Relationships between Dietary Adherence, Blood Pressure, and Anthropometric Status: Empirical Evidence from Selected Government Hospitals in Nigeria

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ABSTRACT

The nutritional and health status of people in Nigeria is plagued with the problems of high blood pressure and non-adherence to dietary guidelines. However, Dietary Approach to Stop Hypertension (DASH) guidelines are used in the management of hypertension. The study assessed dietary adherence, blood pressure, and anthropometric status of hypertensive out-patients in selected Government Hospitals in Abeokuta metropolis, Ogun State, Nigeria. Multistage and stratified sampling technique was used to select 209 Hypertensive-Out Patients from Federal Medical Centre, Idi-Aba, and Ogun State Hospital, Ijaye both in Abeokuta. A structured questionnaire was used to obtain data and analyzed using frequency counts, percentages, mean, standard deviations, and independent sample t-test.

Results showed that 75.10% of the hypertensive out-patients were married, 56.50% were female, 48.8% had tertiary education with a mean age of 57 years. Findings show that 87.1% of the respondents had a poor dietary intake of fruits while 83.3% had a poor dietary intake of vegetables. Independent sample t-test revealed a significant difference ($t=-9.18$, $p<0.05$) in the body fat composition of male and female. There was a significant ($p<0.05$) difference between weight ($t = 2.141$), height ($t = 1.006$) and age of the out-patients. Also, there was a significant ($p<0.05$) differences between height ($t = 0.90$), Body Mass Index ($t = 2.63$), body fat composition ($t = 9.18$) and sex classification of the respondents. The study concluded that hypertensive out-patients poorly adhered to dietary guidelines and it is recommended that hypertensive out-patients should be sensitized on the need to adhere to dietary guidelines and should be incorporated in the management of high blood pressure.

(Keywords: DASH diet, dietary adherence, hypertension, outpatients)

INTRODUCTION

Globally, hypertension is a significant health burden. According to estimates, middle-aged and older people have a 90% lifetime risk of developing hypertension, and the prevalence of the condition has been rising as the population of the aged increases (O'Brien, 2017; Vasan, *et al*., 2002). Uncontrolled blood pressure (BP) has been linked to end-stage renal disease, cardiovascular disease, stroke, and the leading cause of death (Lackland and Weber, 2015). However, antihypertensive drugs and lifestyle changes such as limiting sodium in the diet, consuming alcohol in moderation, and engaging in regular exercise can effectively lower high blood pressure (Lee, *et al*., 2018; Whelton, *et al.*, 2018). According to Dauchet (2007), a healthy lifestyle can lower blood pressure without any negative side effects and enhance cardiovascular health in general.

In addition, Murry, *et al*., (2010) noted that Chronic Diseases of Lifestyle (CDLs), which include heart diseases, stroke, type 2 diabetes, cancer, and Chronic Obstructive Pulmonary Disease (COPDs), amount to 60% of global death and 47% of the global burden of disease. Approximately 80% of the global CDL deaths occur in lower-income and middle-income countries and this poses a major challenge to global health development. Rahim, *et al.,* (2014) accentuated that the health and socioeconomic impact of non-communicable diseases is currently increasing rapidly, making a substantial contribution towards the mortality, and global burden of disease. In an attempt to reduce the rate of mortality due to the prevalence of non-communicable diseases, adherence to diet is of great importance.

To suggest a solution to the problem, it is crucial to note that diet plays a key role in how well certain diseases are treated. In adherence to diet, it is necessary to recognize the preponderant role of eating behavior in the prevention and treatment of disease. According to Delamater (2007), adherence is the patient's collaborative, cooperative, and active participation in a behavior that is mutually agreeable to achieve a therapeutic outcome. The patient has the choice to follow a recommended mutually agreed-upon course of treatment. Low adherence to the prescribed diet can indicate that the patient may not receive the full benefit of the therapy. To optimize health outcomes, people with diseases are usually advised to make significant changes to their lifestyle, including diet, physical activity, and de-stressing techniques. Their treatment plan may also include regular finger-sticks to monitor blood glucose, frequent medical examinations with eye and foot screenings, as well as daily prescribed oral medications and/or injected medications (Ingersoll and Cohen, 2008).

Nigeria is expected to have a 200 million population by 2024 which is equivalent to 2.64% of the world's population and ranked seventh in the list of countries by population. Of those living in Nigeria, 52.0% are expected to be urban dwellers, with a median age of 18.1 years (World Meter – United Nations Data, 2020). This portends an immense challenge to health and nutritional issues particularly where diet adherence is crucial. Given Nigeria's growing population, there will probably be a significant prevalence of hypertension. Therefore, it is important to promote dietary adherence as a means of reducing non-communicable diseases. By 2030, communicable diseases are predicted to rise to the top of the list of causes of death. The consequences of non-adherence are costly and a risk factor for poor health outcomes and a possible increase in hospital admissions. According to Ho, *et al*., (2006), non-adherence frequently leads to a combination of squandered medical care, wasted time and energy for the patients and healthcare providers, and frustration and dissatisfaction for all involved.

Dietary non-adherence, according to Luscher (2013), is a really important health concern since it the lower quality of life, which can result in disability and death as well as lower workers' productivity. Numerous factors, including knowledge of the diet prescription, long-term and continuous treatment, education level, literacy, and a poor relationship with the healthcare provider, as well as beliefs about the diet and its side effects, psychological factors such as social support, socioeconomic status, access to healthcare, lack of health insurance, asymptomatic disease, and inconvenience, affect adherence to hypotensive medication and diet regimes (American Heart Association, 2013). There is typically a correlation between diet non-adherence and the following factors: smoking, obesity, aging, male gender, non-white ace. Lower income, disease burden and decreased social support (Blumenthal, *et al.,* 2010).

According to Semilitsch, *et al.,* (2013), hypertension may also put a financial strain on individuals, their families, and health care workers. Of all age, racial, and gender groups, men between the ages of 18 and 49 typically have the lowest rates of adherence, awareness, treatment and control of high blood pressure. Martin (2013) noted that 70% of African men have been diagnosed with hypertension, but many have not followed through on diet plans, medication regimes, or lifestyle changes. Generally speaking, African males are not persuaded of the necessity of diet therapy. As a result, male hypertension has risen over time in comparison to female hypertension. Moreover, a lack of education may be the reason for the failure to follow dietary recommendations. As a result, hypertension among male has steadily increased over the years compared to female.

Furthermore, the non-adherence to either life changes or prescribed diet may be due to low education level, in some cases illiteracy, poor relationship with health care providers, knowledge about diet and their side effects, psychological factors, social and socio-economic support, access to health care, lack of health insurance, longer and ongoing treatment, and mainly a lack of individual responsibility for his/her health (Hajjar and Kotchen, 2000). It is, therefore, imperative that advocacy and sensitization be put in place by relevant stakeholders to ensure that both males and females are adhered strictly to diet as it arises from their anthropometric measurement and blood pressure. Against this backdrop, the specific objectives of the study assessed outpatient's adherence to dietary guidelines, examined the anthropometric status of the hypertensive outpatients and determined the blood pressure (systolic and diastolic) of hypertensive out-patients. It is hypothesized that there is no significant difference between anthropometric, blood pressure and sex of hypertensive outpatients.

MATERIALS AND METHODS

This study was conducted at the Federal Medical Centre and State Hospital, Ijaye Abeokuta, Ogun State, Nigeria between March 2021 and May 2022. The population used for this study consisted of all the hypertensive-out patients at both Federal Medical Centre and State Hospital. A multistage sampling procedure was used to select hypertensive-out patients for this study. Out of the various units/departments at FMC, Idi-Aba, Cardiology, Nephrology and Neurology units were purposively selected while Medical Out-Patients (MOP), General Out-Patients (GOP) and Surgical Out-Patients (SOP) were selected from State Hospital, Ijaye. The third stage involves the selection of respondents that participated in the study.

Sampling size determination at variance in population of 0.05% was used to select a total of 132 hypertensive out-patients from the Federal Medical Centre, Abeokuta (that is, 55 patients from Cardiology, 49 from Nephrology and 28 from Neurology) and a total of 77 out-patients from State Hospital Ijaye (31 from MOP units, 24 from GOP while 22 out patients was selected from SOP unit). Therefore, a total of 209 hypertensive out-patients participated in the study. A structured questionnaire was used to elicit information from the respondents after it was content and faced validated. Also, a Cronbach-alpha test of internal consistency was conducted with reliability coefficients of 0.82 was achieved.

In addition, weight was measured to the nearest 0.1kg, with respondents wearing minimal clothing, using a digital or manually calibrated scale. Height of the participants was measured using a standiometer (Detecto, Webb City) with the participants standing with normal posture and barefoot. Measurement was read with the participants' heads in Frankfort plane to the nearest 0.1cm. Furthermore, the Body Mass Index (BMI) was calculated by taking the weight (kg) and dividing it by the height (m) squared and presented by BMI category. Waist circumference was measured over minimal clothing at the narrowest part of the body between the ribcage and the iliac crest to the nearest 0.1 cm using a non-stretchable measuring tape. The hip circumference was measured over minimal clothing at the widest part of the body over the buttocks with the same measuring tape. Blood pressure was measured on the left arm with the participant sitting relaxed with the arm at heart level using a digital blood pressure monitor (Omron, Kyoto, Japan)

Also, dietary adherence scores were calculated by dividing food intakes into quintiles, intakes of food (dairy, fish, legumes, nuts and seeds, and fruit and vegetables), fats (monounsaturated fatty acids – MUFA, polyunsaturated fatty acids – PUFA, saturated fats) and fiber as recommended by the NFBG and DASH guidelines will be scored as follows; Q1 was allocated 1 point and quintile 5 was equally be allocated 5 points. Thus, respondents who had intakes that fell into the lowest quintile had the lowest intakes of the recommended foods. Total fats, saturated fat, meat, added sugar, alcohol and sodium were categorized as foods that needed to be consumed in limited amounts and were assigned a reverse score so that respondents in Q1 respondents for these foods were assigned 5 points and those in Q5 were assigned 1 point.

RESULT PRESENTATION AND DISCUSSION

Socio-Demographic Characteristics of the Hypertensive Out-Patients

Findings in Table 1 show that the mean age of the hypertensive out-patients was 57.0 years with a standard deviation of 13.2. The majority of respondents (67.4%) fell between the ages of 46 and 73 years. The average age of the hypertensive outpatients suggests that middle-aged and older people are more likely to have hypertension. The result is consistent with that of Ong, *et al.* (2007), who observed that adults and the elderly are more likely to suffer from hypertension, a dangerous cardiovascular condition. Furthermore, female respondents made up 56.5% of the sample. This suggests that women were more likely than men to develop hypertension.

Table 1: Socio-Demographic Characteristics of the Hypertensive Out-Patients (n=209).

Variables	Frequency	Percentages	Mean/Mode	Standard dev.
		Age (Years)		
18-31	12	5.7	57.0 years	13.2
32-45	32	15.3		
46-59	69	33.0		
60-73	72	34.4		
74-87	23	11.0		
88 & above	01	0.5		
		Sex		
Male	91	43.5	Female	
Female	118	56.5		
		Marital Status		
Single	13	6.2	Married	
Married	157	75.1		
Divorced	02	1.0		
Separated	03	1.4		
Widowed	34	16.3		
		Educational Status		
No formal education	13	6.2	Tertiary education	
Primary education	43	20.6		
Secondary education	48	23.0		
Tertiary education	102	48.8		
Adult education	03	1.4		
		History of Alcohol Usage		
Formally Used	47	22.5	Never used	
Currently Used	19	9.1		
Never Used	143	68.5		
		Equipment Used at Home		
Electricity	42	20.1	Radio & TV	
Gas Cooker	45	21.5		
Radio & TV	93	45.4		
Refrigerator & Washing Machine	27	12.9		

Source: Field survey, 2021

Furthermore, findings show that the majority of hypertension individuals (75.1%) were married when compared to single (6.2%), married respondents had a higher risk of hypertension (75.1%), which may be related to the responsibilities that come with being married. In addition, the findings show that 48.8% of the respondents had completed secondary education. A significant proportion of the respondents were seen to possess knowledge and education, which could potentially positively impact their adherence to diet.

Adherence to Dietary Guidelines by Hypertensive Out-Patients

The result in Table 2 presents Dietary Approaches to Stop Hypertension (DASH) guidelines. Findings show that the majority (87.1%) of the respondents had poor dietary adherence (i.e. Q1 & Q2) to the intake of fruits. The DASH guideline recommended a high intake of fruits such as pawpaw, apple, guava, and watermelon among others, however, majority of the sampled respondents did not meet the recommended DASH guideline on a high intake of fruits. Also, a majority (83.8%) of the respondents had poor dietary adherence (i.e., Q1 & Q2) to the intake of vegetables while 15.3% of them moderately adhered to the intake of vegetables. This implies that, as indicated in the DASH guideline, the high recommendation of vegetables to the hypertensive out-patents, it was noted that the respondents did not adhere to the guideline of the high intake of vegetables.

Table 2: Adherence to Dietary Guidelines by Hypertensive Out-Patients.

Food composition	Scoring criteria	Frequency	Percentage	DASH Recommendation
Fruits (g)	Q1 (1 Point)	39	18.7	
	Q2 (2 Points)	143	68.4	Poor dietary adherence
	Q3 (3 Points)	27	12.9	
	Q4 (4 Points)	-	-	
	Q5 (5 Points)	-	-	
Vegetable (g)	Q1 (1 Point)	34	16.3	
	Q2 (2 Points)	141	67.5	Poor dietary adherence
	Q3 (3 Points)	32	15.3	
	Q4 (4 Points)	01	0.5	
	Q5 (5 Points)	01	0.5	
Nut/Legumes (g)	Q1 (1 Point)	38	18.2	
	Q2 (2 Points)	160	76.6	Poor dietary adherence
	Q3 (3 Points)	11	5.3	
	Q4 (4 Points)	-	-	
	Q5 (5 Points)	-	-	
Whole grain (g)	Q1 (1 Points)	189	90.4	
	Q2 (2 Points)	20	9.6	Poor dietary adherence
	Q3 (3 Points)	-	-	
	Q4 (4 Points)	-	-	
	Q5 (5 Point)	-	-	
Sodium (mg)	Q1 (5 Points)	04	1.9	
	Q2 (4 Points)	12	5.7	Moderate dietary adherence
	Q3 (3 Points)	127	60.8	
	Q4 (2 Points)	50	23.9	
	Q5 (1 Point)	-	-	
Sweetened beverage (%)	Q1 (5 Points)	-		
	Q2 (4 Points)	01	0.5	Poor dietary adherence
	Q3 (3 Points)	02	1.0	
	Q4 (2 Points)	14	6.7	
	Q5 (1 Point)	192	91.9	
Dairy products (g)	Q1 (5 Points)			
	Q2 (4 Points)			Poor dietary adherence
	Q3 (3 Points)	01	0.5	
	Q4 (2 Points)	12	5.7	
	Q5 (1 Point)	196	93.6	
Red/processed meat(g)	Q1 (5 Points)	-	-	
	Q2 (4 Points)	-	-	Poor dietary adherence
	Q3 (3 Points)	02	1.0	
	Q4 (2 Points)	165	78.9	
	Q5 (1 Point)	42	20.1	

Source: Field survey, 2021

In addition, almost all (94.8%) of the respondents did not adhere to the DASH recommendation of the high intake of nuts/legumes while few 5.3% moderately adhered, this shows poor dietary adherence (Q1 & Q2) to nets/legumes respondents in the study area. The non-adherence of the respondents to the consumption of fruits and vegetables may increase their risk of hypertension and this supports the findings of Hu (2003) that the consumption of fruits and vegetables decreases the risk of several chronic diseases.

Anthropometric Status (Weight and Height) of Hypertensive Out-Patients

Results show a noticeable difference of 1.66m from the height of the male respondents. This implies that males were more in height than the female hypertensive out-patients. However, the body mass indexes of both males and females were slight above the World Health Organization (WHO) recommended of 18.00 and 24.00 kg/m^2.

Table 3: Anthropometric Status (Weight and Height) of Hypertensive Out-Patients.

Variables	Mean ± SD	Mean ± SD	F	t-value	p-value
Gender	**Male**	**Female**			
Weight (kg)	77.81±16.04	82.11±12.4	1.47	0.56	0.27
Height (m)	1.66±0.27	1.55±0.26	4.36	0.90	0.03*
Body Mass Index (kg/m^2)	26.76±5.11	30.0±10.76	2.87	-2.63	0.04*
Hospital	**Federal**	**State**			
Weight (kg)	85.4±68.84	82.25±73.32	1.00	1.12	0.39
Height (m)	1.58±0.36	1.57±0.27	1.40	0.10	0.23
Body Mass Index (kg/m^2)	29.32±10.01	27.51±6.61	0.04	1.40	0.84
Age (Years)	**18-55 years**	**56-92 years**			
Weight (kg)	87.50±18.55	74.61±15.53	3.15	1.65	0.07
Height (m)	1.58±0.3102	1.57±0.34	0.43	0.34	0.51
Body Mass Index (kg/m^2)	29.83±11.92	27.71±5.41	4.91	1.69	0.02*

Source: Computed field survey data, 2021; significant at 0.05 level

This connotes that the BMI of the male respondents (26.76 kg/m^2) was better and fairer when compared to that of the female (30.00kg/m^2) respondents. In addition, results show a significant difference (t=0.90, p>0.05) between the height of male and female respondents between. Also, there was a negative significant difference (t= -2.63, p>0.05) between the BMI of the male and female respondents. Also, the BMI of respondents from the State Hospital (27.51 kg/m^2±6.61) was closer to the WHO recommendation than that of respondents at FMC (29.32 kg/m^2±10.01). However, the BMI (3000kg/m^2) of the respondents between the ages of 56 and 92 years was better as compared with respondent between the ages of 18 and 55 years.

The result of the independent t-test shows a significant (t= 1.69, p>0.05) difference between the BMI of the respondents within the age bracket of 18-55 years and 56-92 years. The result corroborates the findings of Fontbonne (2011) and Addo, *et al.* (2007) who compared men versus women and how the rates of hypertension differ between the two genders. They found that hypertension in females is more likely to be detected than in males because of women's higher rate of hospital admission due to pregnancy. While in the hospital, virtually all women have their blood pressure checked. Although there is a greater amount of in-hospital blood pressure data on women, de Ramirez (2011) found men have higher rates of hypertension than women.

Blood Pressure (Systolic and Diastolic mm/Hg) of Hypertensive Out-Patients

Results in Table 4 present the blood pressure hypertensive out-patients. Finding reveals that the mean/standard deviation of systolic blood pressure of the female respondents' 143±25.45 is higher than that of the male counterparts 141.2±22.04 with of difference of 2.0±3.44. This indicates that the SBP of the male is medically better than that of the female. Also, the diastolic blood pressure of the male (86.28±14.30) and female (86.38±15.61) respondents is closely related with a difference of 1.0mm. This implies that the diastolic blood pressure of the male is closer to the standard.

Results also show that the fat content in the female body (40.84±13.54) is more than that of the male (23.53±6.891) respondents and it implies that male respondents are medically fit vis-a-vis fat content in the body than the female counterparts. The independent t-test result shows a negative but significant difference (t= 0.007*, p>0.05) between the fat content of the male and female respondents. In addition, it was noted that systolic (142.71±21.64) and diastolic (142.7±25.71) blood pressure measurements of respondents within the ages of 18 and 55 years is the same with the respondents with the age range of 56 and 92 years. This means that the issue of hypertension is not limited to a certain age group, it cuts across age groups as noted by Nwankwo, *et al.,*(2016) that hypertension is a risk factor for heart diseases such as stroke and heart failure and it contributes to approximately 45% of death in men and approximately 55% in women.

Table 4: Blood Pressure (Systolic and Diastolic mm/Hg) of Hypertensive Out-Patients.

Variables	Mean±SD	Mean±SD	F	t-value	p-value
Gender	**Male**	**Female**			
Systolic blood pressure	141.2±22.04	143.5±25.48	0.352	0.682	0.554
Diastolic blood pressure	86.28±14.30	86.38±15.61	0.106	0.047	0.745
Fat	23.53±6.891	40.84±13.54	7.425	-9.18	0.007*
Pulse	77.41±17.15	78.20±17.86	0.001	0.286	0.907
Hospital	**Federal**	**State**			
Systolic blood pressure	141.5±25.23	144.6±21.88	0.261	0.885	0.610
Diastolic blood pressure	86.28±16.12	86.62±12.98	1.240	0.156	0.266
Fat	33.85±14.98	33.89±12.77	0.415	0.018	0.520
Pulse	76.51±18.41	80.41±15.92	1.350	1.420	0.247
Age (Years)	**18-55 years**	**56-92 years**			
Diastolic blood pressure	142.71±21.64	142.7±25.71	0.708	0.013	0.40
Diastolic blood pressure	88.21±14.02	85.04±15.54	0.005	1.490	0.94
Fat	35.62±12.57	32.57±12.28	2.70	1.31	0.10
Pulse	77.50±18.78	78.48±16.61	0.198	0.35	0.65

Source: Computed field survey data, 2020; significant at 0.05 level

CONCLUSION AND RECOMMENDATIONS

Based on the findings of the study, it could be concluded that hypertensive out-patients did not adhere to a high intake of fruits, vegetables, and whole nuts. The BMI of males and females in the study were slightly above the WHO recommendation of 18.0 and 24.0 kg/m^2. Also, there was a negative and significant difference between the fat content in male and female hypertensive out-patients. It is therefore recommended that a diet-based sensor device be developed to serve as a prompting aid for diet adherence.

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