PREVALENCE AND ASSOCIATED RISK FACTORS OF HYPERTENSION AMONG PRIVATE AND PUBLIC SECONDARY SCHOOL TEACHERS IN BENIN CITY, EDO STATE, NIGERIA

ABSTRACT

Hypertension is one of the major attributable risk factors for cardiovascular diseases. It affects both high and low income groups. There is need for constant research to be done to evaluate its prevalence. This study determined the prevalence and associated risk factors of hypertension among private and public secondary school teachers in Benin City, Edo State. A cross sectional study design was employed in this study. Twelve (12) schools in Benin City were selected using a multistage sampling technique and 252 teachers were equally drafted from both public and private secondary schools using the same technique. One hundred and twenty-six teachers each from both public and private secondary schools participated in the study. A constructive standardized questionnaires was used to collect data. Blood pressures of the participants were measured using a digital blood pressure apparatus. Anthropometric measurements such as the height, weight, BMI, waist circumference and hip circumference of the participants were also taken. The data was analyzed using Statistical Package and Service Solution (SPSS) version 22.0. Level of significance was set at $p < 0.05$. Findings from the study revealed an overall prevalence of hypertension rate of (37.3%) for public secondary school teachers and (26.2%) for private secondary school teachers, though not statistically significant ($p < 0.05$). Age was found to be a significant factor of hypertension ($p = 0.001$) among the private secondary school teachers. The ≤ 40 years, had the highest prevalence of hypertension (63.3%) than those aged ≥ 41 years (36.7%). While teachers in public secondary school aged ≥ 41 years recorded the highest prevalence of hypertension (80.0%) than those ages ≤ 40 years (20.0%). Monthly income showed a statistical significance with hypertension prevalence ($p = 0.005$) among teachers in private secondary schools, with higher number of hypertensive teachers (84.8%) earning ≤ ₦49,999. A higher number of hypertensive teachers (93.6%) in public secondary school earned ≥ ₦50,000, and monthly income did not have significant impact on hypertension prevalence among this study group. BMI also influenced hypertension prevalence among the surveyed public ($p = 0.022$) and private ($p = 0.009$) secondary school teachers with the prevalence being more among public (70.2%) compared to private secondary school teacher. Family history did not show significant impact on prevalence of hypertension. The result of this study showed a high prevalence of hypertension among the surveyed groups, therefore there is need for general public health education, periodic screening and monitoring of the blood pressure of teachers to be incorporated into the school health program.

Key word: HYPERTENSION, RISK FACTORS, cardiovascular diseases, blood pressure

I. INTRODUCTION

Hypertension which is a medical term given to high blood pressure is a condition in which there is elevated blood pressure in the arteries. It is one of the leading causes of cardiovascular diseases, affecting both economically developing and developed countries, and poses a public

health concern globally (Ahmed *et al* 2014). It accounts for about 7.5 million deaths (12.8%) of the total of all annual deaths worldwide (Mendis, 2010). and is anticipated to be increased to 1.56 billion adults with hypertension in 2025 (Tabrizi, Sadeghi-Bazargani, Farahbakhsh, Nikniaz, & Nikniaz, 2016). Currently, the global burden of hypertension is greatest in Low and Middle-income Countries where it affects about 1 in every 5 of the adult population (Seedat, 2000).

In Nigeria, hypertension has been reported to be the commonest non-communicable disease and the commonest risk factor for cardiovascular disease (Familoni & Olunuga, 2005), with a high prevalence rate among secondary school teachers in Nigeria (29.0%) (Adeseye, Wahab, Deborah, Afolabi & Oladimeji (2017).

Healthy young people are frequently regarded as free from such chronic disease as hypertension, but reports from many parts of the world show that both hypertension and prehypertension are prevalent among young people (Nwazor, & Oputa, 2012), and not only among the aged, and teachers of both public and private secondary schools fall in this category. Many studies has being conducted on hypertension, but none has focused on the difference in prevalence of hypertension among public and private secondary school teachers, there is, therefore, a need for constant research to be carried out to evaluate the prevalence. Hence the study aimed to determine the prevalence and associated risk factors of hypertension among the study groups.

II. MATERIALS AND METHODS

Study design

A cross-sectional descriptive study design was employed for this study.

Study Area

The study was conducted in Benin City, which is the capital of Edo State, in Nigeria. Benin City is located within longitude 50 35'E to 50 41'E and latitude 60 26'N to 60 31'N. It comprises four local government areas, Ikpoba Okha, Egor, Oredo, and Uhunmwunode. Benin City is home to many including the Oba of Benin, Omo Noba Nedo Uku Akpolokpolo Oba Erediauwa, Chief Gabriel Igbinedion the Esama of Benin Kingdom, and other prominent princes and chiefs. It has an area of 249 km² and a population of 374,671 at the 2006 census, and an estimated population of 1,782,000 in 2021 (*Encyclopedia Britannica 2021*). The major language is Bini and the inhabitants comprised of Christians, Muslims, and traditional believers. The people are mainly farmers, traders, fishermen, politicians, traditional practitioners, public servants among others.

Study Population

The population of this study include all public and private secondary school teachers in all the selected schools in Benin City, Edo State, Nigeria.

Sample Size and Sampling Method

Sample size

A minimum sample size was determined using Daniel's sample size formula.

$n = \frac{Z^2 \times P \times (1 - P)}{d^2}$ (Quirk, 2015).

Where: n = Minimum sample size required;

Z = the standard normal deviation corresponding to 5% level of significance (0.05).

The value of Z obtained from the normal distribution table was 1.96;

P = Prevalence of hypertension in Nigeria, 18% (Ofili & Omuemu, 2006).

d = Allowable margin of error 5% (0.05) i.e. I would like the result to be within 5% of the true value,

By Substituting the values, $n = \frac{(1.96)^2 \times (0.18) \times (0.82)}{(0.05)^2}$ => $n = \frac{3.8416 \times 0.1476}{0.0025} = 227$

Adding 10% to cater for non-response (NR), invalid data form and invalid Lab result.

$n = \frac{n}{1-NR}$ where n- sample size, NR- non response $n = \frac{226}{1-10\%}$

n = 252.

Hence, a total number of 252 persons were recruited for this study

The estimated sample size of public secondary school teachers was 126, while that of private secondary school teachers was also 126.

Sampling Techniques

A multistage sampling was used to select the schools. In the first stage, a simple random sampling was used to select two local governments from the four local governments that make up Benin City. In the second stage, a stratified sampling technique was used to select 6 schools

each from public and private secondary schools. There are 23 public secondary schools and 185 private secondary schools in the two selected local government. In the third stage, a simple random sampling was used to select 21 teachers each from the 12 selected secondary schools making a total of 252 samples.

Instruments and Data Collection

The instrument for this study was a questionnaire designed and prepared to contain information relating to the objective of the study, The structured questionnaire consists four parts, which include socio-demographic characteristics, such as, the respondent's age, tribe, religion, marital status, level of education, level of monthly income, the knowledge on hypertension, Risk factors of hypertension and finally, the anthropometric measurements, including the weight , height, waist and hip circumference and the blood pressure measurement.

A digital blood pressure apparatus (Omron Hem-7600T Smart Elite Tubeless Blood Pressure Monitor) was used to measure the blood pressure of the participants, 2 portable digital weighing scales and 2 Stadiometers, for measuring the weight and height of the participant. To accurately determine the BMI (body mass index) 2 non-elastic plastic measuring tapes were used, to measure participants' waist and hip circumference.

Method of Data Analysis

The data collected was crosschecked for completeness, coded and classified. Data obtained from completed questionnaires were entered and analyzed using IBM Statistical Package for Social Science Statistics version 22.0. For presentation of the data, frequency tables were used. For univariate analysis, continuous variables were presented as means and standard deviations. Categorical variables were presented as proportions. Bivariate comparisons of private and public

secondary school respondents were done using chi square and Fishers exact tests for categorical variables and t tests for continuous variables. P values less than 0.05 were considered to be statistically significant.

III. RESULTS

Socio-Demographic Characteristics

The mean ages of the teachers were 35.2 ± 8.3 for the private secondary schools and 47.7 ± 8.5 for the public secondary schools. A higher proportion of teachers who were married are greater in number in the private secondary schools 90 (71.4%) when compared to those in public secondary schools 19 (15.1%). A larger number of teachers from the Bini ethnic group were found to be more in the public secondary schools 96 (76.2%) in comparison to the private secondary schools 69 (54.8%). A greater number of the teachers in public secondary schools had tertiary and higher education 123 (97.6%), in comparison to the teachers in the private secondary school 109 (86.5%). A greater number of the teachers earning less than ₦50,000 monthly were found to be in the private secondary schools 119 (94.4%), while more of the teachers in the public secondary school had a household size of four and above 103 (81.7) (Table 1).

Table 1: Socio-Demographic Characteristics of Private and Public Secondary School Teachers

Variables	Frequency (%)	
	Private (n=126)	Public (n=126)
Age (years)		
≤ 40 years	99 (78.6)	28 (22.2)
≥ 41 years	27 (21.4)	98 (77.8)
Mean age	35.2 ± 8.3	47.7 ± 8.5

Sex		
Male	21 (16.7)	27 (21.4)
Female	105 (83.3)	99 (78.6)
Marital status		
Married	90 (71.4)	19 (15.1)
Others	36 (28.6)	107 (84.9)
Ethnicity		
Bini	69 (54.8)	96 (76.2)
Others	57 (45.2)	30 (23.8)
Religion		
Christianity	114 (90.5)	114 (90.5)
Others	12 (9.5)	12 (9.5)
Highest education		
≤ Secondary	17 (13.5)	3 (2.4)
≥ Tertiary	109 (86.5)	123 (97.6)
Monthly income		
≤ ₦49,999	119 (94.4)	14 (11.1)
≥ ₦50,000	7 (5.6)	112 (88.9)
Household size		
≤ Three	53 (42.1)	23 (30.2)
≥ Four	73 (57.9)	103 (81.7)

Distribution of Respondents by Prevalence of Hypertension

A statistically significant (p=0.043) higher proportion of teachers in the studied public secondary schools 65 (51.6%) recorded above normal systolic blood pressure as well as above normal diastolic blood pressure 53 (42.1%), though the latter is not statistically significant (p<0.05) (Table 2). A greater proportion of studied teachers in the public secondary schools 47 (37.3%) already knew they were hypertensive compared to those in the private secondary schools 33 (26.2%), though the difference was not significant (p<0.05) (Table 2).

Table 2: Distribution of Respondents by Prevalence of Hypertension

Variable	Frequency (%)		X^2	df	p-value
	Private (n=126)	Public (n=126)			
Systolic Blood Pressure					
Systolic hypertensive	49 (38.9)	65 (51.6)	4.101	1	0.043*

Non-systolic hypertensive	77 (61.1)	61 (48.4)			
Mean systolic blood pressure	119.5 ± 19.1	123.3 ± 18.3	t = -1.590		0.113
Diastolic Blood Pressure					
Diastolic hypertensive	41 (32.5)	53 (42.1)	2.443	1	0.118
Non-diastolic hypertensive	85 (67.5)	73 (57.9)			
Mean diastolic blood pressure	75.9 ± 13.6	78.1 ± 12.0	t = -1.364		0.174
Known Hypertensive					
Yes (Prevalence)	33 (26.2)	47 (37.3)	3.590	1	0.058
No	93 (73.8)	79 (62.7)			

* Statistically significant

Hypertensive = Systolic BP > 120mmHg, diastolic BP > 80mmHg or both systolic and diastolic BP > 120/80

Comparison of the Associations between Socio-Demographic Characteristics, BMI & Prevalence of Hypertension Among known Hypertensive Teachers in Surveyed Private and Public Secondary Schools.

More teachers in the surveyed private secondary schools who were hypertensive 21 (63.6%) were ≤40 years while majority of public secondary schools teachers who were hypertensive were ≥41 years 37 (78.7)There was a statistically significant association between age and prevalence of hypertension among private secondary school teachers. (p=0.015) A greater number of teachers who were hypertensive in the private secondary schools 28 (84.8%) earned below ₦50,000 as monthly income while majority of public secondary schools teachers who were hypertensive 44 (93.6) earned ₦50,000 and above as monthly income (Table 3). There was a statistically significant association (p=0.005) between monthly income and occurrence of hypertension among the studied private secondary school teachers. Other socio-demographic characteristics such as sex, marital status, ethnicity, religion, highest education and household size and occurrence of hypertension among private secondary school teachers were not statistically significant (p<0.05) (Table 3). Similarly, all socio-demographic characteristics such as sex, marital status, ethnicity, religion, highest education and household size and occurrence of

hypertension in public secondary school teachers were not statistically significant (p<0.05) (Table 3).

A higher proportion of hypertensive teachers in the public secondary schools 33 (70.2) were overweight or obese, with BMI equals or greater than 25.0 kg/m^2 in comparison to hypertensive teachers in the private secondary schools 18 (54.5) who were overweight or obese, with BMI equals or greater than 25.0 kg/m^2. There was a statistically significant association (p=0.009) and (p=0.022) between overweight/obesity and prevalence of hypertension among the studied private and public secondary school teachers.

Table 3: Comparison of the Associations between Socio-Demographic Characteristics, BMI & Prevalence of Hypertension Among known Hypertensive Teachers in Surveyed Private and Public Secondary Schools.

Variable	Private (n=126)			Public (n=126)		
	Hyper tensive n = 33	Non- hyper tensive n= 93	Total n = 126	Hyper tensive n = 47	Non- hyperten sive n= 79	Total n = 126
Age (years)						
≤ 40 years	21 (63.6)	78 (83.9)		10 (21.3)	18 (22.8)	
≥ 41 years	12 (36.4)	15 (16.1)		37 (78.7)	61 (77.2)	
X^2, df, p, Fisher exact p	5.923, 1, 0.015*, 0.025			0.039, 1, 0.844, 1.000		
Sex						
Male	6 (18.2)	15 (16.1)		9 (19.1)	18 (22.8)	
Female	27 (81.8)	78 (83.9)		38 (80.9)	16 (77.2)	
X^2, df, p, Fisher exact p	0.074, 1, 0.786, 0.488			0.231, 1, 0.631, 0.662		
Marital status						
Married	23 (69.7)	67 (72.0)		8 (17.0)	11 (13.9)	
Others	10 (30.3)	26 (28.0)		39 (83.0)	68 (86.1)	
X^2, df, p, Fisher exact p	0.066, 1, 0.798, 0.825			0.221, 1, 0.638, 0.797		
Ethnicity						
Bini	18 (54.5)	51 (54.8)		37 (78.7)	59 (74.7)	
Others	15 (45.5)	42 (45.2)		10 (21.3)	20 (25.3)	
X^2, df, p, Fisher exact p	0.001, 1, 0.977, 1.000			0.265, 1, 0.607, 0.670		
Religion						
Christianity	28 (84.8)	86 (92.5)		42 (89.4)	72 (91.1)	
Others	5 (15.2)	7 (7.5)		5 (10.6)	7 (8.9)	
X^2, df, p, Fisher exact p	1.643, 1, 0.200, 0.297			0.108, 1, 0.742, 0.761		

Highest education				
≤ Secondary	6 (18.2)	11 (11.8)	1 (2.1)	2 (2.5)
≥ Tertiary	27 (81.8)	82 (88.2)	46 (97.9)	77 (97.5)
X^2, df, p, Fisher exact p	0.842, 1, 0.359, 0.381		0.021, 1, 0.886, 1.000	
Monthly income				
≤ ₦49,999	28 (84.8)	91 (97.8)	3 (6.4)	11 (13.9)
≥ ₦50,000	5 (5.2)	2 (2.2)	44 (93.6)	68 (86.1)
X^2, df, p, Fisher exact p	7.846, 1, 0.005*, 0.013		1.697, 1, 0.193, 0.249	
Household size				
≤ Three	17 (51.5)	36 (38.7)	11 (23.4)	12 (15.2)
≥ Four	16 (48.5)	57 (61.3)	36 (76.6)	67 (84.8)
X^2, df, p, Fisher exact p	1.639, 1, 0.200, 0.223		1.333, 1, 0.248, 0.340	
BMI (kg/m^2)				
Normal Weight	15 (45.5)	66 (71.0)	14 (29.8)	40 (50.6)
Overweight/Obesity	18 (54.5)	27 (29.0)	33 (70.2)	39 (49.4)
X^2, df, p, Fisher exact p	6.906, 1, 0.009*, 0.011		5.229, 1, 0.022*, 0.026	

* Statistically significant

Simple Logistic Regression of Presence of Hypertension on Family History of Hypertension

In the public secondary schools, teachers with a family history of hypertension were 1.390 times (AOR: 1.390; 95% CL: 0.656 - 2.945; and $p = 0.389$) more likely to be hypertensive, while in the private secondary schools, respondents with a family history of hypertension were 0.778 times (AOR: 0.778; 95% CL: 0.314 - 1.927; and $p= 0.587$) more likely to be hypertensive. However, the findings were not statistically significant *($p<0.05$)*

Table 4: Simple Logistic Regression of Presence of Hypertension on Family History of Hypertension

Predictor variable	**Private**				**Public**			
	p-value	**Crude odds ratio**	**95% CI Lower**	**Upper**	**p-value**	**Crude odds ratio**	**95% CI Lower**	**Upper**
Family history of hypertension								
Yes	0.587	0.778	0.314	1.927	0.389	1.390	0.656	2.945

IV. DISCUSSION

Hypertension is a major public health problem as a result of its high prevalence globally, (Ahmed *et al*, 2014). This study determined the prevalence and associated risk factors of hypertension among public and private secondary school teachers in Benin City, Edo State.

The prevalence of hypertension in this study was higher than the global prevalence of hypertension as well as WHO's regional prevalence for hypertension for the African region 22% (WHO, 2014). A prevalence of 20% was reported among rural community in Edo State (Omuemu, Okojie, & Omu 2016), which was also lower than the reported prevalence in this study.

The result from this study is more or less consistent with studies carried out in Bahir Dar City in Ethiopia, (29.28%), USA (29.3%), Hosaera Town in southern Ethiopia (30.0%), and Addis Ababa (27.3%) (Destaw *et al.* 2021; Ong *et al*. 2007; Asfaw, Ayanto & Gurmamo 2018; Angaw, Dadi & Aleni, 2015). Ibrahim, Hijazi & Al-Bar (2008), in their study on hypertension among preparatory and secondary school teachers, reported a consistent prevalence of 25.2%. More so, a national representative study of 1.3million adults in India reported a prevalence of hypertension of (25.3%), (Geldsetzer, Manne-oehler & Theilmann 2018), which consistent with this study.

Conversely, the prevalence of hypertension in this study however, was lower than the prevalence of studies done in two different regions in South Africa; 48% and 46% respectively (Senekal, Seme, De Villers, Styn, 2015; Laurence, Volmink, Esterhuizen, Dalal, & Holmes, 2016). In Zambia a study recorded 40% (Mulenga & Siziya, 2013) and in Bangladash a prevalence of 52%

was recorded by Barua *et al.*, (2018). All these prevalence values outweighed the value recorded by WHO for low and middle income countries.

The variation in the prevalence of the this study and other studies might be attributed to the differences in socio-demographic characteristics, life styles, differences sample size, differences in study settings, and other variables of the study subjects. For example, in Zambian study mentioned above, a good number of the study group were cigarette smokers, and alcohol consumers. Furthermore, the subject of this group were educated and purely from urban setting. However, subject of other studies were from the general population and may be conducted in both urban and rural dwellers. The implication of this finding is that hypertension exists in both private and public secondary schools teachers in Benin City.

This study found a statistical significant (p=0.015) difference between age and hypertension occurrence, there is a higher prevalence of hypertension among teachers who aged ≤ 40 years than those aged ≥ 41 years in private secondary schools, the reason behind this difference is unknown, but could be attributed to majority of the participants in this study group being young graduates and are ≤ 40 years. Many studies agreed that hypertension increases with age (Wamala, Karyabakabo, Ndungutse & Guwatudde 2009; Tabrizi, Sadeghi-Bazargani, Farahbakhsh, Nikniaz, & Nikniaz, 2016) Apparently, hypertension now affects young people, but more prevalence among the aged groups, this is because, as the human body ages, it becomes less responsive to stimuli, thereby causing older people to display less sympathetic nervous system regulation than is seen among young individuals (Cohen, Curhan & Forman, 2012).

This study found a statistically significant (p=0.005) association between the monthly income and occurrence of hypertension among private secondary school teachers. A greater number of teachers who were hypertensive in the private secondary schools earned below ₦50,000. This

study is in line with the study conducted in Kenya, (Damaris, Gideon & Walter, 2018) and supported by Steptoe, Brydon, & Kunz-Ebrecht, 2005) in their studies on "Change in Financial Strain over Three Years, Ambulatory Blood Pressure, and Cortisol". The association of income with hypertension in this study is in contrast with that of Girma & Sebiewengel (2016) in their study on socioeconomic status and hypertension among teachers and bankers, where a statistically association was found among both high income and low income groups. The implication of this finding is, having a higher level of income is a protective factor for healthy living, as this can influence choice of living.

In this study, there was a strong statistical significant ($p<0.05$) association between BMI and occurrence of hypertension among public and private secondary school teachers. The result is consistent with the study conducted in Debre Markos town (Northwest Ethiopia) (kiber, *et al*. 2019) and that conducted in Durame town, southern Ethiopia (Helelo, Gelaw,& Adene, 2014), where overweight /obese were found to strong risk factor for hypertension. The result of this finding also, is in consonant with the findings of Adebayo *et al.* (2013) which stated a trend towards increase in risk of hypertension prevalence in Nigeria. Adebayo *et al* further reported that increase in body mass index (BMI) significantly increase blood pressure in adults and was backup by a study carried out in Egypt (Ibrahim, Hijazi & Al-Bar, 2008). The relationship between body mass index and hypertension is clarified by increase in body fluid, as BMI level increases, this indicates the accumulation of fat tissue in the human body, which may increase the risk of chronic diseases, because excess weight increases blood cholesterol and triglyceride level and lowers high-density lipoprotein level (kiber, *et al*. 2019). This evidence was strongly supported by another study carried out in Carolina, USA which found a strong association between hypertension and increase in BMI (Tuan, Adair, Steven, Popkin 2010). The observed

association between overweight/obesity and hypertension in this study could be due to the difference in dietary habit and physical activity of the study participants.

This study revealed a likelihood of hypertension occurrence among the surveyed group who claimed a family history of hypertension. The likelihood of hypertension occurrence in this study may be because family members may share similar genetic factors and lifestyle. Hypertension may likely occur among family members with family history of hypertension, since participants with a family history of hypertension have the same genetic makeup and families tend to share the same lifestyle behavior and choice. (Ranasingh, *et al.* 2015).

V. CONCLUSION

The results of this study revealed a relatively high prevalence of hypertension among private and public secondary school teachers in Benin City Edo State. Age played a significant role in the prevalence of hypertension in this study. Monthly income and Body mass index (BMI), proved to be significantly associated with hypertension in this study. Teachers of both public and private secondary schools are affected with hypertension. Therefore the findings from this study, will provide current information on the prevalence of hypertension, draw more attention to the issue and burden of hypertension and contribute to the development of national and international health policies for the prevention and control of hypertension among private and public secondary school teachers in Benin City. General public health education on teacher hypertension, periodic screening and monitoring of the blood pressure of teachers should be incorporated into the school health program. Awareness programs should be encouraged to

continue to educate teachers about hypertension. Public health programs aim to reduce hypertension should focus primarily on teachers in private and public secondary schools.

Ethical Approval And Consent.

Ethical approval for this study was obtained from the department of public health Technology Owerri. Permission was also sought from the principals of the secondary schools involving in the study, the consent of both the private and public schools' teachers was obtained from all the respondents after explaining the nature of the study, its goals, objectives their obligation, and assurance that participation is purely voluntary and without consequences for non-participation. All study participants with old and newly discovered health conditions in the course of the study.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

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