Original Research Article

Correlation study of socio-demographic factors like gender, age, body mass index and some cardiovascular parameters in hypertensive subjects of Yenagoa, Bayelsa state, Nigeria

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Abstract

Hypertension is defined as a sustained elevated arterial pressure to a level that places the patient at increased risk of organ damage. It is a non-communicable disease which constitutes a public health importance. Its risk factors include advancing age, high salt intake, excessive alcohol consumption and stress. This study was performed to determine the correlation between some socio-demographic factors like gender, age, body mass index (BMI) and some cardiovascular parameters in hypertensive patients of Yenagoa, Bayelsa State, Nigeria. The study was carried out with 400 hypertensive subjects, whose blood pressures were determined using palpatory and auscultatory methods. The gender, age and body mass index of the subjects were also determined. Statistical analysis was done using Z-statistics. We found a significant positive relationship between the age and cardiovascular parameters. Gender and BMI were found to have an insignificant positive correlation with the cardiovascular parameters. The study demonstrated that body mass index, age and gender are closely associated with cardiovascular parameters, though the degree of correlation differed. The risk of hypertension is therefore expected to be higher among the aged and populations who are overweight or obese.

Introduction

Hypertension, often known as high blood pressure, is a well-known chronic medical illness and is described as a persistent rise in arterial pressure (140/90 mm Hg or higher) to a point where the patient is at risk of organ damage. Hypertension is one of the most frequent life-threatening non-communicable diseases affecting about 1 billion people all over the world and contributing to about 7.6 million premature (ages between 30 and 69 years) deaths (about 13% of deaths worldwide), 54% of strokes and 47% of cardiovascular diseases [1,2,3,4,5].

Primary (essential) hypertension and secondary hypertension are two major classes of high blood pressure [6]. Primary hypertension is defined as high blood pressure caused by non-specific

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lifestyle and genetic variables in 90 to 95 percent of all known cases. Secondary high blood pressure occurs in 5–10% of instances and is caused by an identifiable cause, such as chronic renal disease, narrowing of the kidney arteries, an endocrine problem, or the use of birth control pills [6,7].

In adults, the systolic and diastolic pressures, which are the maximum and minimum pressures developed in the arteries, at rest are within the range of 110–140 mmHg and 60–90 mmHg respectively [8,9]. However, different numbers apply to children [10].

Obesity, age, stress, high salt intake, cigarette use, physical inactivity, dietary variables, alcohol usage, and genetics are all key risk factors, according to previous studies [11].

Some drugs and lifestyle modifications can help to control blood pressure and reduce the risk of health issues. Weight loss, physical activity, reduced salt intake, reduced alcohol intake, and a balanced diet are all examples of lifestyle modifications [6]. Medications are used when lifestyle improvements are insufficient to entirely decrease the blood pressure. The use of drugs to treat moderately high arterial blood pressure (defined as >160/100 mmHg) has been linked to a longer life expectancy [12].

The aim of this study was therefore to determine the influence of advancing age, gender and BMI on cardiovascular parameters amongst known hypertensives in Yenagoa, Bayelsa State, Nigeria.

Materials and methods

The study was carried out in the Cardiology Clinics where blood pressure checks and care for hypertension cases are provided routinely in the Niger Delta University Teaching Hospital (NDUTH), Okolobiri. The NDUTH is a Bayelsa State Government-owned teaching hospital established in 2007. It is situated in Okolobiri, in Yenagoa local government area (YELGA) of Bayelsa State.

The target population for this study consisted of all the hypertensive patients attending the Cardiology Clinics for medical care and routine check-up. Two groups of individuals were used for this study— those with normal blood pressure (Normotensives) and those with elevated blood pressure (Hypertensives).

The sample size for this study was obtained using the formula as described by a group of researchers [13].

$$N = \frac{Z^2 Pq}{d^2}$$

Where;

N is the minimum sample size

Z is a constant at 95% confidence level for 2-tailed study (1.96) and significance level is 0.05

P is the immunization coverage for Bayelsa state (51.5%)

q is 1-p

d is the absolute precision required in percentage between the population and the sample, at 95%CI, which we set as 5%

Substituting;

$$N = \frac{(1.96)^2 \times 0.515 \times (1 - 0.515)}{0.05^2} = 384 \approx 400$$

Eight hundred (800) subjects (Hypertensive n=400 and Normotensive n=400) were randomly selected.

The Group 1 subjects were normotensive patients attending the Niger Delta University Teaching Hospital (NDUTH), Okolobiri, Bayelsa State. This group served as the control group. Group 2 subjects were hypertensive patients attending the Cardiology Clinic of Niger Delta University Teaching Hospital (NDUTH) Okolobiri, Bayelsa State.

Data was collected based on a checklist that collects the socio-demographic information, BMI of the patients and their cardiovascular parameters recorded in the laboratory using standard techniques.

The blood pressure parameters were measured manually using stethoscope (Littmann, England) and standard mercury sphygmomanometer (Fisher Scientific, England). The following blood pressure parameters were noted: systolic blood pressure (SBP), diastolic blood pressure (DBP), pulse pressure (PP) and mean arterial pressure (MAP).

The data was analyzed using SPSS version 20.0 (IBM SPSS, Chicago, USA).

This study has been approved by the ethics and research units of both the University of Port Harcourt (Ethical Clearance Number: UPH/CEREMAD/REC/MM67/002) and Niger Delta University Teaching Hospital Okolobiri and have therefore been performed in accordance with the ethical standards laid down by both Universities.

Inclusion and exclusion criteria

The inclusion criteria included both normotensive and hypertensive patients attending the Niger Delta University Teaching Hospital, Okolobiri. Normotensive and hypertensive patients attending other health facilities in Bayelsa State were excluded from the study. Also, patients younger

than 18 years of age were excluded from the study.

Results

Table 1: Socio-demographic characteristics of the study population

Variables		Normotensive (N=400) n(%)	Hypertensive (N=400) n(%)
Gender	Male	207(51.4)	196(49.0)
	Female	193(48.6)	204(51.0)
Age (Years)	18-35	307(76.7)	14(3.5)
	36-55	83(20.8)	188(47.0)
	>55	10(2.5)	198(49.5)
Marital status	Single	242(60.5)	20(5.0)
	Married	155(38.8)	336(84.0)
	Divorced / Separated	3(0.8)	44(11.0)
Ethnicity	Ijaw	249(62.2)	290(72.5)
	Hausa	6(1.5)	10(2.5)
	Igbo	63(15.8)	68(17.0)
	Yoruba	33(8.3)	25(6.3)
	Others	49(12.3)	7(1.8)
Religion	Christian	370(92.5)	367(91.8)
	Muslim	19(4.8)	31(7.8)
	Others	11(2.8)	2(0.5)
Occupation	Student	273(68.3)	3(0.8)
	Civil Servant	127(31.8)	215(53.8)
	Others	0(0.0)	182(45.5)
BMI class	Normal	172(43.0)	34(8.5)
	Overweight	192(48.0)	257(64.3)
	Obese	36(9.0)	109(27.3)

Table 2: Gender and cardiovascular (CV) parameters of male and female hypertensive subjects in Yenagoa, Bayelsa State

CV parameters	Male (n=196)	Female (n=204)	Z-test significance
SBP (mmHg)	134.45±16.73	133.44±14.39	0.28
DBP (mmHg)	85.82±12.78	83.56±10.46	0.24
PP (mmHg)	48.63±12.06	49.87±11.75	0.63
MAP (mmHg)	102.03±13.03	100.18±10.55	0.39

Table 3: Age and cardiovascular (CV) parameters of normotensive and hypertensive subjects in Yenagoa, Bayelsa State

CV parameters	Normotensive (N=400)	Hypertensive (N=400)	Z-test significance
Age (Years)	30.05±9.27	55.82±12.24	0.01*
SBP (mmHg)	119.18±8.55	133.94±15.57	0.01*
DBP (mmHg)	74.98±6.38	84.67±11.69	0.01*
Pulse Pressure (mmHg)	44.20±8.06	49.27±11.90	0.01*
MAP (mmHg)	89.71±6.09	101.09±11.85	0.01*

Table 4: Body Mass Index (BMI) and cardiovascular parameters of male and female hypertensive subjects in Yenagoa, Bayelsa State

CV parameters	Male (n=196)	Female (n=204)	Z-test significance
BMI (kg/m^2)	28.23±2.78	28.74±2.80	0.27
SBP (mmHg)	134.45±16.73	133.44±14.39	0.28
DBP (mmHg)	85.82±12.78	83.56±10.46	0.24
PP (mmHg)	48.63±12.06	49.87±11.75	0.63
MAP (mmHg)	102.03±13.03	100.18±10.55	0.39

Discussion

Distribution of socio-demographic parameters

The socio-demographic characteristics of the study population are shown in **Table 1**. The results showed that normotensive males were more 207(51.4%) than females 193(48.6%) while females were found having hypertension 204 (51.0%) more than the males 196(49.0%). This result contradicts the study results obtained by other researchers **[14]**, which found that men had a higher prevalence of hypertension than women. The result of this study may be due to the tradition of the respondents, as women tend to be more concerned with providing for the family than men do. Married couples were found to be more prone to hypertension in comparison to singles, divorced or separated. This observation may not be unconnected with the stress involved in maintaining a home. The Ijaw ethnicity was found to be predominantly more hypertensive compared to other ethnic groups. This may be because the study location is within the Ijaw ethnic region. Christians were found to be more hypertensive compared to other religious groups. Civil servants

tend to develop hypertension more compared to students and other occupations. Finally, majority of the hypertensive subjects were found to be overweight.

Influence of gender on cardiovascular parameters of the hypertensive subjects

As observed from **Table 1** and **Table 2**, majority of the hypertensive participants in this study were females 204 (51.0%), as against 196 (49.0%) of males, with female to male ratio of 1.04:1 (**Table 1**). This result is in conformity with earlier reports [15] where female participants were in the majority (55.26%). Fewer reports from Nigerian authors also got similar reports. Others [16,17] reported that females were the majority of respondents with hypertension. This result however contradicts the outcome of the work done by other researchers [18] which observed the prevalence rates of hypertension to be generally higher in males than in females.

Influence of age on cardiovascular parameters of the hypertensive subjects

Results from our study revealed that the average age of the hypertensive participants was 55.82 ±12.24 years (**Table 3**). This means that the age range greater than 55 years was seen to be more prone to hypertension. Several studies have indicated that high BP is associated with age and this is connected with the process of modernization. Nowadays, high blood pressure is one of the risk factors for cardiovascular diseases, and the estimated 7.1 million deaths especially among middle, and old-age adults is due to high BP.

This result corroborates with that obtained by others [19], where the mean age of the hypertensive participants was found to be 52.3±10.1 years. This is higher than 35.66±8.2 years reported by others [20] in an earlier report among participants from Northern India.

Influence of BMI on cardiovascular parameters of the hypertensive subjects

Table 4 shows the body mass index (BMI) and cardiovascular parameters of male and female hypertensive subjects in the study population. The female subjects were found to be significantly older when compared to the male subjects. There was an increase in the values of the systolic, diastolic, pulse and mean arterial pressures between the male and female subjects with respect to their body mass indices. However this increase was found to be statistically insignificant.

Body mass index (BMI) is one of the most useful indices for obesity in adults. The relationship between excess weight and diseases has been recognized over time [21,22]. Obesity has been particularly recognized as a major independent risk factor for cardiovascular diseases [23], diabetes mellitus, hypertension and hypercholesterolemia [24,25]. This is true because increased body fat is accompanied by profound changes in the physiological and metabolic functions of the body, which are directly dependent on the degree of excess weight and on its distribution around the body. BMI has been found to be positively and independently associated with morbidity and mortality from hypertension, cardiovascular disease, type 2 diabetes mellitus, and other chronic diseases.

According to a group of researchers [26], the correlation analysis between BMI and BP showed significant positive correlations such that when the mean systolic and diastolic blood pressures among different BMI categories were evaluated, it was found that the mean systolic and diastolic blood pressures increased with increasing BMI from lowest BMI to the highest BMI category. Significant correlation of BMI with blood pressure was also found by others [27]. A positive association between BMI and BP has also been reported by other researchers [28]. Another group of researchers [29] has reported a positive association between increasing body mass index and blood pressure (BP) in populations. Also, according to others [14], the prevalence of hypertension significantly increased with the increase in BMI, such that among participants with a normal BMI, the prevalence of hypertension was 45% compared to 67% among overweight participants, 79% in obesity class I and II, and up to 87% among participants with obesity class III. The work carried out by a group of researchers on the relationship between BMI and pulse pressure in older adults with isolated systolic hypertension found that pulse pressure decreased with an increasing BMI, but this decrease slowed when BMI was >25 and reversed when BMI was 30.1. Overall, pulse pressure was found to be higher in the women than in the men among the lean and the overweight participants, but there were remarkable differences in the relationship between BMI and pulse pressure among men and women. Based on the relationship between BMI and the cardiovascular parameters, a number of clinical measurements for obesity have been used to determine susceptibility to cardiovascular diseases [28]. These measurements include body mass index (BMI), waist-hip ratio (WHR) and waist circumference (WC) [30].

Conclusion

The study demonstrated that body mass index, age and gender are closely associated with cardiovascular parameters, such as systolic, diastolic, pulse and mean arterial pressures.

Though the degree of correlation differed, there was a positive and significant correlation among age and the cardiovascular parameters while the relationships between gender and BMI with cardiovascular parameters were found to be statistically insignificant. The risk of hypertension is therefore expected to be higher among the aged and populations who are overweight or obese.

Finally, this work has revealed that contrary to popular belief that hypertension is more common among men, in Bayelsa state, the prevalence of hypertension is found to be more common among women than in men. This further reveals that the gender with the highest prevalence of hypertension is dependent on the geographical location and the role or occupation assigned to a particular gender in the given location.

Acknowledgments

Source of funding

Disclosure of relationships and activities

Authors have declared that no conflicting interests exist.

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