Prevalence, Awareness and Factors Associated with Hypertension among Adult Residents in Lagos: A Population Based Study

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Authors' contributions

Article Information

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ABSTRACT

Background: Hypertension is a global public health problem in both developed and developing countries. It is estimated that 75% of the world hypertensive patients in 2025 will be in developing

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countries including Nigeria. There is need to understand the nature of the epidemic and institute control measures to reverse the increasing tide of the disease in developing countries.

Methodology: A descriptive cross-sectional survey carried out among Lagos residents between May and June 2012 in four Local Government Areas namely Alimosho, Mushin, Ajegunle/Ifelodun and Kosofe. The study variables were age, sex, occupation, education, marital status, religion and BMI while the outcome variable were frequency of hypertension and mean blood pressure. Statistical analysis included the use of proportions, percentages, chi-square, 't' test and logistic regression using SPSS version 21

Results: A total of 4088 adults aged between 20-81 years (male = 1465 and females= 2623) were included in this study. The overall prevalence of hypertension was 40.9%. Hypertension increased with age in both males and females. Of the 1673 respondents identified as having hypertension, only 316 (18.9%) respondents were previously aware of their diagnosis. Of the 316 known hypertensive patients, only 20 (6.3%) had their blood pressure within the normal range. Age, gender, marital status and BMI were socio-demographic factors associated with hypertension.

Conclusion: The prevalence of hypertension and obesity were found to be high in Lagos state. The need for public health actions to avert the consequences of the high prevalence of hypertension.cannot be over-emphasized.

1. INTRODUCTION

Hypertension is regarded as a major public health problem and a major cause of morbidity and mortality in adults [1]. High blood pressure is responsible for one in every eight deaths globally and has become the third leading cause of death worldwide [2]. In 2000, it was estimated that about a billion people worldwide had high blood pressure with an overall prevalence rate of 25% among the adult population. This number is expected to rise to 1.56 billion (about a third of the world's population) by the year 2025 [3]. Earlier studies on hypertension in Lagos state in the 60's reported a prevalence rate of 8.8-8.9% using blood pressure of 160/90mmHg as cut off values for defining hypertension [4,5]. In 2003, the first population based study conducted in Lagos (in which 140/90 mmHg was used as the cut off point for the definition of hypertension) reported an overall prevalence rate of 34.8% (36.3% in males and 33.5% in females) [6]. This rate was higher than the 12.1-21% obtained in similar community based studies carried out in contiguous states in the country within the same time frame [7,8], but higher than the national average of 10.7-14.5%, [9,10]. Lagos state with an estimated population of over 21 million [11] is currently being suggested as one of the most populated city in Africa. It is the commercial nerve centre of Nigeria and like other metropolitan cities of the world; many people migrate to the city from the rural areas in search of greener pastures. With increasing urbanization of the state like many cities of the world, there is a tendency for the consumption of energy rich foods and decrease in energy expenditure (through less physical activity) which could encourage the development of non-communicable diseases such as hypertension [12]. Hypertension has been identified as the number one risk factor for stroke, heart failure, ischemic heart disease and kidney failure in Nigeria [13]. These complications can be prevented if people are aware of the disease and undergo routine screening for its early detection. However there is lack of data reflecting the current scenario of the population based prevalence in Lagos. This study was therefore carried out to fill this gap in knowledge.

2. METHODOLOGY

The study was a descriptive cross-sectional survey of apparently healthy adult residents in Lagos state as part of the national tuberculosis prevalence survey carried out between May and June 2012. According to official report from the Lagos state government, Lagos state has an estimated population of over 21 million and a growth rate of 8%. It is home to about 37% of Nigeria's urban population. The study was carried out in four of the twenty Local Government Areas (LGAs) of the state namely Alimosho, Mushin, Ajegunle/Ifelodun and Kosofe LGAs. Sample size was determined using the formula for cross sectional study ($n = Z^2pq/d^2$). The prevalence (34.8%) of hypertension obtained during the first population based study in Lagos [6] and a 98% precision (d) was used. A design effect of 1.5 was also used to compensate for the cluster random sampling

method utilized in the study. A non-response rate of 20% was also used in the calculation of the final sample size which gave a total sample size of 4085.

Before the commencement of the study, advocacy visits were carried out to the Local Government Chairmen and the Medical Officers of Health of the selected LGAs. In each of the LGAs, the study areas were selected in conjunction with the Local Government Authorities and officials of the National Population Commission as part of a larger National TB prevalence survey in the country. One enumeration area (EA) was randomly selected in each LGA from a list containing all the enumeration areas in the selected LGAs obtained from the National Population Commission (NPC). Apparently healthy adults aged 20 years and above who have resided in the selected locality/ area for at least 2 weeks before commencement of the study were consecutively recruited from house to house in the selected EA. Recruitment of participants was extended to the adjoining EA in the event that 700 eligible participants were not obtained from the selected EA. Both verbal and written consent were obtained from participants and a pro-forma was used to collect information such as age, sex, history of hypertension e.t.c from the respondents. The diagnosis of hypertension was based on systolic blood pressure (BP) ≥ 140 mmHg or a diastolic blood pressure of ≥ 90 mmHg or both, and/or concomitant use of antihypertensive medications according to the WHO/ISH guidelines [14]. The Joint National Committee on prevention, detection, evaluation, and treatment of High Blood Pressure *(JNC 7)* classified hypertension as follows:

- Normal: systolic BP <120 and diastolic BP <80
- Prehypertension: SBP 120-139 or DBP 80-89
- Stage 1 hypertension: SBP 140-159 or DBP 90-99
- Stage 2 hypertension: SBP ≥160 or DBP ≥ 100 (7)

Respondents were allowed to rest for at least 10 minutes at a designated base station within the selected EAs usually a school or the town hall. Resting blood pressure was taken using an appropriate cuff size electronic sphygmomanometer. Three readings were taken and the mean was calculated to be the reading for each respondent. Body weight was measured

in kilograms to the nearest 0.1 kg with respondents bare footed, with no caps nor head gear on. The corresponding height of respondents was measured in centimeter and later converted to metre using a stadiometre without shoes. The Body Mass Index (BMI) was calculated using weight in kilogram divided by the square of the height in metre. The BMI was classified using the WHO classification [15]. BMI <18.5 kg/m^2 was regarded as underweight, BMI 18.5-24.9 kg/m^2 as normal, BMI 25-29.9 kg/m^2 as overweight and BMI ≥30 kg/m^2 was classified as obesity. Class I obesity was defined as BMI 30.0-34.9 kg/m^2, class II 35.0-39.9 kg/m^2 and Class III or extreme obesity BMI ≥ 40 kg/m^2.

Data was analyzed using IBM SPSS version 21 statistical software. Percentages, mean and standard deviation of numerical variables were determined; chi square test was used to evaluate differences between categorical variables, while Student "t"-test was used to compare means of numerical variables. Pearson's correlation was used to determine the relationship between numeric variables. Logistic regression was performed to assess the predictors of hypertension in the respondents. All the predictor variables were entered into the regression model at once to assess their predictive ability while controlling for the effects of other predictors in the model. Confidence interval for all statistical tests was set at 95%. Statistical tests were considered significant when P<.05.

3. RESULTS

A total of 4088 respondents participated in this study. Male to female ratio was 1:1.8. The majority of the respondents were in the age group 20-39 years (53.4%), while 4.6% were above 69 years. A larger proportion of respondents had secondary school education (42%) while 12.5% had no formal education. Over half of respondents were christians (57.2%), married (71.8%) and were engaged in petty trading. Majority of the respondents had normal weight (42.2%), 31.4% were overweight while 23.2% were obese. However, only 3.2% of respondents were underweight as shown in Table 1.

The prevalence of hypertension found in this study was 40.9%. Both systolic and diastolic BP increased with age in males and females. The mean systolic blood pressure increased in males and females from 134.87±15.12 mmHg and 123.78±16.02 respectively in the age group 20 –

29 years to 152.9±27.2 mmHg and 155.74±30.6 mmHg respectively in those 70 years and above. There was significant difference in the mean systolic blood pressure between the males and females in the age groups 20-29 years and 30-39 years (P=.05). The mean systolic and diastolic blood pressure of males and females increased with age. Overall, the males have significantly higher systolic blood pressure while the females have significantly higher diastolic blood pressure (P=.001) as shown in Table 2.

Table 1. Socio demographic characteristics of respondents by gender

Variable	Male n =1465 (%)	Female n =2623(%)	Total n = 4088 (%)
Age group			
20 – 29	411 (28.1)	686 (26.2)	1097 (26.8)
30 – 39	340 (23.2	746 (28.4)	1086 (26.6)
40 – 49	276 (18.8)	521 (19.9)	797 (19.5)
50 – 59	208 (14.2)	378 (14.4)	586 (14.3)
60 – 69	134 (9.1)	198 (7.5)	332 (8.1)
70 and above	96 (6.6)	94 (3.6)	190 (4.6)
Mean±SD	41.5±15.7	40.1±13.7	40.6±14.4
Education			
None	110 (7.3)	400 (15.2)	510 (12.5)
Primary	342 (23.3)	655 (25.0)	997 (24.4)
Secondary	619 (42.3)	1096 (41.8)	1715 (42.0)
Tertiary	394 (26.9)	472 (18.0)	866 (21.2)
Religion			
Christianity	856 (58.4)	1483 (56.5)	2339 (57.2)
Islam	609 (41.6)	1124 (42.9)	1733 (42.4)
Others	0 (0.0)	16 (0.6)	16 (0.4)
Marital status			
Single	473 (32.3)	330 (12.6)	803 (19.6)
Married	952 (65.0)	1983 (75.6)	2935 (71.8)
Separated	12 (0.8)	42 (1.6)	54 (1.3)
Divorced	2 (0.1)	12 (0.5)	14 (0.3)
Widowed	26 (1.8)	256 (9.8)	282 (6.9)
BMI			
Underweight	63 (4.3)	66 (2.5)	129 (3.2)
Normal	830 (56.7)	895 (34.1)	1725 (42.2)
Overweight	430 (29.4)	855 (32.6)	1285 931.4)
Obese	142 (9.7)	807 (30.8)	940 (23.2)
Occupation			
Trader	310 (21.1)	1461 (55.7)	1771 (43.3)
Artisan	537 (36.7)	472 (18.0)	1009 (24.7)
Student	140 (9.6)	172 (6.6)	312 (7.6)
Civil servant	114 (7.7)	182 (6.9)	292 (7.2)
Transport Worker	80 (5.5)	6 (0.2)	86 (2.1)
Unemployed	84 (5.7)	184 (7.0)	268 (6.6)
Farmer	12 (0.8)	20 (0.8)	32 (0.8)
Healthcare Worker	12 (0.8)	50 (1.9)	62 (1.5)
Construction worker	54 (3.7)	8 (0.3)	62 (1.5)
Others	122 (8.3)	68 (2.6)	190 (4.6)

Table 2. Distribution of mean systolic and diastolic pressure by age and gender

Age group	Mean systolic BP (mm/Hg)		P	Mean diastolic BP (mm/Hg)		P
	Male	Female		Male	Female	
20 – 29	134.87±15.12	123.78±16.02	<0.001	70.10±9.3	69.91±10.8	0.767
30 – 39	135.64±17.5	129.29±22.2	<0.001	74.43±13.0	75.57±14.8	0.225
40 – 49	139.43±22.5	141.51±28.1	0.333	78.59±14.7	82.66±17.3	0.001
50 – 59	145.55±27.3	147.89±27.6	0.324	79.93±14.0	81.98±15.6	0.115
60 – 69	156.03±25.7	155.56±25.8	0.869	81.10±14.1	82.83±15.3	0.299
≥70	152.9±27.2	155.74±30.6	0.498	77.6±15.7	80.66±15.9	0.184
All	140.6±22.2	135.9±26.0	<0.001	75.6±13.5	77.2±15.5	0.001

Tables 3 and 4, showed the factors associated with hypertension. These include age, BMI, gender and marital status. The mean age and BMI of respondents that were hypertensive were significantly higher than those with normal blood pressure. Logistic regression showed that the males had about 2 fold chance of having hypertension than females (OR 1.9 95% CI 1.58 – 2.17) (Table 5). Among respondents, more females (29.8%) had normal BP than males (14.3%) while a higher proportion of males compared with females had pre-hypertension (39.5% vs. 34.4%) and stage I hypertension (30% vs. 19%) while the proportion of males and females with stage two hypertension were comparable (16.25% vs. 16.8%) as shown in Fig. 1. Among obese respondents a higher proportion of females compared with males had normal blood pressure and pre-hypertension while more males than females had stage I and stage II hypertension Fig. 2. Table 6 shows the correlation between BMI, blood pressure and age. There were significant positive correlations of BMI with both systolic and diastolic blood pressure. This means that BP increases with increase in BMI. Correlation coefficient showed that the relationship of BMI with diastolic BP (0.328) was stronger than systolic BP (0.204). There was also significant positive correlation between age and BMI, but the magnitude of correlation of age with systolic and diastolic BP was stronger than that of BMI.

Of the 1673 respondents identified as having hypertension in this study, only 316 (18.9%) respondents were previously aware of their diagnosis. Among total hypertensive individuals, 20 (6.3%) had their blood pressure under control while 296 (93.7%) had poor control. Of the 1673 respondents diagnosed with hypertension, 1357 (81.1%) were not previously aware of their diagnosis as shown in Fig. 3.

4. DISCUSSION

The prevalence of hypertension in this study was 40.9%. This finding is similar to 44.3% obtained for urban areas in a study conducted in Lagos state [14]. Our finding showed a higher prevalence of hypertension compared with findings from studies conducted in other parts of the country [16-18]. Several community surveys have shown that there was an increase in the prevalence of hypertension in Nigeria [13,17,18]. Non communicable diseases which accounted for 60% of patients admitted into the medical wards of most tertiary institutions in Nigeria are responsible for about 20% of all deaths [19,20]. Studies have shown that adoption of western lifestyle by city dwellers, lack of physical activity or exercise, increased intake of processed foods, increased salt intake, sedentary jobs and obesity are associated with the increased prevalence of hypertension [21,22]. Targeted intervention aimed at reducing the effect of these modifiable risk factors may lead to a reduction in the prevalence of hypertension.

Table 3. Factors association with hypertension among respondents

Variable	Normotensive n = 2415 (%)	Hypertensive n = 1673 (%)	X2	p
Age group				
<40 years	1600 (73.3)	583 (26.7)	391.7	<0.001
≥40 years	815 (42.8)	1090 (57.2)		
BMI				
Underweight/Normal	1251 (67.5)	603 (32.5)	99.0	<0.001
Overweight/Obese	1164 (52.1)	1070 (47.9)		
Gender				
Male	774 (52.8)	691 (47.2)	36.8	<0.001
Female	1641 (62.6)	982 (37.4)		
Education qualification				
None	192 (37.8)	316 (62.2)	158.4	<0.001
Primary	535 (53.7)	462 (46.3)		
Secondary	1084 (63.2)	631 (36.8)		
Tertiary	602 (69.5)	264 (30.5)		
Marital status				
Single	569 (70.9)	234 (29.1)	119.8	<0.001
Married	1718 (58.8)	1217 (41.5)		
Separated/divorced/widowed	128 (36.6)	222 (63.4)		

NB: Hypertension is systolic BP ≥140 mmHg and diastolic BP ≥90 mmHg. Normal BP is systolic BP <140 mmHg and diastolic <90 mmHg

In our study, the proportion of hypertensive population was significantly higher among males (47.2%) than the females (37.4%). This is similar to earlier studies in Lagos [6,23] and elsewhere in the country [24,25]. A meta-analysis on the prevalence of hypertension in Nigeria also showed that men had a slightly higher prevalence rate of hypertension than women [26]. Studies have shown that compared with women, men have psychological stress which predisposes them to hypertension [27,28].

The general prevalence of obesity and overweight/obesity put together was 23.2% and 54.6% respectively. Comparable results were obtained from studies conducted in Lagos [29] and some developed countries [30,31]. A lower prevalence rate of obesity and overweight ranging from 21.4% and 32.8% have been reported in different parts of the country [32-34]. The reasons for a much higher prevalence of obesity in this study may also be related to the effects of urbanization resulting in the increase in the consumption of high energy foods and the lack of physical exercise [12]. In this study women were more obese than men. This is consistent with the findings from many studies [13,32-34]. It is common in many African societies including Nigeria for obesity in women to be associated with good wellbeing and sometimes used as a measure of how they are cared for by their husbands [35]. However, this study showed that a higher proportion of obese respondents with stage I and stage II hypertension were men. Development of hypertension has been shown to be a complex interaction between risk factors such as adoption of western lifestyle by city dwellers, lack of physical activity or exercise, increased intake of processed foods, increased salt intake, sedentary jobs and obesity [21,22]. A study showed that men had higher blood pressure than women not because of work stress per se but men drank more alcohol, ate less healthily but exercised more than women. These "maladaptive" coping strategies were found to be directly related to a high blood pressure [36].

Obesity is one of the most important modifiable risk factors for the development of hypertension. Several studies have reported significant associations between obesity and hypertension [29,33,34]. Obesity is associated with an increased risk of cardiovascular diseases; this is only possible in the presence of hypertension in overweight and obese individuals. The cardiovascular risk is significantly increased only in the presence of hypertension [37]. A World Health Organization report has shown that cardiovascular disease accounted for 9.2% of the total deaths in Africa [38] and by 2025 three quarters of the world hypertensive population will be in developing countries [3]. Early intervention is required for this trend to be averted in our city and other part of the world's developing nations.

Table 4. Mean age and BMI of hypertensive and non hypertensive respondents

Variable	Non hypertensive n = 2415 (%)	Hypertensive n = 1673 (%)	T	P
Mean age	36.5±12.7	46.5±14.7	23.11	<0.001
Mean BMI	25.5±4.7	27.8±6.1	13.67	<0.001

NB: Hypertension is systolic BP≥140 mmHg and diastolic BP≥ 90 mmHg. Non hypertensive is systolic BP <140 mmHg and diastolic < 90 mmHg

Table 5. Predictors of hypertension in respondents

Variable	B	Wald	p	Odds ratio	95%CI
Age	0.049	240.2	<0.001	1.051	1.044 – 1.057
BMI	0.082	136.9	<0.001	1.086	1.071 – 1.101
Male	0.617	59.55	<0.001	1.853	1.584 – 2.168
Single	0.457	5.125	0.024	1.579	1.106 – 2.304

Table 6. Correlation between age, blood pressure and BMI

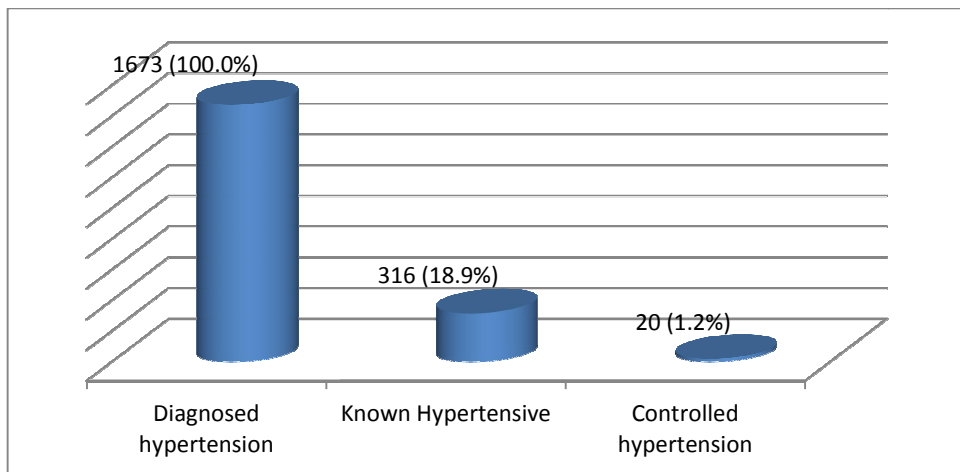| Variable	Pearson's coefficient	P
Systolic blood pressure	0.380	<0.001
Diastolic blood pressure	0.278	<0.001
BMI	0.224	<0.001

Correlation is significant at the 0.001 (2 tailed)
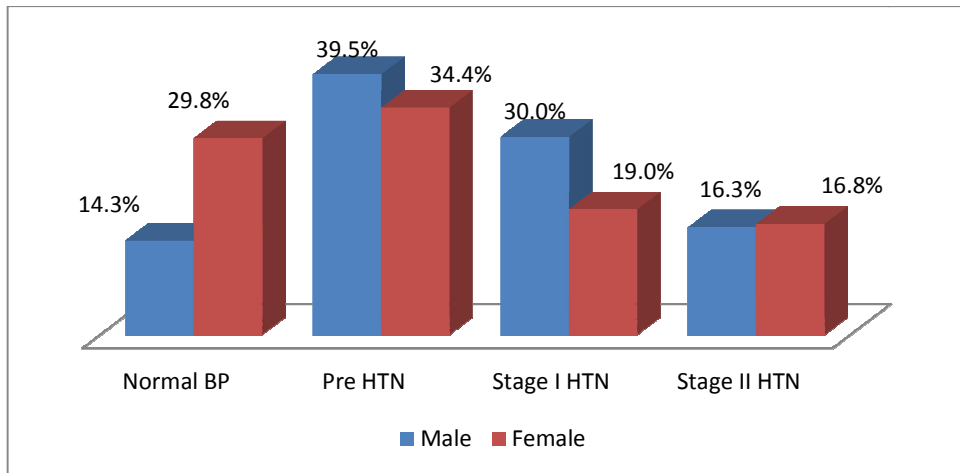
Fig. 1. Distribution of hypertension by sex among respondents
Male N = 1465, Female N = 2623
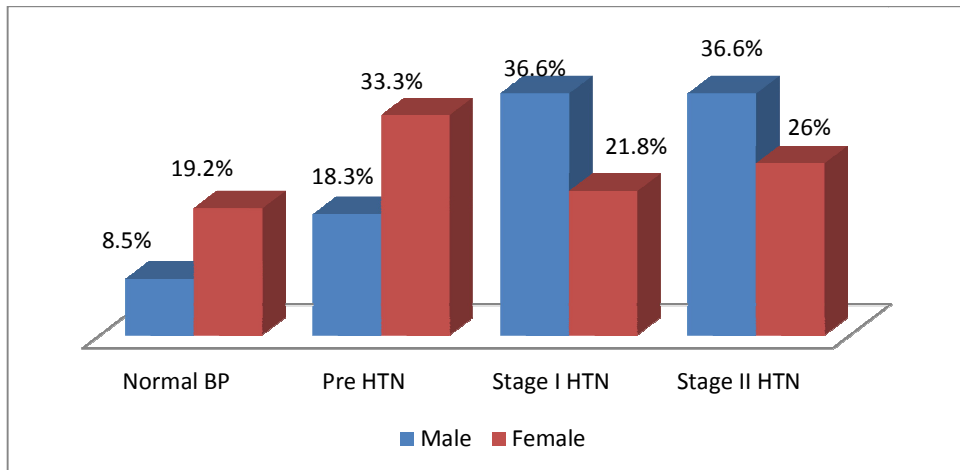
Fig. 2. Distribution of hypertension in obese respondents by sex
Male N =142, Female N = 807

Fig. 3. Awareness of diagnosis and control of hypertension

5. CONCLUSION

Prevalence of hypertension and obesity was found to be high in Lagos state. Policy makers should consider strategies to prevent non communicable diseases in order to avert the consequences of this increasing rate of hypertension.

ETHICAL APPROVAL

Ethical approval was obtained from the Nigerian National Ethics Review Committee.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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