



## **Risk Factors and Anthropometric Variables of Young People with Essential Hypertension in Uyo, Akwa Ibom State**

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### **Authors' contributions**

*This work was carried out in collaboration between both authors. Author UKA designed the study, wrote the protocol and wrote the first draft of the manuscript. Author JHE managed the literature searches, analyses of the study performed the spectroscopy analysis. Both authors read and approved the final manuscript.*

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### **ABSTRACT**

Hypertension, a chronic medical condition is commonly seen in young people in my environment. Certain risk factors are associated with the development of this condition. They include a positive family history of hypertension, being overweight /obese, excessive alcohol intake, cigarette smoking and high salt intake. The role of micro-RNA, GRK2, CaMKIV and PIA<sup>2</sup> are obvious in the aetio-pathogenesis of hypertension. This study was conducted to find out which of these factors have effect on hypertension on young people.

**Methods:** One hundred and fifty one young people diagnosed with essential hypertension (new cases) over a one year period January to December 2013 were recruited from patients attending the general outpatient clinic of the University of Uyo Teaching Hospital. Their age, sex, tribe, occupation and marital status were assessed. Risk factors like cigarette smoking, significant alcohol intake, adding salt to meals before eating, family history of hypertension and history of

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diabetes mellitus, weight, height, body mass index, hip circumference, waist circumference and blood pressure were assessed.

**Results:** A total of 151 respondents (n=151) were recruited into the study. 48 respondents had stage 1 hypertension JNC 7 classification while 103 had stage 2 hypertension JNC 7 classification. More women had hypertension n=84(55.6%). Respondents with secondary level of education had more stage 1 hypertension JNC 7 classification while those respondents with tertiary education had more stage 2 hypertension JNC 7 classification. Married respondents had more of stage 2 hypertension JNC 7 classification n=56(54.4%) than stage 1 hypertension n=22(45.6%). Family history of hypertension was present in n=79(52.3%) respondents. Stage 2 hypertension JNC 7 classification was associated with having a positive family history of hypertension p=0.001. Adding extra salt to serve meals was associated with stage 1 hypertension JNC 7 classification p=0.006. Other risk factors were not significantly associated with any stage of hypertension.

**Conclusion:** Positive family history of hypertension and adding extra salt to serve meals were significant risk factors for hypertension in young persons in this study. So young people with positive family history of hypertension should begin early screening for detection of hypertension and reduce or refrain from adding extra salt to serve meals to reduce risk of developing hypertension.

*Keywords: Young people; hypertension; risk factors.*

## 1. INTRODUCTION

Hypertension or high blood pressure is a chronic medical condition in which the systemic arterial blood pressure is elevated [1]. Hypertension is blood pressure reading greater than or equals to 140 mmHg Systolic and greater than or equals to 90 mmHg Diastolic [2]. JNC 7 classifies hypertension into normal <120/80 mmHg, pre-hypertension 120-130/80-89 mmHg, stage 1 hypertension 140-159/90-99 mmHg and stage 2 hypertension >160/100 mmHg [3]. A systolic blood pressure of <120 mmHg is considered ideal with each 10 mmHg increase in blood pressure being accompanied by a 10% greater risk of cardiovascular event and mortality.[4] About one billion people in the world have Hypertension [5] of which young people between the ages of 18 and 44 years constitute 6% (national health and nutrition evaluation studies 2009-2011) [6]. Hypertension occurs among young people in Nigeria with reported prevalence of 3.3% in South East region [7], 4.3% in Northern region [8] and 30% in South West region [9].

Certain risk factors are known to predispose people to development of essential hypertension. These factors include non modifiable factors like age (45 years and above) [10], sex (males more than females until age 65 years) [10], race (black race) [11] and positive family history [12,13]. Modifiable factors include overweight, obesity, cigarette smoking, excessive alcohol intake and excessive salt intake. Other factors like micro-RNA, GRK2, CaMKIV and PIA<sup>2</sup> are considered to play roles in the aetiology of hypertension.

Overweight (25.0 kg/m<sup>2</sup> -29.9 kg/m<sup>2</sup> and obesity (BMI >30 kg/m<sup>2</sup>) are known to predispose to Hypertension. A study on Africans reported that 6-29% of Hypertension was attributed to overweight and 1-16% was attributed to obesity. [14] Also, obesity may increase the risk of hypertension five fold compared to normal weight [15]. Cigarette contains nicotine which is known to cause release of catecholamine that increase blood pressure and heart rate [16]. Excessive alcohol intake (more than 14 units per week for women and more than 21 units per week for men) causes an increase in blood pressure [17]; this it does by stimulating the sympathetic nervous system and increasing adrenocorticoid hormone in circulation [18]. Excessive salt intake more than 6g per day [19] is a known risk factor for hypertension through its effect on expansion of the extracellular fluid volume, induction of cardiac myoblast and smooth muscle hypertrophy, activation of NF-Kappa B in proximal tubular cells of the kidney leading to inflammation and changes in the Renin Angiotensin System as well as induction of oxidative stress [20]. Calcium/Calmodulin dependent kinase IV (CaMKIV) plays a role in the regulation of smooth muscle vascular tone through control of endothelial nitric oxide synthase activity. Impairment of this protein by loss or deletion results in the loss of balance and will lead to hypertension [21]. Micro-RNA are short (17-25 nucleotides long) single stranded RNA molecules. They have been implicated in cardiovascular physiology, initiation and progression of cerebrovascular diseases. Examples of the micro RNA are miR-9, miR-126,

miR -143, miR-146. The blood levels of the first two correlate with 24 hr mean pulse pressure an established predictor of advanced target organ disease while the last two are known to modulate vascular smooth muscle function [22]. GRK2 is one of the G protein coupled receptor kinases found on cell surfaces, it desensitizes B-adrenoceptor which is known to cause vasodilation thereby causing vasoconstriction leading to hypertension. Young people diagnosed with hypertension have increased quantity of GRK2 in their blood [23]. Other factors that predispose to hypertension are sedentary lifestyle, exposure to chronic stress, diabetes mellitus and dyslipidaemia.

Since there is scarcity of study in Uyo, Akwa Ibom State. Nigeria on risk factors for essential hypertension in young people so this study was undertaken to determine the risk factors and anthropometric variables of young people diagnosed with essential hypertension with the aim of filling the knowledge gap and bringing out

which risk factors have the significant effect on young persons who develop essential hypertension.

## 2. MATERIALS AND METHODS

The study was a cross-sectional descriptive study of young people aged 18-44 years (DSM1V classification of young people) with essential Hypertension attending the General Outpatient Clinic of the University of Uyo Teaching Hospital.

A semi-structured questionnaire was administered to consenting young people diagnosed with essential Hypertension. The instrument sought information on age, sex, tribe, occupation and marital status. The questionnaire also sought information on risk factors like history of cigarette smoking (current smokers-those that were currently smoking and non smokers- those that never smoked or used to smoke but stopped smoking at least five years ago, significant

**Table 1. Socio demographic characteristics of young hypertensive patients attending general out- patient clinic in Uyo**

Variable	Hypertension		Total	Statistical indices
	Stage 1	Stage 2		
<b>Age group</b>				
20-24	6 (12.5)	7 (6.8)	13 (8.6)	$\chi^2=2.5425$ Df = 4 P value =0.637
25-29	11 (22.9)	21 (20.9)	32 (21.2)	
30-34	12 (25.0)	28 (27.2)	40 (26.5)	
35-39	11 (22.9)	33 (32.0)	44 (29.1)	
40-44	8 (16.7)	14 (13.6)	22 (14.6)	
<b>Sex</b>				$\chi^2=0.0610$ Df = 1 P value =0.805
Male	22 (45.8)	45 (43.7)	67 (44.4)	
Female	26 (54.2)	58 (56.3)	84 (55.6)	
<b>Education</b>				$\chi^2=4.6094$ Df = 3 P value =0.156*
No education	1 (2.1)	1 (1.0)	2 (1.3)	
Primary	4 (8.3)	11 (10.7)	15 (9.9)	
Secondary	26 (54.2)	38 (36.9)	64 (42.4)	
Tertiary	17 (35.4)	53 (51.5)	70 (46.4)	
<b>Marital status</b>				$\chi^2=0.9627$ Df = 2 P value =0.596*
Single	25 (52.1)	45 (43.7)	70 (46.4)	
Married	22 (45.6)	56 (54.4)	78 (51.7)	
Widowed	1 (2.1)	2 (1.9)	3 (2.0)	
<b>Occupation</b>				$\chi^2=5.0525$ Df = 6 P value =0.572*
Applicants	2 (4.2)	8 (7.8)	10 (6.6)	
Artisan	7 (14.6)	16 (15.5)	23 (15.2)	
Civil servants	6 (12.5)	19 (18.5)	25 (16.6)	
Students	13 (27.1)	20 (19.4)	33 (21.8)	
Trading	16 (33.3)	30 (19.4)	46 (30.5)	
Teaching	2 (4.2)	9 (8.7)	11 (7.3)	
Professional	2 (4.2)	1 (1.0)	3 (2.0)	

Table 1 above shows that socio demographic characteristics of both stages of disease are similar among the respondents.\*= Fishers exact.

alcohol intake, (men who took more than 21 units of alcohol per week, women who took more than 14 units of alcohol per week, a unit of alcohol was 10 ml of ethanol or 8 g of alcohol in various forms beer, spirits and wine), adding salt to meals on table before eating (self report by respondents), exposure to excessive stress on the job, in the family and finance (self report by respondents). Other risk factors assessed were family history of Hypertension (mainly first degree relatives), personal history of diabetes mellitus and family history of diabetes mellitus.

Anthropometric measures - Weight, Height and Body Mass Index, Waist circumference, Hip circumference and Waist Hip ratio were done for each patient. The weight was done using a bathroom scale standardized to 0.1 kg. Subjects stood on the weighing scale without shoes, remain upright on the scale with the upper limbs to the sides of the body and the weight was read to the nearest 0.1 kg and recorded.

**Table 2. Risk factors associated with stages of hypertension among the respondents attending general out -patient clinic in Uyo**

Variable	Hypertensive		Total	Statistical indices
	Stage 1	Stage 2		
<b>Family history of hypertension</b>				$\chi^2=10.1666$
Yes	16 (33.3)	63 (61.2)	79 (52.3)	Df = 1
No	32 (66.7)	40 (38.8)	72 (47.7)	P value =0.001
<b>Known DM</b>				$\chi^2=1.6381$
Yes	5 (10.4)	5 (4.9)	10 (6.6)	Df = 1
No	43 (89.6)	98 (95.2)	141 (93.4)	P value =0.290*
<b>Alcohol consumption</b>				$\chi^2=1.6381$
Not significant	44 (91.7)	90 (87.4)	134 (88.7)	Df = 1
Significant	4 (8.3)	13 (12.6)	17 (11.3)	P value =0.584*
<b>Smoking</b>				$\chi^2=0.3314$
Yes	1 (2.1)	4 (3.9)	5 (3.3)	Df = 1
No	47 (97.9)	99 (96.1)	146 (96.7)	P value =1.000*
<b>Extra salt</b>				$\chi^2=7.5115$
Yes	32 (66.7)	59 (57.3)	75 (49.7)	Df = 1
No	16 (33.3)	44 (42.7)	76 (50.3)	P value =0.006

Table 2 shows that family history of hypertension is associated with stage -2 disease and adding extra salt to food is associated with stage 1 disease. \*=Fishers exact

**Table 3. Anthropometric variables of young hypertensive respondents attending general out-patients clinic in Uyo**

Variables	Hypertension		Total	Statistical indices
	Stage 1	Stage 2		
<b>Weight (kg)</b>				tt=0.9972
Mean (SD)	75.3 (11.8)	73.1 (12.9)	73.8 (12.5)	Df = 149
				P value =0.320
<b>Height (cm)</b>				tt=1.6933
Mean (SD)	164.9 (9.2)	162.5 (7.9)	163.3 (8.4)	Df = 149
				P value =0.0925
<b>BMI (kg/m2)</b>				$\chi^2=0.3461$
Normal	14 (29.2)	35 (34.0)	49 (32.5)	Df = 2
Overweight	18 (37.5)	36 (35.0)	54 (35.8)	P value =0.841
Obese	16 (33.3)	32 (31.1)	48 (31.8)	Z=1.088
<b>Waist circumference</b>				P value= 0.2768
Median (interquartile range)	91 (20)	88 (15)	89 (16)	$\chi^2=1.9423$
<b>Waist hip ratio</b>				Df = 1
Normal	36 (75.0)	87 (84.5)	123 (81.5)	P value =0.163
Abnormal	12 (25.0)	16 (15.5)	28 (18.5)	

Height was measured with the subjects standing barefooted against an erect metric rule placed on a perpendicular wall. The subjects stood erect, barefooted, heels together against the wall with the buttocks and back touching the metric rule. The subjects looked straight ahead and a 30cm metric rule was placed on the head of the subjects to note the height of the subject on the metric rule on the wall. The subject moved away from the 30 cm metric rule, the height of the subject was read at the point of the head piece on the calibrated wall metric rule to nearest 0.1 cm. The body mass index was calculated using the formula  $BMI = \text{WEIGHT (kg)} / \text{HEIGHT (m}^2\text{)}$ . Waist circumference was done with a measuring tape applied to waist line which is the equidistant abdominal circumference between the costal margin and the iliac crest. The hip circumference which is the widest circumference of the hip was done by measuring the inter-trochanteric diameter of the right and left hip.

The blood pressure of the subject was measured using Accuson mercury sphygmomanometer with cuff of appropriate size in a sitting position. Korotkoff sounds one and five were used as systolic and diastolic blood pressure respectively. Two measurements were taken for each subject at 5 minutes interval and the mean blood pressure was used for the analysis. Systolic blood pressure of 140 mmHg and above and Diastolic blood pressure of 90mmHg and above were taken as Hypertension [2].

Sample population were patients attending the General Outpatients Clinic from where young people diagnosed with essential Hypertension were selected. All young people diagnosed with essential Hypertension over a period of one year January to December 2013 were selected as respondents. Sampling method was consecutive sampling.

Exclusion criteria were young persons with secondary hypertension, persons with essential hypertension above the age of 44 years, young persons with hypertensive heart failure or those with essential hypertension who were too ill to partake in the study. Informed written consent was received from all subjects selected. Ethical approval was obtained from the Ethical Committee of the University of Uyo Teaching Hospital for this study. Data analysis was done using SPSS17.0 version. Results are presented as frequencies and proportions, Chi square was used while level of significance was set at 0.05.

### 3. RESULTS

A total of one hundred and fifty one (n=151) respondents were recruited into the study. 48 respondents had stage 1 hypertension while 103 had stage 2 hypertension (JNC7). More women had hypertension n=84 (55.6%) with n=58 (56.3%) of them having stage 2 hypertension. More respondents n=26(54.2%) with secondary level of education had stage 1 hypertension while n=53(51.5%) with tertiary level of education had stage 2 hypertension. Married respondents n=78(51.7%) had hypertension (n=22(45.6%) had stage 1 and n=56(54.4%) had stage 2). Traders n=46(30.5%) were more than other respondents in occupation. See details in table one.

Family history of hypertension was present in n=79(52.3%) while n=72(47.7%) respondents did not have any family history of hypertension. Stage 2 hypertension was associated with having a positive family history of hypertension, p=0.001. Most of the respondents did not have co-morbid diabetes mellitus n=141(93.4%) and having diabetes mellitus was not associated with stage 1 or 2 hypertension. Majority of the respondents did not take significant alcohol n=134(88.7%), did not smoke cigarette n=146(96.7%), but n=75(49.7%) added extra salt to meal on table before eating and it was associated with stage 1 hypertension p=0.006.

Mean weight of respondents was 73.8 kg (12.5 SD), mean height of respondents was 163 cm (8.4SD), n=54(35.8%) were overweight, median waist circumference was 89 cm and waist hip ratio was normal in n=123(81.5%). There was no significant statistical association between hypertension and anthropometric variables in young people in this study.

### 4. DISCUSSION

Essential hypertension was not commonly diagnosed in young people previously but is presently commonly seen in many centers. Previously, hypertension in a young person was diagnosed as secondary hypertension until proven otherwise. This study of 151 young persons with hypertension showed that essential hypertension was commoner among young females than young males compared to previously held views that hypertension was commoner among males until age 65 when it becomes more common among females. The finding of this study agrees with the work of Ulasi

et al. that found that hypertension was commoner among young women aged 20-30 years than young males [24].

On educational level of respondents diagnosed with essential hypertension, previous studies showed that the less educated a respondent was, the more likely the person to develop essential hypertension. This is supported by the work of Harvard school of public health on African Americans that showed low educational level was a risk factor for hypertension [25]. Wang et al. also found that respondents with low level education had greater frequency of hypertension 27.7% while those with middle level education (18.8%), and higher level of education had less frequency of hypertension (15.8%) [26]. However, in this study the reverse was found. Few respondents with low level education or no education at all n=17(11.2%) had hypertension while those respondents with middle and higher level of education had higher frequency of hypertension n=134(88.8). The finding from this study collaborates the work of Tedesco et al. that found that most hypertensive had higher education [27]. The finding of hypertension among highly educated people in my environment may be due to adoption of western lifestyle and behavior.

Family history of hypertension is an additive risk factor for development of essential hypertension. This study found positive family history of hypertension a significant risk factor for development of stage 2 JNC 7 hypertension in young people p=0.001. Van der Sande et al. had reported that people with a positive family history of hypertension were likely to develop hypertension at a younger age [28]. Also Ranasinghe et al. found the prevalence of hypertension to be significantly higher in subjects with family history of hypertension than those without a family history [29]. In addition, positive family history of hypertension is a predictor of increased susceptibility to hypertension because of interaction between genetic trait, environmental factors and behavior.

High salt diet is another risk factor for developing hypertension. The relationship between salt intake and blood pressure is direct and progressive as there is a dose response relationship between salt intake and blood pressure in the range of 3 to 12 g of salt intake per day [30]. Though, some studies say only those individuals with salt sensitivity develop hypertension with increase salt intake [31]: This

study found a relationship between adding extra salt to meal before eating and stage one hypertension JNC 7 classification p= 0.006 maybe those with this response are salt sensitive.

Obesity increases the risk of development of hypertension; numerous clinical and animal studies have confirmed a strong relationship between obesity and hypertension [32]. There was no significant relationship between obesity and hypertension in this study even-though n=54(35.8%) respondents were overweight. Micro-RNA, GRK2, CaMKIV and PIA<sup>2</sup> are considered to play roles in the aetiology of hypertension, these proteins could not be measured in the blood of the respondents in my environment due to our poor resources.

The use of self report to measure some risk factors like the quantity of salt added to meals may be a limitation in this study due to recall bias though this was controlled by asking how many shakes were done into the meal.

## 5. CONCLUSION

Young people affected by hypertension are frequently seen in my environment. Many factors are known to be associated with development of hypertension at a younger age but amongst them, having a positive family history of hypertension and adding extra salt to serve meals were significant. So, regular screening of young people with family members with hypertension and desisting from adding extra salt to serve meals will be beneficial.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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