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Research

Prevalence and Predictors of Hypertension among Company Workers in Rivers State, Nigeria

Ope Zacchaeus Adeyanju[1a], Mary Obidiya Okuku[2], Goodnews Christopher Opurum[3], Uro Sunday Bills[4]

[1] Department of Human Nutrition and Dietetics, Faculty of Public Health, University of Ibadan, [2] Department of Nursing, Faculty of Basic Medical Sciences, Rivers State University, [3] School of Occupational Health and Safety, Rivers State College of Health Sciences and Management Technology, [4] School of Dental Health Science, Rivers State College of Health Sciences and Management Technology

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Background/Objective

Hypertension, "the silent killer," is an important preventable cause of premature morbidity and mortality globally. This condition has become a major non-communicable disease threatening sub-Saharan Africa, and its prevalence is rising in middle and low-income countries. This study objective was to determine the prevalence and predictors of hypertension among company workers in Rivers State, Nigeria

Methods

This analytical and cross-sectional study used a multi-stage sampling technique to recruit 296 company workers in Rivers State, Nigeria. A semi-structured questionnaire was used to obtain the respondents' demographics, lifestyle, and healthcare characteristics. Respondents' weight and height were measured using standard procedures. Blood pressure was determined by standard practice and criteria as defined by WHO and International Society of Hypertension. Data were analyzed using descriptive statistics, correlation, and logistic regression at $p< 0.05$ level of significance.

Results

64.9% of the respondents were married and 59.5% were male. 52.0% drank alcohol, and 7.4% smoked. While 67.2% claimed they were not hypertensive, 22.6% don't know their blood pressure status, and 58.1% were physically inactive. The prevalence of hypertension was 33.4%, and the prevalence of overweight and obesity was 43.6% and 15.2%, respectively. Predictors of hypertension in the study population were sex (male) ($p<0.001$), age >40 ($p<0.001$), alcohol consumption (any) ($p<0.05$), physical activity (≤rarely) ($p<0.001$) and BMI (≥25) ($p<0.001$) of the respondents.

Conclusion

There was a high prevalence of hypertension and presence of modifiable cardiovascular disease risk factors among the population. Therefore, both secondary and primary prevention require attention, in the latter case, comprehensive population-wide and workstation interventions, including behavioral change and communication interventions that are context-specific, should be implemented.

INTRODUCTION

Hypertension, is defined as the persistent elevation of systolic blood pressure (SBP) and diastolic blood pressure (DBP) of more than or equal to 140 mmHg and/or 90 mmHg, respectively (James et al. 2014). It is often asymptomatic and thus may remain undetected, untreated, and uncontrolled until it results in adverse and catastrophic events like stroke or acute left heart failure. Consequently, it is referred to as the "silent killer." (Sawicka et al. 2011; Mensah 2019).

Globally, the proportion of adults with hypertension is 25%, projected to rise to 29% by 2025, which means about 1.56 billion adults will then live with it (Dean et al. 2012). The most consistent risk factor for cardiovascular disease is high blood pressure. Cardiovascular disease (CVD) is a

a Corresponding author: opadeyanju@gmail.com

heart and blood vessel disease and includes but is not limited to coronary artery disease, stroke, and peripheral vascular disease (Roth et al. 2017). Globally, CVD is the leading cause of morbidity and mortality, and over 80% of it occurs in low and middle-income countries (Bowry et al. 2015). About 17.9 million people died from cardiovascular diseases in 2016, 31% of all deaths (WHO 2016).

Adeloye, Basquill, and Schnabel (2014) observed that the prevalence of hypertension, in Africa, 30.8% in 2010, with 130.2 million cases, is projected to increase to 216.8 million cases of hypertension by 2030. . In 2017, a systematic review and meta-analysis of the prevalence of hypertension in older people in Africa found a prevalence of 55.2% (Kaze et al. 2017).

In Nigeria, although there has been a decline in the prevalence of infectious diseases, non-communicable diseases (NCDs) such as hypertension are increasing, becoming significant public health issues (Adogu et al. 2015). A WHO report found that Nigeria topped the list of countries in Africa, where prevalences ranged between 6.2% and 48.6% (Akinlua et al. 2015). In 2017, hypertension and heart failure had the highest hospital admissions with a prevalence rate of 54.6% and 36.8%, respectively in a study in south-east Nigeria (Ukpabi and Uwanurochi 2017).

Several risk factors have been associated with hypertension which can be grouped into modifiable and non-modifiable risk factors (Mayega et al. 2012). The non-modifiable risk factors include; age, sex, race, family history, and genetic composition. In comparison, the modifiable risk factors include; obesity, excessive salt intake, physical inactivity, high-fat diet, smoking, alcohol consumption. Hence, people's lifestyle characteristics, including their daily activities and functions in work, leisure time, and dietary patterns, are related to their health status (Ahmed et al. 2011). Indeed, changes in patterns of diet and lifestyle have led to an increase in obesity, one of the significant risk factors for CVD (Manjareeka et al. 2015; Reddy and Nambiar 2018).

In addition to the risk factors mentioned above, in Sub-Saharan Africa, low socio-economic status and poor access to health information and services may contribute (Lloyd-Sherlock, Ebrahim, and Grosskurth 2014; Islam et al. 2016). Certain types of work with features like long working hours and little or no resting time may contribute as well.

It is against this backdrop that countries were urged to institute workplace health programs to promote health and prevent NCDs, in particular through healthy dietary lifestyles and physical activity, at the Sixtieth World Health Assembly, which endorsed a global plan of action 2008–2017 for workers' health (WHO 2009). Interventions in workplace settings have been found to be cost-effective in preventing cardiovascular diseases such as hypertension (WHO 2013).

Research is lacking in much of Nigeria that would help in designing policies, programs, advocacy, and population-targeted interventions for better health services for employees, and to promote healthy living and prevention of hypertension among this group and the extended population at large.

Therefore, the present study was examined the prevalence and predictors of hypertension among company workers in one area, Rivers State.

METHODOLOGY

This cross-sectional and analytical study was conducted in Rivers State, which is one of the 36 states in Nigeria, located in the South-South of Nigeria. The study population was men and women who were workers at 2 randomly selected multinational companies of the 7 working in the State. After explaining the study's purpose, company workers who were not sick or pregnant, understood the study's purpose, and were willing to participate were recruited for the study.

SAMPLE SIZE AND SAMPLING PROCEDURE

The management of the randomly selected companies was contacted to obtain the number of their workers and the minimum sample size was determined using

$$n = \frac{N}{1 + Ne^2} \quad \text{(Yaro Yamen formula)}$$

n is the minimum sample size, N is the total number of the study population = 751, e =desired precision/error which was chosen to be 5% (0.05). This gave a sample size of 261. To give room for the non-responses and incomplete responses, 310 workers were recruited for the study. In a multi-stage sampling technique employed, the companies were first selected via random balloting. This was followed by stratifying the companies according to gender for optimum representation. Afterward, respondents were selected by simple random sampling from each stratum. Four recruited research assistants, including two intern nurses, were trainned and used a pretested semi-structured questionnaire with 0.896 reliability to collect information on the socio-demographic and lifestyle characteristics of the companies' workers between October and December, 2021.

PHYSICAL EXAMINATION OF THE RESPONDENTS

The height of the respondents was taken using a calibrated stadiometer with the backs of their heads, buttocks, and heels in contact with the tall block of the stadiometer, both hands hanging loosely on both sides with their eyes looking straight ahead, and their weight was taken with a bathroom scale (Camry P/1211/CRI) calibrated with a standard weight and corrected for zero error while wearing light clothing and without footwear. Body mass index (BMI= weight(kg)/height $(m)^2$) was determined and classified according to WHO classification as underweight (BMI < 18.5), normal weight (BMI = 18.5 – 24.9), overweight (BMI = 25.0 – 29.9) and obese (BMI ⩾ 30).

BLOOD PRESSURE MEASUREMENT

The measurement of blood pressure was done using a sphygmomanometer (Dekamet MG3, England) with all tight clothing and other similar materials removed from the arm and in the sitting position with the arm resting on a table

such that the middle of the forearm was about the level of the heart. After the participant had rested for about 10 minutes, the first measurement was taken. The second and third measurements were taken at the end of the interview, with five (5) minutes between those two measurements. The last two readings' mean was considered for analysis in line with WHO recommendations. Respondents were described as hypertensive if the value of SBP was more than or equal to 140mmHg or DBP greater than or equal to 90mmHg at the time of screening.

DATA PROCESSING AND ANALYSIS

Data were cleaned, cross-checked, and verified for accuracy. The Statistical Package for the Social Sciences (SPSS) version 20.0 statistical software was used for analysis. Data were analyzed, and descriptive statistics such as mean, standard deviation, and percentages were determined. Correlation and logistic regression were also carried out, and the significance level was set at $p< 0.05$ at a 95% confidence interval.

APPROVAL AND CONSENT TO PARTICIPATE

Written informed consent was obtained from the management of the firms involved and from each respondent after explaining the purpose and benefit of the research to them. The respondents were assured of the confidentiality of the information received and were informed of their right to withdraw freely from the study at any time. The respondents were provided with their blood pressure readings; hence, those who had elevated blood pressure were informed about the implications and the need to seek medical care.

Table 1. Socio-demographic characteristics of the company workers in Rivers State

Variable	Frequency	Percentage
Age (years)		
18-30	50	16.9
31-40	113	38.2
41-50	107	36.1
51 and above	26	8.8
Sex		
Male	176	59.5
Female	120	40.5
Educational Status		
Primary	4	1.4
Secondary	86	29.1
Tertiary	206	69.6
Marital Status		
Single	90	30.4
Married	192	64.9
Separated/Divorced	8	2.7
Widow/Widower	6	2.0
Category of Workers		
Director/GM	2	0.7
Manager	26	8.8
Supervisor	60	20.3
Senior Staff/ Foremen	100	33.8
Junior Staff	108	36.5
Total	**296**	**100**

RESULTS

A 95.5% questionnaire retrieval was achieved, and a total of two hundred and ninety-six (296) respondents' information was analyzed. The characteristics of our sample are indicated in Table 1.

Table 2 shows relevant lifestyle characteristics of the respondents.

Table 3 provides the BMI and blood pressure findings from the study. As can be seen, only 41% had normal weights and 23% were normotensive. There were positive and statistically significant correlations between the BMI and the systolic ($r=0.246$, $p=0.000$) and diastolic ($r=0.257$, $p=0.000$) blood pressures of the respondents.

Table 4 presents a logistic regression of factors associated with hypertension among the company workers, finding that BMI, sex, age, exercise and consumption of any alcohol were statistically significant. Education and smoking were not.

DISCUSSION

The prevalence of hypertension in this study was 33.4% which is higher than the hypertension prevalences found in the following studies: 12.4% in Owerri, Nigeria (Diwe et al. 2015), 18.4% in Edo State, Nigeria (Obarisiagbon, Osayi, and Wagbatsoma 2018), 21% in Ethiopia (Fikadu and Lemma 2016), and 25.0% in Maiduguri, Borno state, Nigeria (Vincent-Onabajo, Adaji, and Umeonwuka 2017). It was consistent with the prevalences of 33.1% in Ibadan, Nigeria (Sowemimo et al. 2016) and 35.2% in an Ethiopian national prevalence study (Alwan 2011). It was lower than the prevalences found in studies done in the following countries: 40% in Zambia (Mulenga and Siziya 2013), 42.4% in Ghana, 46% in South Africa (Gebreselassie and Padyab 2015), and 52% in Bangladesh (Barua et al. 2018).

58.8% of our respondents had a BMI higher than normal. This overweight and obesity prevalence was higher than 29.4% and 19.5%, respectively, as reported by Ijoma et al. (2019) in a survey conducted among the adult population in an Urban Area of South East Nigeria. It is also higher than 10.7% (overweight or obese) in Madagascar (Manus et al. 2018). On the other hand, this study's prevalence of overweight and obesity is lower than 62.7% and 27.5%, respectively, reported among doctors in a pilot study in Port Harcourt, Nigeria (Buowari et al. 2021), 54.0% and 34.5%, respectively, in a multinational company in the Niger-Delta (Ofori and Obosi 2019). It is similar to 64.4% reported in a study done in Ghana (Acheampong et al. 2019).

Table 2. Lifestyle characteristics of the respondents

Variable	Frequency	Percentage
Physical exercise participation		
Yes	168	56.8
No	128	43.2
Frequency of physical exercise in last one month		
Always	8	2.7
Often	18	6.1
Sometimes	98	33.1
Rarely	103	34.8
Never	69	23.3
Alcohol beverage consumption		
Yes	142	48.0
No	154	52.0
Frequency of consuming alcoholic beverages		
Always	2	0.7
Often	36	12.2
Sometimes	69	23.3
Rarely	35	11.8
None	154	52.0
Reasons for not participating in physical exercise		
Busy	152	51.4
Do not see the need	56	18.9
Laziness	12	4.1
No Response	76	25.7
Frequency of smoking		
1-2 sticks/day	16	5.4
3-5 sticks/week	6	2.0
Don't smoke	274	92.6
Have high blood pressure		
Yes	30	10.1
No	199	67.2
Don't Know	67	22.6
Total	**296**	**100**

Hypertension was significantly related to respondents' elevated BMI ($p<0.001$). SBP and DBP were observed to each have a positive and significant correlation with BMI. These findings corroborate earlier studies that have established a strong relationship between elevated BMI and hypertension (Bosu 2016; Banigbe et al. 2020). Male respondents in this study had higher odds of being hypertensive ($p<0.001$). In a systematic review conducted in Nigeria, 22 out of the 33 studies reported a higher prevalence of hypertension among males (Akinlua et al. 2015). Many other reports have affirmed this finding (Fikadu and Lemma 2016; Ofori and Obosi 2019). However, studies carried out in Ghana, and rural Madagascar did not find this (Cappuccio et al. 2004; Ratovoson et al. 2015). In the present study, those aged 40 years and below has lesser odds of being hypertensive ($p<0.001$), this is commonly identified as a non-modifiable risk factor for hypertension (Obarisiagbon, Osayi, and Wagbatsoma 2018; Banigbe et al. 2020). Our results showed that participants with secondary education or below had lesser odds of being hypertensive ($p<0.05$) before being adjusted; when adjusted, this relationship was no longer significant. Similar findings were reported by Chowdhury et al. (2016) and Leng et al. (2015).

58.1% of our respondents were physically inactive and those who sometimes and always exercise had lesser odds of being hypertensive ($p<0.001$). While we did not locate other studies of this relationship in Nigeria, Oyeyemi and Adeyemi (2013) reported that moderate-to-vigorous physical activity was significantly and negatively correlated with BMI. Those who sometimes, often, and always consumed alcohol were 2.35 times more likely to be hypertensive ($p<0.05$) than those who did not or rarely drink alcohol. Thus the frequency of alcoholic beverage intake was a stronger factor associated with hypertension than consuming alcohol or not. Others have also reported that regular and moderate drinking and not just mere drinking was associated with hypertension (Roerecke et al. 2017). A study conducted among men in North Central Nigeria reported that hypertension was significantly associated with alcohol consumption (Banigbe et al. 2020).

Although, this study has provided some updated and additional information about the prevalence and predictors of hypertension among the studied population, its results cannot be generalized at the level of all workers, since our respondents were purposively selected. Future larger study samples among populations from different work statuses, socioeconomic characters, and job types will be needed for that.

CONCLUSIONS

Risk factors associated with hypertension among company workers in Rivers State studied included male sex, increasing age, physical inactivity, high/regular alcohol intake, and elevated BMI. Female respondents had a higher BMI (a risk factor for hypertension) than male respondents. Nevertheless, the prevalence of hypertension was higher in males than in females. This implies that BMI was not the only factor contributing to the male respondents' elevated blood pressure; other factors like alcohol consumption, stress, food consumption patterns, and physical inactivity could be confounders. As a matter of concern, government, non-governmental bodies, and top management of companies should implement population-wide and workplace interventions to address hypertension (the silent killer). This can be achieved by controlling salt intake, work-related stress, unhealthy lifestyles like alcohol intake, smoking, and other risky behaviors, improving physical activity, and increasing knowledge, awareness, and care-seeking related to cardiovascular health.

Table 3. BMI and Blood Pressure of the Respondents

Variable	Frequency	Percentage
Nutritional status (Mean = 26.33±3.99 min = 19.75, max= 37.83)		
Underweight (BMI< 18.50Kg/m^2)	0	0.0
Normal Range (BMI 18.50 - 24.99 Kg/m^2)	122	41.2
Overweight (BMI 25.0 - 29.99 Kg/m^2)	129	43.6
Obese (BMI 30.0 and above Kg/m^2)	45	15.2
Systolic blood pressure. Mean=129.55±14.27 min=100, max=164		
<120 (Normal)	80	27.0
120-139 (Pre-hypertension)	136	45.9
140-159 (Stage 1 hypertension)	70	23.6
160-179 (Stage 2 hypertension)	10	3.4
Diastolic blood pressure. Mean=80.08±11.75 min=65, max =115		
<80 (Normal)	170	57.4
80-89 (Pre-hypertension)	58	19.6
90-99 (Stage 1 hypertension)	32	10.8
≥100 (Stage 2 hypertension)	36	12.2
Blood Pressure Category		
Normal	68	23.0
Pre-hypertension	129	43.6
Stage I Hypertension	74	25.0
Stage II Hypertension	25	8.4
Total	**296**	**100**

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AUTHORS' CONTRIBUTIONS

Conceptualization: Ope Zacchaeus Adeyanju. Writing – original draft: Ope Zacchaeus Adeyanju, Mary Obidiya Okuku. Investigation: Ope Zacchaeus Adeyanju, Mary Obidiya Okuku, Goodnews Christopher Opurum, Uro Sunday Bills. Data curation: Goodnews Christopher Opurum, Uro Sunday Bills.

CONFLICT OF INTEREST

The authors declare to have no conflict of interest concerning the research, authorship, and publication of this work.

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Table 4. Logistic regression of factors associated with hypertension among respondents

	Hypertension					
Variable	**Yes**	**No**	**COR*(95% CI)**	**P value**	**AOR*(95% CI)**	**P-value**
BMI						
< 25.0 Kg/m^2	19	103	0.22(0.12-0.38)	0.000	0.13(0.07-0.26)	0.000
≥ 25.0 Kg/m^2	80	94				
Sex of respondents						
Male	75	101	2.97 (1.74–5.09)	0.000	1.79 (0.99–3.23)	0.053
Female	24	96				
Age of respondents						
≤ 40 years	20	126	0.14(0.08-0.25)	0.000	0.16(0.09-0.30)	0.000
> 40 years	79	71				
Educational Status						
≤ Secondary	22	68	0.54(0.31-0.95)	0.031	0.68(0.38-1.21)	0.187
> Secondary	77	129				
Freq. of Exercise in last one month						
Sometimes-Always	26	98	0.36(0.21-0.61)	0.000	0.33(0.19-0.56)	0.000
None/Rarely	73	99				
Freq. of alcoholic consumption						
Sometimes-Always	49	58	2.35(1.43-3.87)	0.001	1.73(1.01-2.95)	0.046
None/Rarely	50	139				
Smoking						
Yes	6	16	0.73(0.28-1.93)	0.526	0.55(0.20-1.51)	0.246
No	93	181				

COR* = Crude Odd ratio, AOR* = Adjusted Odd ratio, CI = Confidence Interval

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