Prevalence, Awareness and Risk Factors for Hypertension in Adults Attending a Tertiary Hospital in South-East Nigeria

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Abstract

Hypertension, a non-communicable disease, is considered a major public health challenge because of its widespread prevalence globally coupled with its huge morbidity and mortality burden, which is largely preventable if early detection and prompt initiation of management are done. Hypertension prevalence is increasing especially in the developing world, despite this, its awareness among the general population is low. This study aimed at determining the prevalence of hypertension among adult attendees of the General Outpatient Clinic of the Federal University Teaching Hospital (FUTH), Owerri, with an assessment of the proportion of hypertensives who were aware of their hypertensive status, and identifying risk factors of hypertension in the study participants. A cross-sectional analytical study was conducted between October and November 2022 at the General Outpatient Clinic of the FUTH, Owerri. A total of 257 consenting and eligible adult patients made up of 135 males and 122 females, aged 18 years and above, were selected by systematic random sampling method. The overall prevalence of hypertension was 34.6%. The prevalence was higher in females than in males (37.7% vs 31.9%, P = 0.325). Among the hypertensive subjects 56.2% had awareness of their hypertensive status. Following a multiple regression analysis, hypertension was independently associated with age, family history of hypertension, occupation (retirees, traders, farmers and the unemployed), and marital status (being widowed). Hypertension is prevalent in our environment; the prevalence rate from this study is higher than in most studies in our environment, suggesting possibly, a rising burden. The results from the study underscore the need for

increased and sustained advocacy for implementation of policies and programs directed at increased detection and management of hypertension in the different population groups such as annual wellness check for employees in the formal sector, largescale dietary and lifestyle adjustments, and know your numbers (an approach to population driven blood pressure check for all adults). Also, health workers should use any opportunity of contact with a patient to screen for hypertension.

Keywords

Hypertension, Prevalence, Awareness, Nigeria

1. Introduction

Non-communicable diseases (NCDs) have continued to attract a lot of attention worldwide, and more so in developing countries since the turn of the 21st century. This is not surprising given the current trend which involves a shift in the pattern of diseases from communicable diseases and nutritional deficiencies as major causes of mortality and morbidity to the NCDs. This shift is explained by the theory of epidemiological transition which focuses on the complex change in patterns of health and disease and on the interactions between these patterns and their demographic, economic and sociologic determinants and consequences [1]. There is a high global burden of hypertension (HTN) with an estimated 1.3 billion people worldwide reported to have hypertension with two out of every three hypertensive subjects' resident in low- and middle-income countries (LMICs) [2]. According to the World Health Organization (WHO), among the regional populations, the African region has the highest prevalence of hypertension put at 27%, which is a major contributor to the burden of hypertension in LMICs; with the high prevalence attributable to an increase in the risk factors for hypertension in Africans in the last five decades [2]. The reported prevalence of hypertension varies in various parts of the world and is probably influenced by many factors including genetic, racial and environmental factors. In the year 2000, high blood pressure was estimated to affect about 972 million persons globally, thus giving a worldwide prevalence of 26.4% in the adult population (26.6% of men and 26.1% of women), with 333 million affected persons in developed countries and 639 million persons in the developing world [3] [4]. It is projected that in the year 2025, 1.56 billion persons will be affected, an increase of 60% from the figure in 2000 [4]. Most of the expected increase in the prevalence of hypertension will occur in the developing countries where nearly three-quarters of all hypertensives will be found by the year 2025 [2].

There has been a recently reported very high increase in prevalence of hypertension in Nigeria between 1995 and 2000 where it increased by over 540% from four million to twenty-eight million individuals [5]. The age adjusted HTN prevalence in 2020 was 32.5% quite higher than the 28% preva-

lence reported 2010 in an earlier study [6]. Murthy *et al.* reported a very high prevalence of hypertension among the Ibos and Nupe communities in the southeast and northcentral at 40.4% and 50.5% in 2013 [7]. Previously, the prevalence of hypertension in the rural communities was low with the burden of the disease associated predominantly with urban dwellers. Recent studies suggest otherwise with the prevalence of hypertension recording an exponential rise in the rural populations, 27.6% was reported in south-east Nigeria in 2023 [8]. Possibly wide spread changes in sociocultural and lifestyle habits that have deeply permeated even the rural communities are responsible for the rising prevalence of hypertension among all adult populations in the country with studies reporting association between socio-demographic and lifestyle factors with hypertension [9].

Owerri, like many other parts of Nigeria, is experiencing rapid developmental and socio-economical changes with associated adoption of western lifestyles, including dietary patterns, which no doubt can impact on the prevalence of NCDs such as hypertension in the populace. A high prevalence of 42.7% was reported in adults in a rural community, a suburb of Owerri in 2021 [10].

Globally, about half (46%) of adults with hypertension are not aware they have the disease [2].

This level of awareness varies considerably in regions and countries of the world. Generally, it is higher in developed countries, with level of awareness ranging between one-half (1/2) to two-thirds (2/3) of hypertensives compared to between one-quarter (1/4) and one-half (1/2) in the developing nations [3]. The apparent "silent" nature of hypertension in most sufferers, contributes to the high level of unawareness among the subjects.

Several risk factors for essential hypertension have been identified and they include older age, a positive family history of hypertension, diabetes, heavy alcohol intake, obesity, excessive dietary salt intake, sedentary lifestyle, cigarette smoking as well as hyperlipidaemia [11] [12]. In a study in Cameroon, independent risk factors for hypertension reported were physical inactivity (Adj. OR 2.6, 95% CI: 1.3 - 4.4, P = 0.021), regular alcohol consumption for more than 10 years (Adj. OR 2.9, 95% CI: 1.6 - 5.1, P = 0.014) and being older than 40 years of age (Adj. OR 2.5, 95% CI: 1.02 - 4.1, P = 0.002 in age category 41 - 60 years while in Nigeria, Increasing age, gender, urban residence and body mass index were independent risk factors (P < 0.001) for hypertension [7].

From the foregoing, the burden of hypertension is increasing in Nigeria especially the south-eastern region. This study therefore set out to assess the prevalence of hypertension and its associated risk factors among patients attending the General Outpatient Clinic, FUTH, Owerri in order to provide information that will serve as a basis for the formulation of policies and strategies to address the disease burden in the population. Assessment of risk factors from the study will serve as a basis for formulation and implementation of strategies aimed at reducing the modifiable risks factors in the general population.

2. Methodology

2.1. Study Area

The research was carried out at the General Outpatient Clinic of the Federal University Teaching Hospital (FUTH), Owerri, Imo state.

2.2. Study Population

The study population included all registered adult patients attending the General Outpatient Clinic (GOPC), FUTH, Owerri.

2.3. Study Duration

Collection of data for the study lasted from February 2023 to May 2023.

2.4. Study Design

This was a hospital-based cross-sectional analytical study.

2.5. Sample Size

Two hundred and fifty-seven (257) participants, calculated using the formula $n = z^2 pq/d$ [13], for sample size estimation for prevalence studies.

2.6. Sampling Method

A systematic random sampling method was used for recruiting patients into the study. An average of 120 adult patients were seen on each of the five working days per week at the GOPC and the average number of hypertensive subjects seen daily was about 10 of the 120 patients. For each day, this gave a sampling interval (k) of 12. The first patient (*x*) for the study, each day, was chosen from the first 12 patients that come on that day by simple random sampling using the balloting technique. Subsequent patients recruited were $x + k$, $x + 2k$ (*i.e. x* + 12, *x* + 24) etc. till the end of the clinic for that day. The procedure was repeated each day until the sample size was attained in 12 weeks.

2.7. Inclusion Criteria

Consenting adult patients attending the General Outpatient Clinic, FUTH, Owerri.

2.8. Exclusion Criteria

Individuals who were too ill to participate in the study. Patients who were unable to provide verbal or written consent. Pregnant women.

2.9. Data Collection

A combination of structured interview and clinical/biochemical measurements was used for data collection. The structured interview was conducted using a questionnaire that was administered by the researchers. A pre-testing of the

questionnaire was done at the medical outpatient clinic of the hospital. Contents of the questionnaire included socio-demographic characteristics of the subjects such as age, gender, marital status, educational level, occupation, questions relating to awareness of blood pressure status and certain risks factors for high blood pressure such as family history of hypertension, smoking, alcohol intake and sedentary lifestyle.

2.10. Statistical Analysis

Data were analysed using SPSS version 22. Statistical significance was taken as a *p*-value less than 0.05.

2.11. Ethical Clearance

This was obtained from the Institutional Ethics Committee of the Federal University Teaching Hospital, Owerri (FUTHO), formerly Federal Medical Centre, Owerri.

3. Results

All 257 participants sampled consented and were recruited into the study giving a 100% response rate. Table 1 and Table 2 summarized the characteristics of the population. Of the 257 respondents, 135 (52.5%) were males while 122 (47.5%) were females. Majority, 136 (53.0%) of the respondents were married, 115 (44.7%) had tertiary education. On lifestyle, only 9 (3.5%) were currently smoking while 123 (47.9%) took alcohol. Forty-six participants (17.9%) had adequate physical activity.

3.1. Socio-Demographic Distribution of Participants

Table 1. Socio-demographic characteristic of respondents.

Characteristic	Frequency	Percentage (%)
Age group (years)		
<25	37	14.4
25 - 34	61	23.7
35 - 44	33	12.8
45 - 54	47	18.3
55 - 64	39	15.2
≥65	40	15.6
Sex		
Male	135	52.5
Female	122	47.5
Marital status		
Single	88	34.2

Continued

Married	136	53.0
Widowed	33	12.8
Educational Status		
No formal education	19	7.4
Primary	63	24.5
Secondary	60	23.4
Tertiary	115	44.7
Occupation		
Artisan	41	16.0
Civil servant	43	16.7
Unemployed	26	10.1
Farming	53	20.6
Trading	22	8.6
Student	50	19.5
Apprentice	3	1.2
Housewife	6	2.3
Retired civil servant	13	5.0

Table 2. Frequency distribution showing lifestyle pattern of the respondents.

Lifestyle	Frequency	Percentage (%)
Smoking status		
Current smoker	9	3.5
Past smoker	23	8.9
Never smoked	225	87.6
Alcohol intake		
No intake	134	52.1
Light-moderate intake	101	39.3
Excessive intake	22	8.6
Physical activity		
Adequate	46	17.9
Inadequate	211	82.1

3.2. Prevalence of Hypertension

A total of seventy-eight respondents presented with blood pressure $\geq$ 140/90 mmHg while eleven are on antihypertensive medications, hence, eighty-nine participants met the criteria for hypertension, thus, giving a prevalence of 34.6%

for hypertension in the study sample (Figure 1).

3.3. Awareness of Hypertension Status

Of the eighty-nine hypertensive subjects, fifty (56.2%) were aware of their hypertension status. Of the fifty, thirty-two (64%) were females while the remaining eighteen (36%) were males. Majority of those who were aware of their hypertensive status (90%, n = 45) were at least 40 years old while the reminder (10%, n = 5) were less than 40 years of age (Figure 2).

3.4. Association between Hypertension and Socio-Demographic Variables

With respect to the association between hypertension and age (Table 3), the prevalence of hypertension increased with increasing age group, being 5.4% in the age group < 25 years and 72.5% in those at least 65 years of age. This was statistically significant (P < 0.001).

The mean age of hypertensive subjects was significantly greater than that of non-hypertensive subjects. The difference in the means of the two groups is statistically significant (T-test value = 7.928, P < 0.001).

The prevalence of hypertension was higher in the females compared to the males but this was not statistically significant (37.7% vs 31.9%, P = 0.325).

The prevalence of hypertension showed an increasing trend moving from the singles group (14.8%), through the married group (39.7%) to the group of widows and widowers (66.7%). This was statistically significant (P < 0.001).

With increasing level of educational attainment, the prevalence of hypertension among the respondents decreased. The prevalence of hypertension was thus
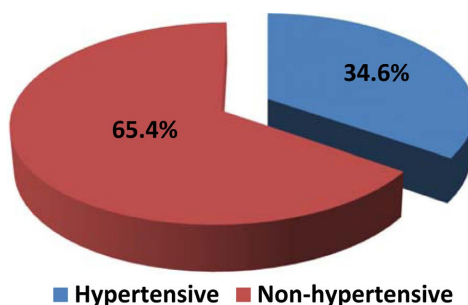

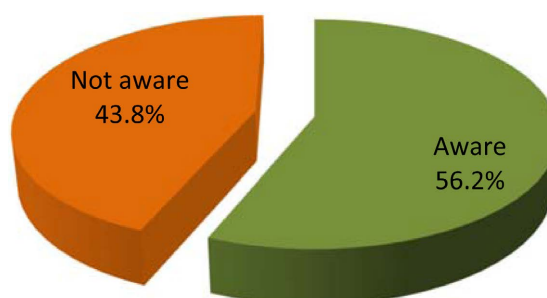**Figure 1.** Pie chart showing the hypertensive status of the respondents.

Figure 2. Pie chart showing awareness of hypertensive status.

Table 3. Association between hypertension and socio-demographic variables.

Variable	Hypertensive	Non-Hypertensive	Total
Age group (years)			
<25	2 (5.4%)	35 (94.6%)	37 (100%)
25- 34	13 (21.3%)	48 (78.7%)	61 (100%)
35 - 44	8 (24.2%)	25 (75.8%)	33 (100%)
45 - 54	16 (34.0%)	31 (66.0%)	47 (100%)
55 - 64	21 (53.8%)	18 (46.2%)	39 (100%)
≥65	29 (72.5%)	11 (27.5%)	40 (100%)
	χ^2 = 52.02, df = 5, P < 0.001*		
Mean age ± SD	54.60 ± 16.55	38.38 ± 15.09	
	T-test = 7.928, P < 0.001*		
Sex			
Male	43 (31.9%)	92 (68.1%)	135 (100%)
Female	46 (37.7%)	76 (62.3%)	122 (100%)
	χ^2 = 0.970, df = 1, P = 0.325		
Marital status			
Single	13 (14.8%)	75 (85.2%)	88 (100%)
Married	54 (39.7%)	82 (60.3%)	136 (100%)
Widowed	22 (66.7%)	11 (33.3%)	33 (100%)
	χ^2 = 31.837, df = 2, P < 0.001*		
Educational level			
No formal education	11 (57.9%)	8 (42.1%)	19 (100%)
Primary	29 (46.0%)	34 (54.0%)	63 (100%)
Secondary	17 (28.3%)	43 (71.7%)	60 (100%)
Tertiary	32 (27.8%)	83 (72.2%)	115 (100%)
	χ^2 = 11.563, df = 3, P = 0.009*		
Occupation			
Artisan	18 (43.9%)	23 (56.1%)	41 (100%)
Civil servant	17 (39.5%)	26 (60.5%)	43 (100%)
Unemployed	8 (30.8%)	18 (69.2%)	26 (100%)
Farming	15 (28.3%)	38 (71.7%)	53 (100%)
Trading	12 (54.5%)	10 (45.5%)	22 (100%)
Student	6 (12.0%)	44 (88.0%)	50 (100%)
Apprentice	0 (0.0%)	3 (100%)	3 (100%)
Housewife	3 (50%)	3 (50%)	6 (100%)
Retired C/S[†]	10 (76.9%)	3 (23.1%)	13 (100%)
	χ^2 = 30.776, df = 8, P < 0.001*		

*Significant, [†]Civil servant.

highest in those with no formal education (57.9%) and least in those with tertiary education (27.8%). This was statistically significant (P = 0.009).

Among the various occupations, the prevalence of hypertension was highest in the retired civil servants followed by artisans (43.9%) and civil servants (39.5%). This was statistically significant (P < 0.001).

3.5. Family History of Hypertension

Of the 257 respondents, 77 (30.0%) had a positive family history of hypertension while the remaining 180 (70%) did not have a family history of hypertension as illustrated in Table 4. Of the 77 respondents with positive family history, 73 had a positive history in first degree relatives while the remaining four had a positive history in second degree relatives.

The prevalence of hypertension was higher in the group with a positive family history of hypertension (46.8%) compared with the group with a negative family history (29.4%). This was statistically significant (P = 0.008).

3.6. Association between Respondents' Co-Morbidities and Hypertension

Thirteen subjects (5.0%) met the diagnostic criteria for diabetes mellitus and, thus, classified as diabetic subjects while the remaining 244 subjects (94.9%) who did not meet the criteria were classified as non-diabetic subjects (Table 5).

On the association between respondents' co-morbidities and hypertension (Table 5), the prevalence of hypertension in the diabetic group was significantly higher than that in the non-diabetic group (76.9% vs 32.4%, P = 0.001).

There were more obese hypertensive subjects (n = 23) than obese non-hypertensive subjects (n = 21), and the prevalence of hypertension in the obese group was significantly higher than that of the non-obese group (52.3% vs 31.0%, P = 0.007).

The mean BMI of hypertensives was greater than that of non-hypertensives. The difference in the means of the two groups, using the Student T-test, was found to be statistically significant (T-test value = 2.849, P = 0.005).

3.7. Association between Lifestyle Patterns of the Respondents and Hypertension

The prevalence of hypertension was highest in those who had never smoked

Table 4. Association between respondents' family history of hypertension and hypertension.

FHH[†]	Hypertensive	Non-hypertensive	Total
Positive	36 (46.8%)	41 (53.2%)	77 (100%)
Negative	53 (29.4%)	127 (70.6%)	180 (100%)
Total	89 (34.6%)	168 (65.4%)	257 (100%)
χ^2 = 7.137, df = 1, P-value = 0.008*			

[†]Family history of hypertension, *Significant.

Table 5. Association between respondents' co-morbidities and hypertension.

Co-morbidity	Hypertensive	Non-hypertensive	Total
Diabetes			
Diabetic	10 (76.9%)	3 (23.1%)	13 (100%)
Non-diabetic	79 (32.4%)	165 (67.6%)	244 (100%)
	χ^2 = 10.819, df = 1, P = 0.001*		
Obesity			
Non-obese (BMI < 30)	66 (31.0%)	147 (69.0%)	213 (100%)
Obese (BMI ≥ 30)	23 (52.3%)	21 (47.7%)	44 (100%)
	χ^2 = 7.299, df = 1, P = 0.007*		
Mean BMI ± SD†	26.23 ± 5.65	24.43 ± 4.30	
	T-test = 2.849, P = 0.005*		

*Significant, †Standard deviation.

Table 6. Association between lifestyle patterns of the respondents and hypertension.

Lifestyle	Hypertensive	Non-hypertensive	Total
Smoking status			
Current smoker	3 (33.3%)	6 (66.7%)	9 (100%)
Past Smoker	7 (30.4%)	16 (69.6%)	23 (100%)
Never Smoked	79 (35.1%)	146 (64.9%)	225 (100%)
	χ^2 = 0.209, df = 2, p = 0.901		
Alcohol intake			
No intake	51 (38.1%)	83 (61.9%)	134 (100%)
Light-moderate intake	31 (30.7%)	70 (69.3%)	101 (100%)
Excessive intake	7 (31.8%)	15 (68.2%)	22 (100%)
	χ^2 = 1.465, df = 2, P = 0.481		
Physical activity			
Adequate	9 (19.6%)	37 (80.4%)	46 (100%)
Inadequate	80 (37.9%)	131 (62.1%)	211 (100%)
	χ^2 = 5.617, df = 1, P = 0.18		

(35.1%) and least in past smokers (30.4%). This was however not statistically significant (Table 6).

The prevalence of hypertension was highest in those who did not take alcohol (38.1%) followed by those who were heavy drinkers (31.8%) while light-moderate drinkers had the lowest prevalence (30.7%). This was however not statistically significant (P = 0.481).

The prevalence of hypertension in the group with inadequate physical activity

was higher than in the group with adequate physical activity (37.9% vs 19.9%). This was however not statistically significant (P = 0.18).

3.8. Logistic Regression of Variables Significantly Associated with Hypertension

From the multiple logistic regression analysis done, age ≥ 40 years (OR 3.85, 95% CI 1.388 - 10.65, P = 0.010), being widowed (OR 2.70, 95% CI 1.02 - 7.17, P = 0.046), being unemployed (OR 6.45, 95% CI 1.42 - 29.48, P = 0.016), farmers (OR 6.41, 95% CI 1.08 - 37.81, P = 0.040), traders (OR 10.10, 95% CI 1.94 - 52.12, P = 0.006), apprentices (OR 9.21, 95% CI 1.47 - 57.69, P = 0.018), retirees (OR 11.67, 95% CI 1.09 - 124.8, P = 0.042) and a positive family history of hypertension (OR 2.67, 95% CI 1.37 - 5.26, P = 0.004) were independently associated with hypertension (Table 7).

Table 7. Multivariable analysis (logistic regression) of variables significantly associated with hypertension.

Variables	O.R.*	95% C.I.*	P-value
Age (years)			
<40 years[+]	1.00		
≥40 years	3.85	1.39 - 10.65	0.010
Marital status			
Single[+]	1.00		
Married	1.86	0.41 - 8.35	0.42
Widowed	2.7	1.02 - 7.17	0.046
Occupation			
Artisan[+]	1.00		
Civil servant	4.28	0.82 - 22.44	0.086
Unemployed	6.45	1.41 - 29.48	0.016
Farming	6.41	1.08 - 27.81	0.04
Trading	10.1	1.94 - 52.12	0.006
Student	5	0.83 - 30.13	0.079
Apprentice	9.21	1.47 - 57.69	0.018
Housewife	312.1	0.00 - 0.00	0.999
Retiree	11.67	1.09- 124.80	0.042
Educational level			
No formal education[+]	1.00		
Primary	0.55	0.12 - 2.50	0.436
Secondary	0.72	0.25 - 2.08	0.544
Tertiary	0.94	0.36 - 2.41	0.89

Continued

Diabetic status			
Non-diabetic[+]	1.00		
Diabetic	0.29	0.07 - 1.23	0.093
Obesity status			
Non-obese[+]	1.00		
Obese	1.94	0.86 - 4.35	0.11
FHH[†]			
Negative[+]	1.00		
Positive	2.67	1.37 - 5.26	0.004
Physical activity			
Adequate[+]	1		
Inadequate	1.58	0.65 - 3.89	0.314

Odds ratio, [x]Confidence interval, [†]Family history of hypertension, [+]Reference groups.

4. Discussion

The prevalence of hypertension from this study was 34.6%. This is higher than the national prevalence of 30.6% and southeast pooled prevalence rate of 33.3% (which incidentally is the highest in the country) reported by Adeola *et al.* in 2020 [5] as well as higher than other prevalence obtained from other hospital-based studies conducted in Nigeria [8] [9] [10] [11] as well as most community-based studies conducted in other parts of the country [14] [15] [16]. The reported prevalence from these other studies was between 11% and 33.3% [14] [15] [16]. The prevalence from this study is however lower than the reported prevalence in two communities in Southeast Nigeria which were 44.5% [9] and 46.4% [10] respectively. The two communities were rural in location, a situation where one would have expected a lower prevalence. The prevalence rate obtained in this study is similar to what has been reported in some European countries [3] [4]. This may be a reflection of the urbanization, developmental changes and well as changes in lifestyle including diet of Owerri and its environs.

The awareness of hypertension status among hypertensives in this study was 56.2%. This is higher than the reported low awareness level in various studies conducted in Nigeria [8] [11]. Awareness levels similar to or even higher than in this study have been reported in North America [17]. The relatively higher level of awareness in this study compared to other local studies may be explained by the fact that being a hospital-based study, most of the patient are likely to have better health seeking behavior.

There was a significant association between marital status and hypertension in this study; the prevalence of hypertension was highest in those who are widowed (66.7%), followed by married respondents (39.7%) while unmarried respondents had the least prevalence (14.8%) [P < 0.001]. Marriage is ideally supposed to be

emotionally and psychologically beneficial especially in Nigeria, but the recent stresses associated with marriage carry with it increased risk of hypertension as some women have to take care of the home [18] in addition to actively working to support the husbands while the men are under immense pressure to make ends meet [19].

Hypertension was significantly associated with the educational status of the respondents (P = 0.009). Those with no formal education had the highest prevalence of hypertension (57.9%) while those with tertiary education had the least prevalence of hypertension (27.8%). It is possible that a higher level of education will reflect in higher health literacy, healthy living and avoidance of high-risk lifestyles. Some studies, however, reported the contrary suggesting that higher education was associated with higher socioeconomic status which may predispose to unhealthy diet, and sedentary lifestyle [17].

With respect to the association between hypertension and socio-demographic variables, the prevalence of hypertensives in each age group increased with increasing age group, being 5.4% in the age group < 25 years and 72.5% in those at least 65 years of age. This was statistically significant (P < 0.001).

A significantly higher prevalence of hypertension was found in those with a positive family history of hypertension compared with those without such a history (46.8% vs 29.4%, P = 0.008). This association has been reported in other studies [20].

A significant association was found between hypertension and obesity in the study. The mean BMI of hypertensives was significantly greater than that of non-hypertensives (26.23 ± 5.65 kg/m vs 24.43 ± 4.30 kg/m^2, P = 0.005). The prevalence of hypertension was significantly higher in the obese compared with the non-obese group (52.3% vs 31.0%, P = 0.007). This association has also been reported elsewhere [17] [18] [19].

From the study, never smokers had the highest prevalence of hypertension (35.1%) followed by current smokers (33.3%) and past smokers having the least prevalence (30.4%). This was however not statistically significant. This is similar to the report by Babangida *et al.* [20].

In this study, the prevalence of hypertension was higher in the group with inadequate physical activity than in the group with adequate physical activity (37.9% vs 19.9%). This was however not statistically significant (P = 0.18). Other studies have also noted a similar association between hypertension and physical activity [19] [20] [21].

There was no statistically significant association between hypertension and alcohol intake in the study: the prevalence of hypertension was highest in those who did not take alcohol (38.1%) and least in light-moderate drinkers (30.7%). The effect of alcohol reduction on blood pressure reduction has been established in a recent systematic review [22].

Following a multiple regression analysis, the following were found to be independently associated with hypertension: age (above 40 years), marital status (widowed), occupation (unemployed, farmers, traders, apprentices and retirees)

and positive family history. Adeyanju *et al.* in a very recent study among company workers in Nigeria reported sex, age, physical activity, BMI, alcohol consumption as independent predictors of hypertension [23]. Olack *et al.* in a study in Kenya found overweight, obesity, current smoking, some level of education, highest wealth index, moderate physical activity, older age and being widowed were each independently associated with hypertension [24].

Limitations of the Study

Our study has some limitations. We relied on the use of self-report for some of the parameters like physical activity level, which may introduce a possibility of recall bias. Our sample size may not be adequate to make a generalization of the result to the southeast Nigeria. Our study is a hospital-based study; hence the reported prevalence may be relatively higher than community-based study. Lastly, this study used a cross-sectional design and the outcome that age (above 40 years), marital status (widowed), occupation (unemployed, farmers, traders, apprentices and retirees) and positive family history, are risk factors for occurrence of hypertension, which seems to suggest cause-effect relationship is fraught with error due to lack of temporality. Temporal relationship offered by longitudinal studies is essential at determination of true risk factors for hypertension.

5. Conclusions

The prevalence of hypertension in patients attending the GOPC, FUTO was 34.6%, a relatively high figure in our environment but comparable to what is obtainable in the developed countries of the world. This may be due in part by urbanization and lifestyle changes currently in our environment. The awareness level of 56.2% is also relatively high compared to other studies in our environment.

Government should strengthen primary health services all over the country so as to enable everyone have access to health care at the basic level with great emphasis on health education, age (above 40 years), marital status (widowed), occupation (unemployed, farmers, traders, apprentices and retirees) and positive family history of hypertension as predictors of hypertension. Health workers should also use every contact with a patient to screen for hypertension.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Omran, A.R. (2005) The Epidemiologic Transition: A Theory of the Epidemiology of Population Change. *The Milbank Quarterly*, **83**, 731-757.
https://doi.org/10.1111/j.1468-0009.2005.00398.x

[2] World Health Organization (2021) Hypertension.
https://www.who.int/news-room/fact-sheets/detail/hypertension

[3] Kearney, P.M., Whelton, M., Reynolds, K., Muntner, P., Whelton, P.K. and He, J. (2005) Global Burden of Hypertension: Analysis of Worldwide Data. *The Lancet*, **365**, 217-223. https://doi.org/10.1016/S0140-6736(05)17741-1

[4] Hajjar, I., Kotchen, J.M. and Kotchen, T.A. (2006) Hypertension: Trends in Prevalence, Incidence and Control. *Annual Review of Public Health*, **27**, 465-490. https://doi.org/10.1146/annurev.publhealth.27.021405.102132

[5] Adeloye, D., Owolabi, E.O., Ojji, D.B., Auta, A., *et al.* (2021) Prevalence, Awareness, Treatment, and Control of Hypertension in Nigeria in 1995 and 2020: A Systematic Analysis of Current Evidence. *The Journal of Clinical Hypertension*, **23**, 963-977·

[6] Adeloye, D., Basquill, C., Aderemi, A.V., Thompson, J.Y. and Obi, F.A. (2015) An Estimate of the Prevalence of Hypertension in Nigeria: A Systematic Review and Meta-Analysis. *Journal of Hypertension*, **33**, 230-242. https://doi.org/10.1097/HJH.0000000000000413

[7] Murthy, G.V., Fox, S., Sivasubramaniam, S., Gilbert, C.E., Mahdi, A.M., Imam, A.U., Entekume, G. and Nigeria National Blindness and Visual Impairment Study Group (2013) Prevalence and Risk Factors for Hypertension and Association with Ethnicity in Nigeria: Results from a National Survey. *Cardiovascular Journal of Africa*, **24**, 344-350. https://doi.org/10.5830/CVJA-2013-058

[8] Ezeala-Adikaibe, B.A., Mbadiwe, C.N., Okafor, U.H., Nwobodo, U.M., Okwara, C.C., Okoli, C.P., *et al.* (2023) Prevalence of Hypertension in a Rural Community in Southeastern Nigeria; an Opportunity for Early Intervention. *Journal of Human Hypertension*, **37**, 694-700. https://doi.org/10.1038/s41371-023-00833-x

[9] Adeke, A.S., Chori, B.S., Neupane, D., Sharman, J.E. and Odili, A.E. (2022) Socio-Demographic and Lifestyle Factors Associated with Hypertension in Nigeria: Results from a Country-Wide Survey. *Journal of Human Hypertension*. https://doi.org/10.1038/s41371-022-00673-1

[10] Ibebuike, J., Vincent, C., Nwagbo, C.O. and Emmanuel, O.E. (2021) Studies on Hypertension and Associated Risk Factors in Ifakala Community, Nworieubi in Mbaitolu Local Government Area Imo State, Nigeria. *EAS Journal of Nursing and Midwifery*, **3**, 261-267.

[11] Princewel, F., Cumber, S.N., Kimbi, J.A., Nkfusai, C.N., Keka, E.I., Viyoff, V.Z., Beteck, T.E., Bede, F., Tsoka-Gwegweni, J.M. and Akum, E.A. (2019) Prevalence and Risk Factors Associated with Hypertension among Adults in a Rural Setting: The Case of Ombe, Cameroon. *The Pan African Medical Journal*, **14**, Article 147. https://doi.org/10.11604/pamj.2019.34.147.17518

[12] Ulasi, I.I., Ijoma, C.K., Onwubere, B.J., Arodiwe, E., Onodugo, O. and Okafor, C. (2011) High Prevalence and Low Awareness of Hypertension in a Market Population in Enugu, Nigeria. *International Journal of Hypertension*, **2011**, Article ID: 869675. https://doi.org/10.4061/2011/869675

[13] Charan, J. and Biswas, T. (2013) How to Calculate Sample Size for Different Study Designs in Medical Research? *Indian Journal of Psychological Medicine*, **35**, 121-126. https://doi.org/10.4103/0253-7176.116232

[14] Ike, S.O. (2009) Prevalence of Hypertension and Its Complications among Medical Admissions at the University of Nigeria Teaching Hospital, Enugu (Study 2). *Nigerian Journal of Medicine: Journal of the National Association of Resident Doctors of Nigeria*, **18**, 68-72.

[15] Ogah, O.S., Madukwe, O.O., Chukwuonye, I.I., Onyeonoro, U.U., Ukegbu, A.U., Akhimien, M.O., Onwubere, B.J. and Okpechi, I.G. (2013) Prevalence and Determinants of Hypertension in Abia State Nigeria: Results from the Abia State Non-

Communicable Diseases and Cardiovascular Risk Factors Survey. *Ethnicity & Disease*, **23**, 161-167. https://doi.org/10.14194/ijmbr.2110

[16] Ajayi, I.O., Sowemimo, I.O., Akpa, O.M. and Ossai, N. (2016) Prevalence of Hypertension and Associated Factors among Residents of Ibadan-North Local Government Area of Nigeria. *Nigerian Journal of Cardiology*, **13**, 67-75. https://doi.org/10.4103/0189-7969.165168

[17] Okello, S., Muhihi, A., Mohamed, S.F., Ameh, S., Ochimana, C. and Oluwasanu, A.O. (2020) Hypertension Prevalence, Awareness, Treatment, and Control and Predicted 10-Year CVD Risk: A Cross-Sectional Study of Seven Communities in East and West Africa (SevenCEWA). *BMC Public Health*, **20**, Article No. 1706. https://doi.org/10.1186/s12889-020-09829-5

[18] Kayima, J., Wanyenze, R.K., Katamba, A., Leontsini, E. and Nuwaha, F. (2013) Hypertension Awareness, Treatment and Control in Africa: A Systematic Review. *BMC Cardiovascular Disorders*, **13**, Article No. 54. https://doi.org/10.1186/1471-2261-13-54

[19] Eze, N. (2017) Balancing Career and Family: The Nigerian Woman's Experience. PhD Thesis, Walden University, Minneapolis. https://scholarworks.waldenu.edu/cgi/viewcontent.cgi?article=5158&context=dissertations

[20] Jaiyeola, E.O. and Isaac, A. (2020) Patriarchy and Colonization: The "Brooder House" for Gender Inequality in Nigeria. *Journal of Research on Women and Gender*, **10**, 3-22.

[21] Bappah, B.S., Shittu, A., Usman, J.S., Nuhu, J.M., Sumaila, F.G., Ahmad, A.A. and Mohammed, J. (2022) Prevalence and Correlates of Undiagnosed Hypertension among Staff of a Nigerian University Community. *Pan African Medical Journal*, **42**, Article 80. https://doi.org/10.11604/pamj.2022.42.80.26464

[22] Roerecke, M., Kaczorowski, J., Tobe, S.W., Gmel, G., Hasan, O.S.M. and Rehm, J. (2017) The Effect of a Reduction in Alcohol Consumption on Blood Pressure: A Systematic Review and Meta-Analysis. *The Lancet Public Health*, **2**, E108-E120. https://doi.org/10.1016/S2468-2667(17)30003-8

[23] Adeyanju, O.Z., Okuku, M.O., Opurum, G.C. and Bill, U.S. (2023) Prevalence and Predictors of Hypertension among Company Workers in Portharcourt, Nigeria. *World Nutrition*, **14**, 33-41. https://doi.org/10.26596/wn.202314233-41

[24] Olack, B., Wabwire-Mangen, F., Smeeth, L., Montgomery, J.M., Kiwanuka, N. and Breiman, R.F. (2015) Risk Factors of Hypertension among Adults Aged 35-64 Years Living in an Urban Slum Nairobi, Kenya. *BMC Public Health*, **15**, Article No. 1251. https://doi.org/10.1186/s12889-015-2610-8

Appendix

QUESTIONNAIRE

Participant Serial Number...................

Introduction

1. This study is aimed at determining the prevalence, awareness level and associated risk factors of hypertension in adult patients attending the general outpatient clinic of the Federal University Teaching Hospital, Owerri. In order to achieve this goal, your participation and co-operation is highly needed. You are required to fill the attached consent form indicating that you have agreed to participate in the study. Responses to this questionnaire will be treated with absolute confidentiality.

2. Kindly tick only one response for each question or information required except where otherwise instructed. Where blank spaces exist, kindly fill them with the appropriate answer(s).

3. Thank you for your cooperation.

Section A: Demographic Data

1. Age (years): _____

2. Sex: (a) Male [   ]   (b) Female ——

3. Marital status: (a) Single [   ]   (b) Married [   ]   (c) Separated [   ]
                     (d) Divorced [   ]   (e) Widowed [   ]

4. Highest educational level attained:
                     (a) No formal education [   ]   (b) Primary [   ]
                     (c) Secondary [   ]   (d) Tertiary [   ]

5. Occupation: (a) Unemployed [   ]   (b) Student/Apprentice [   ]   (c) Civil servant [   ]
                     (d) Retired [   ]   (e) Professional [   ]   (f) Farmer/Petty trader [   ]
                     (g) Business executive [   ]   (h) others (specify)...... [   ] ....

Section B: History of Hypertension and Diabetes

6. Have you been told previously by a doctor or other health worker that you have hypertension?

    Yes [   ]   No [   ]

   If No, skip question 7 and go to 8

7. Are you currently taking medications for hypertension?   Yes [   ]   No [   ]

8. Do you know of any member (or members) of you family who has hypertension?   Yes [   ]   No [   ]

   If No, skip question 9 and go to 10

9. Which member(s) of your family has hypertension?...
....

10. Do you have diabetes (high blood sugar)?   Yes [   ]   No [   ]

    If No, skip question 11 and go to 12

11. Are you currently taking medication(s) for diabetes?   Yes [   ]   No [   ]

Section C: Health Behaviours

12. Are you currently smoking cigarettes?   Yes [   ]   No [   ]   Never [   ]

     If Yes, continue with question 13

     If No, skip question 13 and go to question 14

13. How many sticks of cigarette do you smoke daily?...............

14. When did you quit smoking/using tobacco products?

    (a) Within last one month ☐   (b) More than 1 month but less than 6months ☐

    (c) More than 6 months but less than 1 year ☐   (d) More than 1 year ☐

15. What type of alcoholic drink do you consume? (You can tick more than one option)

    (a) Beer ☐   (b) Stout ☐   (c) Palm wine ☐   (d) Brandy ☐

    (e) Whiskey ☐   (f) Local gin ☐   (f) 'Red' wine ☐   (g) Never ☐

16. On the average, how many bottles of the alcoholic drink(s) do you take each week? ……………

17. Does your work involve activity that causes increases in breathing or heart rate [like carrying or lifting loads, digging or construction work]?   Yes ☐   No ☐

    If No go to question 19

    If Yes, continue with question 18

18. In a typical week, on how many days do you do such activities as part of your work?…………………………………

19. Do you do any sports, fitness or recreational (leisure)activities that cause increases in breathing or heart rate [like brisk walking, swimming, cycling, 8hvolley ball, running or football]?   Yes ☐   No ☐

    If No, omit question 20

20. In a typical week, on how many days do you do such sports, fitness or recreational (leisure*)* activities?……

CLINICAL/BIOCHEMICAL MEASUREMENTS

Blood pressure reading	Systolic	Diastolic
1	…………………	…………………
2	…………………	…………………

Average…………………………………………

1. Height (cm)…………………

2. Weight (kg)…………………

3. BMI (kg/m^2)……………………

4. Blood glucose (mg/dl)

    Fasting………………

    *Random………………

*If random blood glucose ≥ 200 mg/dl, ask for symptoms of diabetes mellitus.