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ORIGINAL ARTICLE

Prevalence and Risk Factors of Hypertension among Workers of an Oil Palm Company in Edo State, Nigeria

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Hypertension, Prevalence, Risk factors, Oil Palm Company

ABSTRACT

Background: Hypertension is one of the most important preventable causes of premature morbidity and mortality globally. This condition which was initially considered rare in sub-Saharan Africa is now a major non-communicable disease threatening sub-Saharan Africa. This study assessed the prevalence and risk factors of hypertension among workers of the Oil Palm Company in Ikpoba-Okha Local Government Area, Edo State Nigeria.

Methods: This descriptive cross-sectional study was carried out among 354 workers of Oil Palm Company selected using stratified sampling technique. A structured interviewer-administered questionnaire (adapted in line with the WHO stepwise surveillance questionnaire for chronic disease risk factors) was used to obtain data. Data analysis was by IBM SPSS version 21.0. Chi-square tests and logistic regression were done and level of significance was set at $p < 0.05$.

Results: The mean age (SD) of respondents was 37.9 (10.4) years. The prevalence of hypertension was 18.4%. Sixteen (4.5%) of respondents were current tobacco users and 34 (9.6%) were obese. Significant determinants of hypertension were age ($p = 0.001$), current tobacco use ($p = 0.007$), BMI ($p = 0.027$) and Waist Hip Ratio ($p = 0.033$).

Conclusion: Hypertension is a public health problem among the study population and the determinants of hypertension identified include age, tobacco use, and obesity. There is need for health education on how to reduce these risk factors and screening programs among the staff for early diagnosis and treatment of hypertension.

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INTRODUCTION

Hypertension is a condition in which blood vessels have persistently raised pressure. This makes it a major risk factor for coronary heart disease, kidney disease and stroke.[1, 2] Worldwide, hypertension is estimated to cause 7.5 million deaths, about 12.8% of the total of all deaths. One-quarter of the world's population has hypertension and by 2025, an estimated 1.56 billion adults will be living with hypertension.[2] Hypertension affects 75 million US adults (1 in 3 US adults) and African American adults have one of the highest rates of hypertension in the world at 44%.[3] Only about half (54%) of people with high blood pressure have their condition under control.[3] The overall prevalence of hypertension in Nigeria ranges from 8% to 64%.[4] A systematic review conducted in 2015 to assess the prevalence of hypertension among workers in West Africa from January 1980 to September 2014 revealed that the prevalence ranged

between 12.0% and 69.9%.[5] However, few studies have assessed the prevalence of hypertension among workers in various occupation in Nigeria.

Hypertension can be classified as either primary (essential) or secondary. Over 90% of all cases of hypertension are primary hypertension, with no obvious identifiable cause and the remaining 10% of cases are usually secondary hypertension. Secondary hypertension results from other diseases present in the body such as kidney disease, cardiovascular disease (CVD), coronary heart disease, etc.[6-8] Although the exact cause of primary hypertension is unknown, there are several risk factors that have been associated with the condition. These factors can be categorized into non-modifiable and modifiable risk factors. [9-10] The non-modifiable risk factors include age, sex, race, family history, genetic composition, etc. On the other hand, the modifiable risk factors include; obesity, excessive salt intake, inactivity or lack of exercise, high fat diet, tobacco use, alcohol consumption. The risk for high blood pressure increases in men over age 44years and women over the age of 55years.[11-13]

Work stress has been found to cause hypertension.[14-18] However, only a few studies have assessed the prevalence of hypertension among some occupational groups in Nigeria. The documented prevalence of hypertension in Nigeria revealed a range of 17.7% among bankers in Edo State to 32% among civil servants in Port Harcourt. [19-22] Oil plantation workers are a defined occupational group and their working conditions can be unfavorable. They are often separated from their families, the demands of acquisition of new skills associated with automation of the work processes in order to meet the increasing demands and standard of production increases their physical and psychological stress.[14] In addition, unhealthy lifestyle, such as irregular diet, excessive alcohol consumption, cigarette smoking, and other unhealthy behaviors, are also common in this population.[14] All of these factors predispose them to hypertension. The morbidities associated with hypertension can have enormous impact on the individuals, families, and societies.

Few studies have been conducted among this population to determine the prevalence of hypertension. This study, therefore, assessed the prevalence and risk factors of hypertension among oil plantation workers in Benin City, Edo State, Nigeria with a view to providing information that can serve as a basis for the design of policies and programs that would promote healthy lifestyle and prevention of hypertension among the study population. Evidence has shown that interventions in workplace settings are cost-effective in preventing cardiovascular diseases such as hypertension.

METHODOLOGY

The study was carried out in Presco PLC, Obaretin Estate, Ikpoba Okha Local Government Area, Edo State. Presco is a public limited liability company incorporated in 1991 under Nigerian law.[23] Obaretin Esate Presco PLC, is hosted mainly by three communities namely Agbonmwonba, Obagie and Orogho. These are rural communities and their major occupation is farming. The estate has a clinic with a Doctor and nursing staff. The total number of work force of the company in Obaretin estate is 1519.[23] The activity of the company includes cultivation of Oil palm, starting from preparing the ground for the seedlings, taking care of the nursery, planting of palm, harvesting of produce, milling, refining and fractionation into different by-product.

This study utilized a descriptive cross-sectional study design and was carried out

over a period of six months June 2017 to December 2017. The study population comprised male and female workers of the Oil Palm Company, Ikpoba-Okha, Edo State. The sample size was calculated using; $n = Z^2pq/d^2$.[24] Where; n= desired minimum sample size, Z= standard normal deviate (1.96 at α=0.05), p= prevalence rate of 29.3% was used based on the prevalence of hypertension among the respondents in a study carried out in Sri Lanka in 2015, [25] q= 1-p and d= degree of accuracy (5%= 0.05). Thus the minimum sample size was 319. Addition of 10% non-response (32) increased sample size to 351. However, 354 respondents participated in this survey.

Stratified sampling technique was utilized to select the respondents. The category of workers (senior, junior and contract workers) formed the basis for the stratification. The total number of workers in the different categories (1,519) was obtained from the personnel department in the company. This comprised of 82 senior workers, 258 junior workers and 1,179 contract field workers. Proportional allocation was used to determine the number of workers to be selected in each category. All the workers in the various categories were assigned numbers. A sampling interval was determined (total number of workers (N) ÷ sample size (n) = 1519 ÷ 354 = 4.29, approximately 4). Thus, in each category, (every 4th) worker who met the inclusion criteria was recruited for the study till the sample size was attained.

Data was obtained using research assistants who were trained by the researcher for three days. The tool for data collection was a structured interviewer - administered questionnaire comprising both open and closed-ended questions. The questionnaire was adapted from the WHO stepwise surveillance questionnaire for chronic disease risk factor[26] and consisted of three sections. Section A sought information on the socio-demographic characteristics of the respondents, section B sought information on the risk factors of hypertension and section C sought information on the prevalence of hypertension. Pretesting of thirty six questionnaires (10% of the sample size) was done among workers at Okomu Oil Palm Company Plc, Ovia South West LGA, Edo State.

The blood pressure was measured using the mercury sphygmomanometer (Accoson®) with appropriate cuffs and a Littmann® stethoscope on the left arm of all the respondents in the sitting position after 5 minutes of rest using the procedure described by WHO.[7] The blood pressure of the respondents was measured on two different occasions at least 5 minutes interval between measurements and the average was used for all the respondents. The participants were considered to be hypertensive if they had a systolic blood pressure of ≥140 mmHg and/or a diastolic blood pressure of ≥90 mmHg, if they gave a history of hypertension or if they were on prescription medications for hypertension taken in the last 2 weeks. For those with a raised BP, two additional BP measurements were made at least a week apart.

Body weight was measured using a bathroom weighing scale (Hana® made in China) that was standardized and validated daily using a known weight (3kg dumb bell) before weighing before weighing the respondents. Subjects were weighed bare-footed in light clothing, same weighing scale was used for all the subjects and readings expressed in kilograms (kg) to the nearest 0.5kg. [28] Height was also measured with the subjects standing upright, bare footed, back and heel against the wall facing forward using a collapsible standard metal ruler mounted against the wall, while the height was read by placing a

ruler at the highest point of the subject's scalp and expressed to the nearest centimeters. [29]

Waist circumference was measured using a flexible, non-stretchable tape with the subject standing erect with relaxed abdominal muscles (expiration), arm at the side and feet together. The waist circumference was measured at the level of umbilicus to the nearest 0.5 cm. The measurement was taken at the end of a normal expiration. Hip circumference was measured at the point of greatest circumference around hips and buttocks, level of the anterior iliac spine, to the nearest 0.5 cm. Measurements were taken with a flexible, non-stretchable tape in close contact with the skin, but without indenting the soft tissue.[31]

Male and female respondents with Waist Circumference (WC) values ≤ 94 and ≤80cm, respectively, were considered to have normal WC, whereas males and females with WC values > 94 and > 80 cm, respectively, were considered to have high WC (obesity) according to WHO cut off.[31] Waist Hip Ratio (WHR) ≤ 0.9 in men and ≤ 0.85 in women were considered normal while WHR > 0.9 in men and > 0.85 in women was considered abnormal and indicative of central obesity.[31]

The questionnaires were screened for completeness by the researcher after which they were coded and entered into the IBM SPSS version 21.0 software. Univariate analysis was done for all variables to assess the distribution. Descriptive statistics such as means and proportions were used to summarize the data. Bivariate analysis (Chi square test) was carried out to identify factors associated with hypertension. Multivariate analysis using binary logistic regression was carried out using the 'enter approach" to further determine significant predictors of hypertension and control for confounders. Frequency tables were used to present the results. The level of significance was set at $p < 0.05$ for all statistical associations.

The WHO grading system of hypertension to profile risk was used to classify respondents' hypertensive status. This defines Grade 1 hypertension as SBP 140–159 mmHg or DBP 90–99 mmHg; Grade 2 as SBP 160–179 mmHg or DBP 100–109 mmHg; and Grade 3 as SBP ≥ 180 or DBP ≥110 mm Hg. [32] The prevalence of hypertension was obtained by adding the proportion of newly diagnosed hypertensives and previously diagnosed hypertensives whether they had normal blood pressure readings or not at the time of the study and expressed as a percentage.

Body mass index (BMI) was calculated using weight (kilogram) divided by height (meters) squared and classified as: Underweight (≤18.5 kg/m^2), Normal range (18.5 – 24.9 kg/m^2), Overweight (25.0 – 29.9 kg/m^2) Obese (≥ 30.0).[33]

Ethical approval to conduct this research was obtained from the Edo State Ministry of Health Ethical Clearance Committee. Permission was also obtained from the Managing Director of the company. Written Informed consent was obtained from the respondents and they were assured of the confidentiality of their responses and the opportunity to withdraw at any time without prejudice. The specific blood pressure readings of the respondents were provided to them verbally and in writing and those with raised blood pressure were referred for further management.

RESULTS

A total of 354 respondents participated in this study. The mean age of the respondents was 37.9 ± 10.4 years with over one third 124 (35.0%) seen to be in the 31-40 years age group. Majority of the respondents 302 (85.3%) were males. Over three-quarters of the respondents, 297 (78.8%) were married while 150 (42.3%) of

the respondents had a secondary level of education. Over three-fifths of the respondents, 243 (68.6%) and 221 (62.5%) were contract staff and worked at the plantation department, respectively. (Table 1)

Over two-thirds of the respondents, 253 (71.5%) worked 1-8 hours daily and 311 (87.9%) worked for 6-7 days weekly. Two hundred and forty-eight (70.1%) were not allowed to go on paid annual leave and the level of work activity of 298 (84.2%) of the respondents was of either moderate or vigorous intensity. One hundred and seventy-two (48.6%) respondents consumed alcohol and of these, 12 (6.9%) consumed alcohol more than 5 days a week in the past 1 year. Sixteen (4.5%) of respondents were current cigarette or tobacco smokers. Of the 338 (95.5%) who were not smoking currently, 6 (1.8%) had smoked cigarette or tobacco in the past. Less than a tenth of the respondents 32 (9.0%) had a family history of hypertension Ten (2.8%) of the respondents were known diabetics, and a higher proportion 224 (25.4%) of the respondents had normal weight, while 178 (50.3%) had an abnormal waist-hip ratio. (Table 2)

As at the time of the study, 65 (18.4%) of the respondents were hypertensive. This comprised of 17 (4.8%) who were known hypertensive and 48 (13.6%) respondents who had elevated blood pressure readings (newly diagnosed). Of the newly diagnosed respondents, over two thirds 33 (68.8%) were classified as Stage 1 hypertension.

Half of the respondents 178 (50.3%) had their last blood pressure check hours before the study. (Table 3) The prevalence of hypertension was highest among respondents who were more than 60 years of age as 13 (92.9%) were hypertensive. The association between age of respondents and the prevalence of hypertension was statistically significant (p=0.001). A higher proportion of females 14 (26.9%) were found to be hypertensive, however, this difference was not statistically significant (p=0.084). Alcohol compared to those who do not60 (17.8%).

Table 1: Socio-Demographic Characteristics of Respondents

Variable	Frequency (n = 354)	Percent
Age group (years)		
≤30	100	28.2
31 – 40	124	35.0
41 – 50	88	24.9
51 – 60	28	7.9
> 60	14	4.0
Mean age = 37.9 (10.4) years		
Sex		
Female	302	85.3
Male	52	14.7
Race		
Black	343	96.9
Caucasian	10	2.8
Asian	1	0.3
Marital status		
Married	279	78.8
Single	72	20.3
Divorced	1	0.3
Widow	2	0.6
Level of Education		
None	2	0.6
Primary	134	37.9
Secondary	150	42.3
Tertiary	68	19.2
Department		
Plantation	221	62.5
Office	55	15.5
Mill	55	15.5
General service	16	4.5
Refinery	7	2.0

Table 2: Risk Factors for Hypertension among Respondents

Variable	Frequency (n = 354)	Percent
Alcohol intake		
Yes	172	48.6
No	182	51.4
Tobacco use		
Yes	16	4.5
No	338	95.5
Family history of hypertension		
Yes	32	1.8
No	322	98.2
History of diabetes		
Yes	10	2.8
No	344	97.2
Anthropometric Characteristics		
BMI Category		
Underweight	6	1.7
Normal weight	224	63.3
Overweight	90	25.4
Obese	34	9.6
Waist Hip Ratio		
Normal	176	49.7
Abnormal	178	50.3

However, this difference was not statistically significant (p=0.340).Twenty-eight (16.3%) of the respondents who consume alcohol were hypertensive consume Over one-third of the respondents who were currently smoking tobacco 5 (31.3%) were hypertensive compared to those who did not smoke 60 (17.8%), however, this difference observed was not statistically significant (p=0.186). Hypertension was more prevalent among respondents who were overweight 24 (26.7%) and obese 9 (26.5%). This difference in prevalence of hypertension observed in the respondents was statistically significant (p=0.028). The prevalence of hypertension was higher among respondents with abnormal Waist Hip Ratio 44 (24.7%) and this was statistically significant (p=0.002). (Table 4)

The variables in the model accounted for between 9.0% - 14.6% of the variation observed in the outcome variable (presence of hypertension). With a year increase in age, respondents were more likely to be hypertensive by an odds of 1.049 and this was statistically significant (p=0.001, 95%CI: 1.019-1.080). Males had less odds of being hypertensive compared to the females (OR=0.576), this was however not statistically significant (p=0.139, 95%CI: 0.277-1.196).

Table 3: Blood Pressure Status of Respondents

Variables	Frequency	Percent
Blood Pressure (BP) status(n=354)		
Normal	289	81.6
Normal BP (known hypertensive)	17	4.8
High BP (newly diagnosed)	48	13.6
Classification of hypertension (n=48)		
Stage 1	33	68.8
Stage 2	12	25.0
Stage 3	3	6.2
Last BP check (n=354)		
Hours ago	178	50.3
Days ago	16	4.6
Weeks ago	26	7.3
Months ago	54	15.3
Years ago	27	7.6
Never	53	15.0

Respondents were 1.076 times more likely to be hypertensive with increasing weekly days of work.

Table 4: Factors associated with hypertension among respondents

Variable	Hypertensive Status		Test statistics	p-value
	Yes (n=65) Freq %	No (=289) Freq %		
Age group (years)				
≤30	4 (4.0)	96 (96.0)	χ^2 = 182.73	<0.001
31 – 40	7 (5.6)	117 (94.4)		
41 – 50	15 (17.0)	73 (83.0)		
51 – 60	2 (7.1)	26 (92.9)		
≥61	13 (92.9)	1 (7.1)		
Sex				
Male	51 (16.9)	251 (83.1)	χ^2 =2.981	0.084
Female	14 (26.9	38 (73.1)		
Current Tobacco use				
Yes	5 (31.3)	11 (68.8)	Fishers exact = 1.857	0.186
No	60 (17.8)	278 (82.2)		
Alcohol use				
Yes	28 (16.3)	144(83.7)	χ^2 =0.968	0.340
No	37 (20.3)	145(79.7)		
BMI				
Underweight	0 (0.0)	6 (100.0)	Fishers exact = 0.018	0.028
Normal	32 (14.3)	192 (85.7)		
Overweight	24 (26.7)	66 (73.3)		
Obese	9 (26.5)	25 (73.5)		
Waist hip ratio				
Normal	21 (11.9)	155 (88.1)	χ^2 = 3.316	0.002
Abnormal	44 (24.7)	134 (75.3)		

χ^2 – Chi-square

However, this was not statistically significant (p=0.746, 95%CI: 0.680-1.711). Respondents who were not smoking cigarette currently had less odds of being hypertensive compared to those who were smoking currently (OR=0.188) and this was statistically significant (p=0.007). Respondents who had no family history of hypertension had less odds of being hypertensive (OR=0.773), but this was not statistically significant (p=0.598, 95%CI: 0.296-2.014). Respondents who were underweight or had a normal BMI had less odds of being hypertensive compared to those who were overweight or obese (OR=0.517), and this was statistically significant (p=0.027, 95%CI: 0.288-0.929). Respondents who had a normal Waist Hip Ratio had less odds of being hypertensive (OR= 0.506) and this was statistically significant (p=0.033, 95%CI = 0.271-0.946). (Table 5)

DISCUSSION

The result of this study revealed that 18.4% of the studied population were hypertensive. This is higher compared to the value obtained

Table 5: Logistic Regression of Factors associated with hypertension among Respondents

Predictors	B (regression co-efficient)	Odds ratio	95% CI for OR		p - value
			Lower	Upper	
Age	0.048	1.049	1.019	1.080	0.001
Sex					
Male	-0.522	0.576	0.277	1.196	0.139
Female*		1			
Weekly days of work	0.076	1.079	0.680	1.711	0.746
Level of work activity					
Mild intensity	-0.562	0.570	0.246	1.319	0.189
Moderate/Vigorous Intensity*		1			
Alcohol intake					
No/Low intake					
High intake*	0.280	1.323	0.359	4.874	0.674
		1			
Current tobacco smoking					
No					
Yes*	-1.672	0.188	0.055	0.636	0.007
		1			
Family History of Hypertension					
No					
Yes*	-0.258	0.773	0.296	2.014	0.598
		1			
History of Diabetes					
No					
Yes*	0.247	1.280	0.235	6.968	0.775
		1			
BMI					
Underweight/Normal					
Overweight/Obese*	-0.659	0.517	0.288	0.929	0.027
		1			
Waist Hip ratio					
Normal					
Abnormal*	-0.680	0.506	0.271	0.946	0.033`
		1			

***Reference Category, R^2= 9.0% – 14.6%, CI = Confidence Interval**

in Maiduguri where prevalence of hypertension was 15.3%. [34] It was however lower than the value (20.8%) obtained in Egbeda and 33.1% in Ibadan, Southwest of Nigeria.[35-36]The prevalence of hypertension was found to increase with increasing age of respondents in this study. This is comparable with findings from a study carried out in Nsukka in 2010.[37] Advancing age is a known non-modifiable risk factor for hypertension.

Increase in blood pressure with age is mostly related to changes in arterial and arteriolar stiffness. Other pathophysiological influencing factors which contribute to increase in BP with ageing include decreased baroreceptor sensitivity, increased responsiveness to nervous system stimuli, altered renal and sodium metabolism and an altered renin-aldosterone relationship.[6] Hypertension was more prevalent among the female respondents in this study compared to the males. This is similar to findings obtained in a systematic review of studies published between January 2000 and August 2015 where 19 studies revealed that the prevalence of hypertension were higher in females than in males.[38] However, this finding was in contrast to findings from a systematic review of 33 studies carried out Nigeria where 22 studies reported a higher prevalence of hypertension among the males.[39]

Hypertension was found to be slightly higher in respondents who had tertiary level of education compared to respondents with other levels of education except for those respondents with no formal education. These findings support several reports that higher education tend to support increased prevalence of hypertension because it affords individuals the opportunity to have greater access to wealth which influences lifestyle and job types such as sedentary occupation. Hypertension was also more prevalent among managers/senior staff who were more likely to have higher levels of education as well as earn higher incomes compared to other staff. This is in congruence with findings from a study done in California in United State of America, it was revealed that person in management cadre had the highest percentage of self-reported hypertension when compared with other workers.[40] Increased income as a result of high wealth index, has been significantly associated with hypertension.[41] This leads to a desire for modern conveniences, such as adoption of unhealthy food habits such as consumption of fast food which are rich in salt and saturated fats which are misconstrued to be a sign of good living. These are also some of the factors which influence the establishment of hypertension in individuals.

Ironically, respondents whose level of work activity was of moderate or vigorous intensity had a higher prevalence of hypertension. This may be due to the presence of other confounding factors like age, sex, tobacco smoking etc. BMI was a significant predictor of the prevalence of hypertension. Hypertension was found to increase with increasing BMI in this study. This is in congruence with a study done in Uganda in 2009 where it was found that participants who were hypertensive on the average had greater BMI when compared to those without hypertension.[42] This supports the claim that obese people, are more likely to be hypertensive than those who are not obese.[43] BMI is greatly influenced by dietary practice linked to high saturated fats, tobacco use, and low physical activity, all of which individually are also risk factors for hypertension.[44]

In this study, nearly half of the respondents admitted to consuming alcohol. There was no association between increased level of alcohol intake and hypertension in this study as none of those who consume alcohol for greater than five days in a week had hypertension. A high proportion of respondents who had never taken alcohol or had low alcohol intake had hypertension. However, this study did not establish any link between increased level of alcohol intake and hypertension. This finding is in contrast to findings obtained from a study carried out in Korea where present alcohol user were 1.3 times more likely to be hypertensive compared to those who had never used alcohol.[34]Another study carried out in the USA between 1988 – 2004 also

reported that current alcohol users and past alcohol users were more likely to be hypertensive.[45] The reason for the finding in this study could be that, majority of these workers are involved in vigorous activity like, clearing, climbing, lifting heavy object or walking more than 10 minutes in day. Such vigorous activity reduces accumulation of cholesterol and fat whose increase are linked to alcohol use. This therefore counters the hypertensive effect of alcohol. However, current tobacco smoking was a predictor of hypertension as a higher proportion of those who smoked were hypertensive (31.3%). Tobacco smoking is one of the major causes of avoidable cardiovascular disease including hypertension.

Other factors considered in the study include a family history of hypertension. Less than ten percent of the respondents had a family history of hypertension. The prevalence of hypertension was slightly higher among those who had a family history of hypertension compared to those who had no family history in this study. This result is in agreement with the findings obtained in Sri Lanka, where nearly one third of those who had hypertension also had a family history of hypertension.[32] Family history has been implicated as one of the non-modifiable risk factor for hypertension.[46] Continuous efforts should be made by relevant stakeholders to educate individuals on risk factors of hypertension as this would promote healthier lifestyle patterns. The strengths of this study are that a relatively large sample size was used and a probability sampling technique was employed in the selection of respondents. A limitation of this study is that the quantity of alcohol consumed was not done.

Conclusion: Hypertension is a public health problem in the study population and identified risk factors include alcohol consumption, tobacco use, and obesity. Efforts should be made by the management of the company to have health programs such as screening exercises for hypertension and "health week" where sensitization and health education on hypertension can be done for all the staff. This will help to identify risk factors for hypertension and promote the adoption of healthy lifestyles. This will ultimately contribute to a reduction in the prevalence and risk factors for hypertension among the study population. A limitation of this study was that the quantity of alcohol consumed by the respondents was not assessed in this study.

Conflict of interest: Authors declared they have no conflict of interest in carrying out this research.

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