4)		52 (59.1)	36 (40.9)	
Employed	296 (44.0)	377 (56.0)		425 (64.6)	233 (35.4)	
<b>Currently consume alcohol</b>			<b>2.84 (0.092)</b>			<b>0.193 (0.661)</b>
Yes	137 (45.7)	163 (54.3)		189 (63.0)	111 (37.0)	
No	189 (39.5)	289 (60.5)		288 (64.6)	158 (35.4)	
<b>Currently smoke</b>			<b>0.19 (0.666)</b>			<b>1.95 (0.163)</b>
Yes	26 (39.4)	40 (60.6)		37 (56.1)	29 (43.9)	
No	300 (42.1)	412 (57.9)		440 (64.7)	240 (35.3)	
<b>Physically active</b>			<b>10.08 (0.001)*</b>			<b>16.94 (&lt;0.001)*</b>
Yes	264 (45.1)	321 (54.9)		385 (68.0)	181 (32.0)	
No	62 (32.1)	131 (67.9)		92 (51.1)	88 (48.9)	
<b>Adds salt to food on the table</b>			<b>0.06 (0.804)</b>			<b>12.02 (0.001)*</b>
Yes	67 (41.1)	96 (58.9)		82 (52.2)	75 (47.8)	
No	259 (42.2)	355 (57.8)		395 (67.2)	193 (32.8)	
<b>Family history of hypertension</b>			<b>9.61 (0.002)*</b>			<b>2.78 (0.096)</b>
Yes	170 (47.9)	185 (52.1)		227 (67.2)	111 (32.8)	
No	156 (36.9)	267 (63.1)		250 (61.3)	158 (38.7)	
<b>Family history of diabetes</b>			<b>11.80 (0.001)*</b>			<b>3.04 (0.081)</b>
Yes	88 (53.7)	76 (46.3)		115 (69.7)	50 (30.3)	
No	238 (38.8)	376 (61.2)		362 (62.3)	219 (31.7)	

\*Adjusted Bonferroni correction p value is 0.04.

Nigeria recorded a lower prevalence of about 20% harmful alcohol consumption.<sup>30</sup> The high prevalence of harmful alcohol consumption recorded in our study could be because this study was conducted among individuals aged 35 years and above who are more likely to

be exposed to alcohol and able to afford it. Similarly, unlike in other studies where physically inactivity was reported to be less than 10%,<sup>6 7 30</sup> it was also observed that slightly more than 20% of respondents in this study do not engage in any form of exercise, thereby

**Table 5** Awareness of hypertension and diabetes status and related management practices among respondents

Variable	Imo (%*)	Kaduna (%*)	Total (%†)
<b>Hypertension</b>			
Ever been screened for high blood pressure? (N=824)			
Yes	393 (60.6)	256 (39.4)	649 (78.8)
No	78 (44.6)	97 (55.4)	175 (21.2)
Last blood pressure check (n=649)			
0–3 months ago	237 (66.4)	120 (33.6)	357 (54.8)
4–6 months ago	50 (49.5)	51 (50.5)	101 (15.5)
>6 months ago	106 (55.5)	855 (44.5)	191 (29.7)
Frequency of blood pressure check (n=649)			
At least once in a month	218 (70.1)	93 (29.9)	311 (47.8)
At least once in a year	62 (37.6)	103 (62.4)	165 (25.5)
Occasionally ( <i>when sick</i> )	117 (67.6)	56 (32.4)	173 (26.7)
Ever been diagnosed of high blood pressure? (N=824)			
Yes	99 (52.9)	88 (47.1)	187 (22.7)
No	372 (58.4)	265 (41.6)	637 (77.3)
Were you prescribed medication for your condition? (n=187)			
Yes	88 (59.1)	61 (40.9)	149 (79.7)
No	11 (28.9)	27 (71.1)	38 (20.3)
Do you take you medication regularly? (n=149)			
Yes	61 (53.5)	53 (46.5)	114 (76.5)
No	27 (77.1)	8 (22.9)	35 (23.5)
<b>Diabetes</b>			
Ever been screened for high blood sugar? (N=824)			
Yes	316 (67.1)	155 (32.9)	471 (57.2)
No	155 (43.9)	198 (56.1)	353 (42.8)
Last blood sugar check (n=471)			
0–3 months ago	155 (75.2)	51 (24.8)	206 (43.7)
4–6 months ago	30 (65.2)	16 (34.8)	46 (9.8)
>6 months ago	131 (59.8)	88 (40.2)	219 (46.5)
Frequency of blood sugar check (n=471)			
At least once in a month	150 (82.0)	33 (18.0)	183 (38.9)
At least once in a year	70 (44.6)	87 (55.4)	157 (33.3)
Occasionally ( <i>when sick</i> )	96 (73.3)	35 (26.7)	131 (27.8)
Ever been diagnosed of high blood sugar? (N=824)			
Yes	28 (40.0)	42 (60.0)	70 (8.5)
No	443 (58.8)	311 (41.2)	754 (91.5)
Were you prescribed medication for your condition (n=70)			
Yes	21 (60.0)	14 (40.0)	35 (50.0)
No	7 (20.0)	28 (80.0)	35 (50.0)
Do you take you medication regularly? (n=35)			
Yes	15 (53.6)	13 (46.4)	28 (80.0)
No	6 (85.7)	1 (14.3)	7 (20.0)

\*Percentage of total within group.

†Percentage of total across group.

predisposing them to obesity and subsequently hypertension and diabetes.

According to WHO, diabetes is a lifelong metabolic condition in which BG levels are elevated while hypertension, on the other hand, is a condition which results from persistently raised pressure in the blood vessels.<sup>1</sup> Stress, old age, family history could predispose individuals to both conditions. In this study, a significant proportion of the respondents identified these factors as causes of hypertension and diabetes. Old age, for instance, was identified among at least 20% of the respondents as the cause of hypertension and diabetes. Studies have shown that the prevalence of the two condition increases with age.<sup>5 6 30 31</sup> This belief however encourages a misconception that younger people are not at risk of developing these conditions. Research has shown that young people are also at risk of developing either condition.<sup>1</sup>

Among the nine symptoms of diabetes identified by the American Diabetes Association and the international Diabetes Federation, only two were known by our respondents. These two symptoms could be the most common which are experienced in the respondents' localities. In a study conducted in Nigeria where the respondents were screened for hypertension and diabetes, frequent urination (one of the two symptoms mentioned among our respondents) was reported as one of the common symptoms observed among the diabetic cases and known among students in another study.<sup>16 17</sup> On the other hand, more hypertension symptoms were mentioned by the respondents; which were similar to those reported in a study among hypertensives.<sup>32</sup> This suggests a better knowledge of hypertension symptoms compared with diabetes among our respondents. The higher proportion of individuals who have been diagnosed of high BP (22.7%) compared with high BG (8.5%) observed in this study could be a reason for a better knowledge of hypertension symptoms observed in this study. Also, death was the most common complication of hypertension and diabetes reported among respondents in this study. However, these two conditions do not suddenly result in death if properly managed. It could be inferred that the respondents are aware of a number of deaths resulting from hypertension and diabetes which has made them believe these two conditions are likely to result in death than any other known form of complication.

Based on the validated knowledge test tools for hypertension and diabetes used in this study, more respondents who were aware of hypertension had poor knowledge about the condition while a considerably high proportion (about 6 out of every 10 persons) of those who were aware of diabetes had a good knowledge of the disease. This suggests that misconceptions about the two disease conditions abound. Interventions such as Access-N which focuses on provision of comprehensive hypertension and diabetes education needs to be embraced and encouraged in order to address misconceptions about the two condition; the World Diabetes Foundation sponsored (WDF 10-515) project aimed at promoting primary



**Table 6** Respondents characteristics and regular blood pressure/blood sugar check

Variable	Check BP regularly? (n=824)			Check BS regularly? (n=824)		X <sup>2</sup> (P value)
	Yes (%) (n=516)	No (%) (n=308)	X <sup>2</sup> (P value)	Yes (%) (n=342)	No (%) (n=482)	
<b>Age (years)</b>			<b>19.64 (&lt;0.001)*</b>			<b>8.21 (0.042)*</b>
35–44	208 (56.7)	159 (43.3)		134 (36.5)	233 (63.5)	
45–54	146 (60.8)	94 (39.2)		103 (42.9)	137 (57.1)	
55–64	108 (76.1)	34 (23.9)		69 (48.6)	73 (51.4)	
65 & above	54 (72.0)	21 (28.0)		39 (52.0)	36 (48.0)	
<b>Gender</b>			<b>0.40 (0.528)</b>			<b>0.95 (0.329)</b>
Male	258 (63.7)	147 (36.3)		175 (43.2)	230 (56.8)	
Female	258 (61.6)	161 (38.4)		167 (39.9)	252 (60.1)	
<b>State of residence</b>			<b>0.08 (0.777)</b>			<b>14.35 (&lt;0.001)*</b>
Imo	293 (62.2)	178 (37.8)		222 (47.1)	249 (52.1)	
Kaduna	223 (63.2)	130 (36.8)		120 (34.0)	233 (66.0)	
<b>Highest level of education</b>			<b>30.68 (&lt;0.001)*</b>			<b>25.36 (&lt;0.001)*</b>
No education	52 (59.8)	35 (40.2)		24 (27.6)	63 (72.4)	
Primary	91 (58.0)	66 (42.0)		58 (36.9)	99 (63.1)	
Secondary	176 (55.0)	144 (45.0)		127 (39.7)	193 (60.3)	
Tertiary	186 (76.9)	56 (23.1)		129 (53.3)	113 (46.7)	
Qur'anic school	11 (61.1)	7 (38.9)		4 (22.2)	14 (77.8)	
<b>Average monthly income</b>			<b>17.06 (&lt;0.001)*</b>			<b>66.01 (&lt;0.001)*</b>
<N50 000	320 (57.8)	324 (42.2)		176 (31.8)	378 (68.2)	
≥N50 000	196 (72.6)	74 (27.4)		166 (61.5)	104 (38.5)	
<b>Currently consume alcohol</b>			<b>4.53 (0.033)*</b>			<b>6.39 (0.11)</b>
Yes	204 (67.3)	99 (32.7)		143 (47.2)	160 (52.8)	
No	312 (59.9)	209 (40.1)		199 (38.2)	322 (61.8)	
<b>Currently smoke</b>			<b>0.12 (0.724)</b>			<b>1.97 (0.160)</b>
Yes	40 (60.6)	26 (29.4)		22 (33.3)	44 (66.7)	
No	476 (62.8)	282 (37.2)		320 (44.4)	438 (57.8)	
<b>Physically active</b>			<b>1.21 (0.270)</b>			<b>0.41 (0.522)</b>
Yes	381 (61.6)	238 (38.4)		253 (40.9)	366 (59.1)	
No	135 (65.9)	70 (34.1)		89 (43.3)	116 (56.6)	
<b>Family history of hypertension</b>			<b>11.18 (0.001)*</b>			<b>1.27 (0.259)</b>
Yes	251 (69.0)	113 (31.0)		159 (43.7)	205 (56.3)	
No	265 (57.6)	195 (42.4)		183 (39.8)	277 (60.2)	
<b>Family history of diabetes</b>			<b>12.51 (&lt;0.001)*</b>			<b>23.88 (&lt;0.001)*</b>
Yes	127 (74.3)	44 (25.7)		99 (57.9)	72 (42.1)	
No	389 (59.6)	264 (40.4)		243 (37.2)	410 (62.8)	
<b>Hypertension knowledge</b>			<b>17.87 (&lt;0.001)*</b>			<b>13.34 (&lt;0.001)*</b>
Good	259 (70.6)	108 (29.4)		178 (48.5)	189 (51.5)	
Poor	257 (56.2)	200 (43.8)		164 (35.9)	293 (64.1)	
<b>Diabetes knowledge</b>			<b>0.43 (0.514)</b>			<b>2.76 (0.097)</b>
Good	336 (65.2)	179 (34.8)		232 (45.0)	283 (55.0)	
Poor	173 (62.9)	102 (37.1)		107 (38.9)	168 (61.1)	

\*Adjusted Bonferroni correction p value is 0.04.

prevention of NCDs among secondary school students is a typical example of the effectiveness of health education in improving hypertension and diabetes knowledge.<sup>27</sup> A

significant increase in hypertension and diabetes awareness and knowledge was observed among the beneficiaries of the project compared with the non-beneficiaries.

Previous studies have also reported a poor knowledge of the two conditions, especially diabetes.<sup>33 34</sup>

High levels of education and physical activity were associated with improved knowledge of hypertension and diabetes. More proportions of individuals that had a higher level of education and those who were physically active had a good knowledge of the two conditions. Educational status has been reported to have a statistically significant relationship with both hypertension and diabetes knowledge.<sup>34</sup> It is important that interventions such as Access-N targeted at improving level of knowledge about the two conditions should focus more on people with lower level of education and those who do not regularly engage in any form of physical activity as there is a significant knowledge gap among them. In the Access-N project information, education and communication materials are made available in local languages in implementing states for ease of understanding among residents while inter-personal communication agents on the project (working in selected communities) are also native speakers of local dialects in the implementing communities, and focus interventions on more vulnerable populations.

Our study failed to identify a definite pattern in the levels of knowledge of hypertension and diabetes across the two states; among those who were aware of either of the two conditions. While more Imo state residents had a good knowledge of hypertension than the Kaduna state residents, the reverse was the case for diabetes knowledge. Also, no association was found between state of residence and level of hypertension and diabetes knowledge. Across both states, both urban and rural LGAs were included in the study which are likely to have similar demographic characteristics. This could be a reason for this observation as a similar trend was also observed with state of residents and regular BP and BG checks.

BP check is part of routine assessment for outpatients in Nigeria regardless of patients' presentation<sup>35</sup> unlike diabetes. Thus, a higher proportion of hypertension screening compared with diabetes reported in this study appears to be plausible. It was however observed that less than two-thirds of these persons check their BP or BG status at least once every year. This is particularly low as it is recommended that regular monitoring of BP and glucose levels is necessary to prevent the progression of hypertension and diabetes.<sup>36 37</sup> Regular checks for BP and glucose levels is very important to ensure early detection of hypertension and diabetes as most patients become aware of their status at late stages where disease progression and complications are difficult to monitor.<sup>38</sup> Findings from this study shows a need to encourage regular BP and BG checks among adults as they are at higher risk of developing high BG and BP levels.

The prevalence of self-reported hypertension diagnosis (22.7%) among the respondents in this study was higher than self-reported diabetes diagnosis (8.5%). This finding is within the range of reports from other studies where previously reported hypertension and diabetes diagnosis

were between 10%–32% and 6%–35%, respectively.<sup>6 16 30</sup> In comparison to WHO national prevalence (18% for hypertension and 4.3% for diabetes),<sup>1</sup> the prevalence of hypertension and diabetes in this study appears to be higher. Although the prevalence in this study is based on report by the respondents and not actual screening for either condition, the inclusion of only adults age 35 years and above in this study could be responsible for the higher prevalence observed. However, this study further establishes a higher prevalence of hypertension compared with diabetes in Nigeria. Also, it was observed in this study that adherence to medication was high among the previously diagnosed cases for both conditions. This is higher than the findings in other studies where a lower percentage of the respondents reported to adhere strictly to their medication as prescribed.<sup>16 34</sup> These other studies included the study population as the denominator in calculating the proportion of respondents that adhere to their medication unlike in our study where only previously diagnosed persons were included in our calculation. This could have contributed to the higher proportion recorded in our study. However, the reasons stated by those not adhering to their treatment (which included pill burden, perceived controlled BP/BG levels, use of herbal mixtures) were similar to the finding from these other studies.<sup>16 34</sup>

A closer look at the factors that contribute to regular BP and BG checks showed an association with age, average monthly income, level of education and knowledge of hypertension. A higher proportion of the respondents who were older, earned more on the average every month, had a higher level of education and those who had a good knowledge of hypertension tend to check their BP and glucose levels regularly compared with those who were younger, earned less income monthly, had a lower level of education and those who had a poor knowledge of hypertension. The risk of hypertension and diabetes have been shown to increase with increasing age.<sup>5 6</sup> Thus, older people are more likely to be aware to be required to conduct routine BP and BG checks compared with younger people.

Also, the cost of these tests could be a deterrent for people that earn lesser monthly income to regularly request to perform them. Educated people are likely to be more knowledgeable about hypertension and diabetes as observed in this study. This could be a major reason why a higher proportion of those with a level of education compared with those with none or lower level of education check their BP and glucose levels regularly. Interventions such as Access-N will need to focus more on increasing knowledge about hypertension and diabetes especially among younger adults and low-income earners in order to encourage regular screening tests for the two conditions among them at a subsidised cost. Although at the national level, the benefit package of the National Health Insurance Scheme (NHIS) covers general outpatient care services including BP and BG tests, only the formal sector of the economy is covered. There is a need for the NHIS and additional financing mechanisms

such as State Health Insurance schemes, community based social health insurance programmes and health subsidy programmes to cater for the informal sector of the economy (which include people with lower level of education and low-income earners).

This study did not explore the relationship between the level of hypertension and diabetes knowledge, practices, and the prevalence of the two conditions in the study areas. This was because the study design did not include screening of the respondents; only self-reported diagnosis data were collected. Although this observation does not invalidate the findings of this study, further studies should consider hypertension and diabetes screening in order to explore the relationship between lifestyle practices and prevalence of hypertension and diabetes.

## CONCLUSION

Despite the high level of awareness of hypertension and diabetes observed in this study, knowledge about the two conditions remains inadequate. The inadequate knowledge of the two conditions has encouraged the observed prevalence of modifiable risk factors for these conditions such as smoking, alcohol consumption and lack of physical activity among our respondents. This is despite their higher risk for both conditions owing to their older age (35 years and above) and reported family histories for both conditions by a significant proportion of study respondents. Educational status and physical activity were found to be associated with the level of knowledge of both hypertension and diabetes while increasing age, educational status, average monthly income and level of knowledge were associated with regularity/frequency of screening for the two conditions. Thus, there is a need to improve access to quality information about hypertension and diabetes to enhance behaviour change especially among people with little or no education while regular testing should also be encouraged, especially for diabetes at least once in a year. Government and donor funded programmes should consider subsidising the test costs to encourage testing among low-income earners.

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