

# Comparative Study on Blood Pressure Status of Cigarette Smokers and Non-Smokers in Owerri Municipal of Imo State, Nigeria

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## ABSTRACT

**Objectives:** The work aimed to compare the blood pressure status, knowledge and attitude of cigarette smokers and non-smokers in Owerri Municipal LGA

**Methodology:** A community based; comparative cross-sectional study was conducted among 400 respondents of above 15 years selected by multistage cluster sampling technique. Anthropometric and blood pressure measurements were done for the participants, together with questionnaire administration.

**Results:** Only 59(26.7%) of non-cigarette smokers and 11(6.1%) of cigarette smokers had a satisfactory knowledge level while 22(10.0%) of non-cigarette smokers and 24(13.4%) of cigarette smokers had satisfactory attitudes towards blood pressure. The prevalence of hypertension among non-cigarette smokers (22.2%) was higher than that of cigarette smokers (9.5%). The multivariate logistic regression analysis reveals that systolic blood pressure (0.205 to 0.719, 95%CI, b=-0.956, p=0.003, AOR=0.384), body mass index (0.535 to 0.864, 95%CI, b=-0.386, p=0.002, AOR=0.680) and knowledge level (0.098 to 0.392, 95%CI, b=-1.630, p<0.001, AOR=0.196) was found to be a negative predictive variable for the smoking status of the respondents.

**Conclusion:** This study shows that a good number of the participants were not aware of the possible risk factors that could alter the blood pressure status of individual. This finding therefore highlights the urgent need to sensitize people (smokers and non-smokers) on blood pressure and factors that can alter or trigger a person blood pressure.

**Keywords:** blood pressure, cigarette smoking.

## INTRODUCTION

Blood pressure is one of the key signs that is used by healthcare professionals in evaluating a patient's health <sup>[1]</sup>. High blood pressure usually does not cause symptoms <sup>[2]</sup>. Long-term high blood pressure, however, is a major risk factor for coronary artery disease, stroke, heart failure, atrial fibrillation, peripheral vascular disease, vision loss, chronic kidney disease, and dementia <sup>[3]</sup>.

High blood pressure constitutes a global public health burden <sup>[4]</sup>. It is the most common non-communicable disease in Nigeria <sup>[5]</sup>. It constitutes approximately 25%

of emergency medical admission in hospitals in Nigeria and also the most often diagnosed cardiovascular disorder in Nigeria <sup>[6]</sup>

Although studies have investigated the effect of cigarette smoking on blood pressure and the development of hypertension, the mechanism involved is still unclear <sup>[7]</sup>. The acute effect of cigarette smoking is a temporary increase in heart rate and blood pressure with an increase in epinephrine and norepinephrine production due to activation of the sympathetic system <sup>[8]</sup>.

It has been suggested that long-term cigarette smoking raises blood pressure by causing an

increase in inflammation, endothelial dysfunction, plaque progression and vascular damage. Some studies support this view that there is an increase in blood pressure and development of hypertension in cigarette smokers compared to non-smokers<sup>[9][10]</sup>.

However, other studies have reported, less development of hypertension in non- or ex-smokers compared to smokers<sup>[11][12]</sup>. Studies have also reported that cigarette smoking does not affect development of hypertension<sup>[13][14]</sup>.

Prior studies have shown that the proportion of people who are aware of their blood pressure status is usually low. Therefore, it became imperative to compare the blood pressure status, knowledge and attitude of cigarette smokers and non-smokers. The emphasis should be placed on prevention instead of cure. This can be achieved by mounting public awareness view to identifying individuals who are vulnerable to the disease.

## **MATERIALS AND METHODS**

### **Study design**

This is a community-based comparative, cross-sectional study. The study population included all males and females aged 15 years and above who were resident in Owerri Municipal

According to 2006 population census, Owerri municipal has a population of about 125,337 which predominantly comprises career civil servants, students, professionals, businessmen and semi-skilled workers of mainly Ibo extraction. With 15 years and above having a population of 87,599.

### **Settings and sample**

A multistage cluster sampling was used. In the first stage, five clusters were made based on the five communities in the local Government. In the second stage, a simple random sampling was used to select 80 respondents from each of the community. Respondents were randomly and proportionally selected from each of the community. Using standard methods, trained field workers measured blood pressure and

anthropometric parameters and help the respondents to fill the questionnaire.

The minimum sample size for the study was calculated using Taro Yamane formula with 95% confidence level. A total of 400 respondents were used for the study

### **Ethical considerations**

Letter of introduction was obtained from Head of Department. Permission and endorsement for the study was obtained from the community head. The purpose of study was explained to the study participants and verbal informed consent was obtained from the respondents and they were assured of the confidentiality of their responses. Those study participants found hypertensive were advised and linked to the nearby health institution for further diagnosis and treatment.

### **Data collection**

Data were collected between October and November 2021. The questionnaire was administered to the respondents through research assistants after an informed consent was obtained. The literate respondents were allowed to fill the questionnaire themselves but for non-literate respondents, the questions were asked in local language and their responses were filled by the research assistants. Each questionnaire takes about 4-6 minutes to be completed. Blood pressure was measured from sitting position using standardized procedure using digital blood pressure measuring device (Andon KD-595, China). The blood pressure (BP) was measured two times at the sitting position. There was a 3-minute rest between each measurement. A person's BP was calculated as the average of the measurements. Weight and height of the respondents was measured using a weighing scale and stadiometer. Height was measured to nearest 0.1 m using fixed stadiometer, whereas weight was measured with slanted weighing scale (BC-420, TANITA, Japan). Body mass index (BMI) was determined using the following formula:  $BMI = \text{weight (kg)} / \text{height}^2(\text{m})$ .

## STATISTICAL ANALYSIS

Data generated were captured and filtered in Microsoft Excel office, 365 (Microsoft Corporation, Redmond, WA). Data analyses were conducted with SPSS (Statistical Product and service solutions) version 23 (descriptive statistics, inferential statistics, and figure presentations). Descriptive statistics were conducted for all variables and presented in form of frequencies and proportions/ percentages using SPSS. As for the descriptive statistical methods, the following were used: measures of central tendency (arithmetic mean), measures of variability (standard deviation), and absolute numbers (n) and percentage representation. To evaluate the knowledge level of respondents, a numeric pattern of scoring was used by giving a score of "1" for the "correct answer" and "0" for an "incorrect". Similarly, the attitude level was assessed by giving scores of "0" for the "no" and "1" for "Yes" responses. The scores were thereafter converted to percentages and based on the respondents' mean scores in knowledge and attitude categories, cut-off points for good/satisfactory were set at  $\geq 75\%$ , while those below ( $< 75$ ) were considered to have poor/unsatisfactory levels. The cut-off points were so set since it is expected that such respondents of urban settings should have basic knowledge and demonstrate good attitude towards issues related to health. Associations between the socio-demographics of respondents (independent variables) and binary outcomes of knowledge and attitude (dependent variables) using chi-square tests were determined. Factors affecting knowledge and attitude of cigarette smokers and non-smokers towards their blood pressure status were processed further by a stepwise forward likelihood multivariate analysis (logistic regression model) using SPSS 23. A  $p < 0.05$  was considered statistically significant and odds ratio were computed to determine strength of associations between variables at 95% confidence intervals (CIs). All illustrations were performed with SPSS version 23 and Microsoft excel office 365.

## RESULT

The socio-demographic characteristics of the respondents are summarized in Table 1. Majority of the participants were males 288(72.0%), 257(64.3%) had tertiary education, 31-45 years 216(54.0%), married 214(53.5%), public servants 135(33.8%), and had a monthly income above 50,000 naira 251(62.7%).

The summary statistics of participant's overall level of knowledge and attitude towards Blood Pressure was shown in Table 2. Satisfactory knowledge and attitude were set at 75% and above. Only 59(26.7%) of non-cigarette smokers and 11(6.1%) of cigarette smokers had a satisfactory knowledge level while 22(10.0%) of non-cigarette smokers and 24(13.4%) of cigarette smokers had satisfactory attitudes towards blood pressure.

The Blood pressure status of cigarette smokers and non-smokers are summarised in Table 3. Majority of the respondents had normal systolic blood pressure [non-cigarette smokers=133(60.2%); cigarette smokers=121(67.6%)] and normal diastolic blood pressure [non-cigarette smokers=149(67.4%); cigarette smokers=132(73.7%)].

Table 4 shows a bivariate analysis of knowledge and participant's blood pressure status. Chi-Square test ( $X^2$ ) result showed that the systolic blood pressure of non-smokers was statistically associated with the knowledge level ( $p=0.018$ ). However, systolic blood pressure of smokers, diastolic blood pressure of smokers and non-smokers was not significantly associated with the respondents' knowledge level ( $p > 0.05$ ).

Table 5 shows a bivariate analysis of participant's attitude and blood pressure status. Chi-Square test ( $X^2$ ) result from the table shows that systolic ( $p=0.018$ ) and diastolic blood pressure ( $p < 0.001$ ) of the respondents who were non-cigarette smokers was statistically associated with their attitudes toward blood pressure.

Table 6 shows the regression analysis of Systolic Blood Pressure, Body Mass Index, Level of Knowledge and the Cigarette

Smoking Status of the Respondents. From the table, systolic blood pressure (0.205 to 0.719, 95%CI,  $b=-0.956$ ,  $p=0.003$ , AOR=0.384), body mass index (0.535 to 0.864, 95%CI,  $b=-0.386$ ,  $p=0.002$ , AOR=0.680) and knowledge level (0.098 to 0.392, 95%CI,  $b=-1.630$ ,  $p<0.001$ , AOR=0.196) was found to be a negative predictive variable for the smoking status of the respondents. The likelihood of smoking compared to not smoking decreases with an increasing systolic blood pressure, body mass index, and knowledge level of 0.384, 0.680 and 0.196 respectively.

Figure 1 show the smoking status of the respondents, 179(44.8%) of the respondents

were cigarette smokers while 221(55.3%) of them don't smoke cigarette.

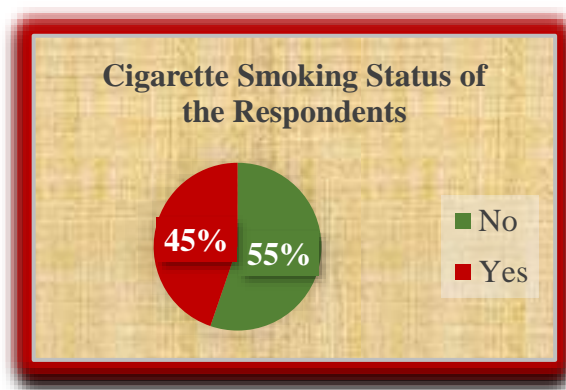


Figure 1: Cigarette Smoking Status of the Respondents

Table 1: Summary statistics of participant's socio-demographic characteristics

Variables	Frequency (N=400)	Percent
<b>Sex</b>		
Male	288	72.0
Female	112	28.0
<b>Age</b>		
16-30 years	103	25.8
31-45 years	216	54.0
46-60 years	67	16.8
61 years and above	14	3.5
<b>Level of Education</b>		
Primary school	3	0.8
Secondary school	140	35.0
Tertiary	257	64.3
<b>Marital status</b>		
Single	186	46.5
Married	214	53.5
<b>Occupation</b>		
Artisans	66	16.5
Public servants	135	33.8
Student	72	18.0
Trading	102	25.5
Apprentice	11	2.8
Housewife	2	0.5
Retired	12	3.0
<b>Monthly Income</b>		
Less than 20,000 naira	95	23.8
20-50,000 naira	54	13.5
Above 50,000 naira	251	62.7

Table 2: Summary statistics of participant's overall level of knowledge and attitude towards Blood Pressure

Variables	Non-smokers(N=221)	Frequency	Smokers(N=179)	Frequency
Level of Knowledge	Not Satisfactory	162(73.3%)	Not Satisfactory	168(93.9%)
	Satisfactory	59(26.7%)	Satisfactory	11(6.1%)
Level of Attitude	Not Satisfactory	199(90.0%)	Not Satisfactory	152(84.9%)
	Satisfactory	22(10.0%)	Satisfactory	24(13.4%)

Table 3: Summary statistics of participant's blood pressure status

Variables	Non-smokers(N=219)	Frequency	Smokers(N=178)	Frequency
Systolic Blood Pressure	Normal Blood Pressure	133(60.2%)	Normal Blood Pressure	121(67.6%)
	Elevated Blood Pressure	39(17.6%)	Elevated Blood Pressure	41(22.9%)
	Stage 1 Hypertension	23(10.4%)	Stage 1 Hypertension	11(6.1%)
	Stage 2 Hypertension	26(11.8%)	Stage 2 Hypertension	6(3.4%)
	Hypertension Crisis	0(0.0%)	Hypertension Crisis	0(0.0%)
Diastolic Blood Pressure	Normal Blood Pressure	149(67.4%)	Normal Blood Pressure	132(73.7%)
	Elevated Blood Pressure	1(0.5%)	Elevated Blood Pressure	1(0.6%)
	Stage 1 Hypertension	43(19.5%)	Stage 1 Hypertension	31(17.3%)
	Stage 2 Hypertension	27(12.2%)	Stage 2 Hypertension	13(7.3%)
	Hypertension Crisis	0(0.0%)	Hypertension Crisis	0(0.0%)

**Table 4: Bivariate analysis of knowledge and participant's blood pressure status**

Variables	Categories	Non-smokers(N=221)		P-Value	Smokers(N=179)		P-Value
		Overall Level of Knowledge			Overall Level of Knowledge		
		Not Satisfactory	Satisfactory		Not Satisfactory	Satisfactory	
Systolic Blood Pressure	Normal Blood Pressure	95(71.4%)	38(28.6%)	0.018	114(94.2%)	7(5.8%)	0.348
	Elevated Blood Pressure	36(92.3%)	3(7.7%)		39(95.1%)	2(4.9%)	
	Stage 1 Hypertension	14(60.9%)	9(39.1%)		9(81.8%)	2(18.2%)	
	Stage 2 Hypertension	17(65.4%)	9(34.6%)		6(100.0%)	0(0.0%)	
Diastolic Blood Pressure	Normal Blood Pressure	112(75.2%)	37(24.8%)	0.288	123(93.2%)	9(6.8%)	0.880
	Elevated Blood Pressure	0(0.0%)	1(100.0%)		1(100.0%)	0(0.0%)	
	Stage 1 Hypertension	29(67.4%)	14(32.6%)		30(96.8%)	1(3.2%)	
	Stage 2 Hypertension	20(74.1%)	7(25.9%)		12(92.3%)	1(7.7%)	

**Table 5: Bivariate analysis of participant's Attitude and blood pressure status**

Variables	Categories	Non-smokers(N=221)		P-Value	Smokers(N=179)		P-Value
		Overall Level of Attitude			Overall Level of Attitude		
		Not Satisfactory	Satisfactory		Not Satisfactory	Satisfactory	
Systolic Blood Pressure	Normal Blood Pressure	126(94.7%)	7(5.3%)	0.018	99(82.5%)	21(17.5%)	0.146
	Elevated Blood Pressure	34(87.2%)	5(12.8%)		36(92.3%)	3(7.7%)	
	Stage 1 Hypertension	19(82.6%)	4(17.4%)		11(100.0%)	0(0.0%)	
	Stage 2 Hypertension	20(76.9%)	6(23.1%)		6(100.0%)	0(0.0%)	
Diastolic Blood Pressure	Normal Blood Pressure	140(94.0%)	9(6.0%)	0.000	115(89.1%)	14(10.9%)	0.056
	Elevated Blood Pressure	0(0.0%)	1(100.0%)		1(100.0%)	0(0.0%)	
	Stage 1 Hypertension	38(88.4%)	5(11.6%)		22(71.0%)	9(29.0%)	
	Stage 2 Hypertension	20(74.1%)	7(25.9%)		12(92.3%)	1(7.7%)	

**Table 6: Multivariate logistic regression analysis of Systolic Blood Pressure, Body Mass Index, Level of Knowledge, and the Cigarette Smoking Status of the Respondents**

Variables	Categories	Cigarette smoking status		95% Confidence Interval		Regression Coefficient (B)	P-Value	Adjusted Odds Ratio (AOR)
		No	Yes	Lower Bound	Upper Bound			
Systolic Blood Pressure	Normal Blood Pressure	133(52.4%)	121(47.6%)	0.205	0.719	-0.956	0.003	0.384
	Elevated Blood Pressure	39(48.8%)	41(51.2%)					
	Stage 1 Hypertension	23(67.6%)	11(32.4%)					
	Stage 2 Hypertension	26(81.3%)	6(18.8%)					
Body Mass Index	Underweight	2(40.0%)	3(60.0%)	0.535	0.864	-0.386	0.002	0.680
	Normal Weight	89(47.6%)	98(52.4%)					
	Overweight/pre-obesity	70(57.4%)	52(42.6%)					
	Obesity case 1	42(67.7%)	20(32.3%)					
	Obesity case 2	13(72.2%)	5(27.8%)					
Level of Knowledge	Not Satisfactory	162(49.1%)	168(50.9%)	0.098	0.392	-1.630	0.000	0.196
	Satisfactory	59(84.3%)	11(15.7%)					

No (non-smokers) is the reference category  
P-Value significant at <0.05



## DISCUSSION

In this study, it was revealed that 99.1% of non-cigarette smokers and 99.4% of cigarette smokers have heard of blood pressure before, and only 26.7% of non-cigarette smokers and 6.1% of cigarette smokers had a satisfactory knowledge level. This finding is not in consonance with the fact that majority of the respondents had tertiary education. Knowledge on the risk factor associated with hypertension was low. Only 38.0% of non-cigarette smokers and 24.6% of cigarette smokers knew that excessive salt consumption could be a factor that alter the blood pressure status of an individual. It was discovered in other work that about 56% of the respondents could not identify a single risk factor that affects the blood pressure status of an individual [15]. Study on knowledge of heart disease risks [16] and awareness of hypertension and associated risk factors [17] found that 49.0% and 80.4% of their respondents had poor knowledge of hypertension risks factors respectively.

This study also implicated excessive salt consumption, obesity, lack of exercise, bad dietary patterns, family history of hypertension, excessive alcohol consumption, and cigarette smoking to be statistically associated with the level of knowledge of cigarette smokers ( $p < 0.001$ ) and non-smokers ( $p < 0.001$ ). Also, systolic blood pressure of non-smokers was statistically associated with the knowledge level ( $p = 0.018$ ) of the respondents. This is consistent with the findings in a cross-sectional descriptive study design of the prevalence of substance use and its association with high blood pressure among adults [18] that current daily smoking was significantly associated with elevated mean diastolic blood pressure ( $\beta = 2.1$ ,  $P = 0.03$ ).

In this study, it was revealed that the prevalence of hypertension among non-cigarette smokers (22.2%) was higher than that of cigarette smokers (9.5%). This finding is not different from the work in a cross-sectional study of 712 patients [19] that reported that blood pressures and prevalence

of hypertension were significantly low in smokers. This could be because of other cofounding variables such as age, excessive salt and alcohol consumption, lack of exercise etc., which may have contributed in altering the blood pressure status of the respondents. However, the study disagrees partially with the work in a population-based cross-sectional study of 12417 men [19] that reported the prevalence of hypertension to be higher in former smokers than in never smokers (13.5 versus 8.8%,  $P < 0.001$ ). The risk of hypertension was higher [odds ratio (OR) 1.31 (1.13-1.52),  $P < 0.001$ ] in former smokers than in never smokers, independently of age and alcohol intake. Both current and former smokers were at risk for systolic hypertension, especially those subjects aged 60 years and above. The risk of hypertension was associated with the number of cigarettes smoked [OR per 10 cigarettes smoked daily: 1.13 (1.05-1.21),  $P < 0.001$ ] and the duration of smoking cessation [OR 0.99 (0.98-1.00),  $P = 0.01$ ].

In this study, it was also revealed that the systolic blood pressure, body mass index and knowledge level of the respondents was found to be a negative predictive variable for the smoking status of the respondents. The likelihood of smoking compared to not smoking decreased with an increasing systolic blood pressure, body mass index, and knowledge level of 0.384, 0.680 and 0.196 respectively. Therefore, smokers were 0.384, 0.680, and 0.196 less likely to have a higher systolic blood pressure, BMI and knowledge level respectively. A Facility-based cross-sectional study [20] reported that Cigarette smokers were 16.511 times more likely to be hypertensive as compared to non-cigarette smokers (AOR = 16.511, 95% CI: 4.775-57.084).

## CONCLUSION

This research compared the blood pressure status of cigarette smokers and non-smokers in Owerri Municipal and its associated factors. The study revealed that the overall knowledge level and attitude of the respondents was very poor despite the facts

that a good number of them had tertiary education and the fact that the study was conducted in Owerri municipal. This study shows that a good number of the participants were not aware of the possible risk factors that could alter the blood pressure status of individual. The fact that the likelihood of smoking cigarette decreased with increasing knowledge level goes a long way to emphasize the importance of health education/sensitization on hypertension and its associated factors. Researchers can conduct cohort studies to further understand the chronic effect of smoking on blood pressure while excluding other confounding variables which could also contribute to the instability of a person's blood pressure. In addition, BMI, age, alcohol consumption, excessive salt consumption and ethnicity are all areas that can be individually explored in future research works.

#### **Declaration by Authors**

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**Conflict of Interest:** The authors declare no conflict of interest.

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