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TABLE OF CONTENTS

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ORIGINAL ARTICLE

Anthropometric Indices for Predicting Hypertension among General Outpatient Clinic Attendees of Federal Medical Centre, Bida, Nigeria

Indices Anthropométriques Permettant de Prédire l'Hypertension chez les Patients du Centre Médical Fédéral de Bida, au Nigeria

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ABSTRACT

BACKGROUND: The literature is replete with overwhelming evidence that being obese is a predictor of hypertension risk. Obesity can be defined by anthropometric indices, such as Body Mass Index (BMI), Waist Circumference (WC), waist-hip ratio (WHR), and waist-height ratio (WHtR). Despite wide use of BMI as indicator of obesity, it does not reflect central fat distribution, whereas WC, WHR, and WHtR are used as surrogate markers for body fat centralization. A central distribution of body fat has been shown to be strongly associated with hypertension. Controversies, however, remain regarding the best predictor of hypertension risk. We determined the prevalence of hypertension and assess its association with the four obesity-related indices above. We evaluated which anthropometric measurement most closely relates to high blood pressure risk among adult patients 18 years and above in Bida.

METHODS: This is an analytical cross-sectional hospital-based study of 210 systematic randomly selected adults. Participants were administered a standardized questionnaire and had anthropometric measurements taken along with their blood pressure.

RESULTS: The percentage of people with high blood pressure was 38.6% (33.7% for males and 42.4% for females). WC (p-value <0.001), WHR (p-0.001), WHtR (p-value <0.001) and BMI (p-0.016) were all statistically significantly associated with hypertension. At the multivariate analysis level; waist circumference (OR= 3.635, p= 0.002, CI = 1.613-8.189) and waist-height ratio (OR= 7.183, p-value <0.001, CI = 2.661-19.389) remained strong predictors of hypertension risk. Analysis of the receiver operated characteristics curve showed that waist circumference (0.842) and waist-height ratio (0.838) were the best predictors of hypertension risk.

CONCLUSION:
The central obesity indices WC, and WHtR were better than BMI for the prediction of hypertension in adults >18 years. Therefore, WHtR or WC is recommended as a screening tool for the prediction of hypertension in our clinics, as a means of prevention and early detection of hypertension to halt or slow down the rising burden of hypertension. **WAJM 2023; 40(1): 3–10.**

Keywords: BMI, High blood pressure, Waist circumference, Waist-height ratio.

RÉSUMÉ

CONTEXTE: La littérature regorge de preuves irréfutables que l'obésité est un facteur de prédiction du risque d'hypertension. L'obésité peut être définie par des indices anthropométriques, comme l'indice de masse corporelle (IMC), le tour de taille (TT), le rapport taille-hanche (RTH) et le rapport taille-hauteur (RTH). Bien que l'IMC soit largement utilisé comme indicateur de l'obésité, il ne reflète pas la distribution centrale de la graisse, alors que le tour de taille, le WHR et le WHtR sont utilisés comme marqueurs de substitution pour la centralisation de la graisse corporelle. Il a été démontré qu'une distribution centrale de la graisse corporelle est fortement associée à l'hypertension. Cependant, des controverses subsistent quant au meilleur prédicteur du risque d'hypertension. Nous avons déterminé la prévalence de l'hypertension et évalué son association avec les quatre indices liés à l'obésité ci-dessus. Nous avons évalué quelle mesure anthropométrique est la plus étroitement liée au risque d'hypertension chez les patients adultes âgés de 18 ans et plus à Bida.

MÉTHODES: Il s'agit d'une étude analytique transversale menée en milieu hospitalier auprès de 210 adultes sélectionnés de manière systématique et aléatoire. Les participants ont reçu un questionnaire standardisé et des mesures anthropométriques ont été prises en même temps que leur tension artérielle.

RÉSULTATS: Le pourcentage de personnes ayant une pression artérielle élevée était de 38,6 % (33,7 % pour les hommes et 42,4 % pour les femmes). Le tour de taille (valeur p <0,001), le WHR (p-0,001), le WHtR (valeur p <0,001) et l'IMC (p-0,016) étaient tous associés de manière statistiquement significative à l'hypertension.
Au niveau de l'analyse multivariée, le tour de taille (OR= 3,635, p= 0,002, CI = 1,613-8,189) et le rapport taille-hauteur (OR= 7,183, p-value <0,001, CI = 2,661-19,389) sont restés des prédicteurs forts du risque d'hypertension. L'analyse de la courbe des caractéristiques opérées par le récepteur a montré que le tour de taille (0,842) et le rapport taille-hauteur (0,838) étaient les meilleurs prédicteurs du risque d'hypertension.

CONCLUSION: Les indices d'obésité centrale WC, et WHtR étaient meilleurs que l'IMC pour la prédiction de l'hypertension chez les adultes de plus de 18 ans. Par conséquent, le WHtR ou le tour de taille est recommandé comme outil de dépistage pour la prédiction de l'hypertension dans nos cliniques, comme moyen de prévention et de détection précoce de l'hypertension pour arrêter ou ralentir l'augmentation du fardeau de l'hypertension. **WAJM 2023; 40(1): 3–10.**

Mots clés: IMC, Hypertension artérielle, Tour de taille, Rapport taille-hauteur.

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INTRODUCTION

Hypertension is a major global public health problem among adult population. It is estimated that about 26.4% of the global adult population have hypertension with two-third of them living in economically developing nations. Furthermore, hypertension is one of the leading causes of morbidity and mortality worldwide, Nigeria inclusive.[1]

The World Health Organization statistics of 2012 reported that one in three adults worldwide has a raised blood pressure, a condition that causes around half of all deaths from stroke and heart disease.[2]

Hypertension is defined, according to the World Health Organization (WHO) guidelines, and the 7th Joint National Committee on Prevention, Detection, Evaluation and Treatment of high blood pressure (JNC 7) as systolic blood pressure (SBP) ed 140mmHg and/or diastolic blood pressure (DBP) ed 90mmHg.[3]

Anthropometric measurements can be divided into basic and derived indices. Basic anthropometric measurements (weight, height, waist circumference and hip circumference) and their derived indices (Body Mass Index, Waist-Hip ratio and Waist-Height ratio) are used as indicators for the presence of diseases and their assessment in clinical practice.[4–6] Indicator of global obesity like BMI, is not capable of differentiating body fat and lean body mass. However, indicators of central obesity like waist circumference, waist-hip ratio and waist-height ratio give an idea of the distribution of fat in the body.

Anthropometry provides the single most portable, universally applicable, inexpensive and non-invasive technique for assessing the size, proportion and composition of the human body.[4]

Several epidemiological studies from different populations have reported a significant association between the different anthropometric indicators and blood pressure levels.[7–10] This association between the different indicators and hypertension have been consistently observed, but poorly understood.

With the rising incidence and prevalence of hypertension and their complications, there is a need to develop a comprehensive healthcare plan to halt the epidemic. A comprehensive health-care plan that would involve the prevention of overweight and obesity, and early detection and management of hypertension. This can be achieved with the use of anthropometric indices especially in low resource communities where funds and modern diagnostic equipment may be lacking. This study is designed to assess the relationship between these anthropometric measures and blood pressure for effective hyper-tension prevention and management.

METHODS

The study was conducted at the General Outpatient Clinic of Federal Medical Centre, Bida, Niger State, a Tertiary Health Centre located in the ancient town of Bida, the chiefdom of Nupe Kingdom and headquarters of Bida Local Government area of Niger State, in the North-Central part of Nigeria.

The indigenous people are the Nupe speaking ethnic group, with Gwaris, Igbos, Yorubas, and Hausa-Fulanis as the other major ethnic groups. Brass work, farming, trading and fishing are the predominant occupation of the people. Islam and Christianity are the common religions practised by the people. The GOPC of the hospital runs every day of the week.

Study Population

The study population comprised all adults attending the General Out-Patient Clinic of Federal Medical Centre Bida who met the inclusion criteria. Women that were pregnant, patients with abdominal distension from any cause e.g. ascites and acutely ill patients were excluded.

Study Design

This was an analytical cross-sectional study.

Sample Size Calculation

Sample size calculation was determined using the Kish Leslie formula for cross-sectional studies stated below:

$n=Z^2pq/d^2$ [11]

A prevalence of 14.9%, found in Ilorin, north central Nigeria was used.[12] This gave a sample size of approximately 195.

Given that N (the average number of new adult patients ed18 years seen in GOPC monthly was 1,331 and as a result a total of 2,662 in two months) is < 10,000, the required sample size will be smaller.

Final sample estimate (n_f) = n/(1+(n/N)

Where:

n = the desired sample size when population is more than 10,000 = 195.

N = the estimate of the population size, that is the population frame = 2662.

n_f= 195/1+(195/2662)

Hence n_f = 182

Adjusting for non-response with an attrition rate of 10%, therefore the minimum sample size:

N = n_f/1–NR

N = minimum sample size

n_f= 182

NR = non-response rate = 0.10

N = 182/1–0.10 = 202

N = 202

Therefore, a minimum of 202 adults were recruited for this study.

Subject Selection

An approximate of 210 first time adult attendees presenting in the GOPC of FMC Bida were recruited. The study was designed to be carried out over a period of two months. Given that a total of 1331 adult clients visit the GOPD on average per month, hence for the two months of the study, a total of 2662 clients were expected. Systematic sampling method was employed. Using a population frame of 2662, the sampling interval (K) employed was = 2662/202 = 13.2 ≈ 13.

The first patient was picked by simple random sampling among the first thirteen patients. This was done by writing one to thirteen on similar pieces of papers which were then folded separately and, mixed thoroughly in a container from where the first eligible adult was picked randomly by balloting. The participant who was picked as the number one and found eligible was selected as the first study subject. Thereafter, the remaining subjects were selected through systematic sampling at a fixed interval of 13 (every thirteenth number). Identification numbers were placed on all selected participants' record cards to avoid repeat selection. The process was repeated each of the clinic days. The participants were screened and those who met the inclusion criteria were recruited for the study after signing or thumb printing a written informed consent.

The study protocol was approved by the ethics committee of the Federal Medical Centre, Bida, (FMCB/HCS/HREC/APPR/VOL.1/3/17) and data collection commenced from March 2018 to May 2018 with each respondent providing informed written consent before participation.

Measurements

A. Blood pressure was measured using a conventional mercury sphygmomanometer (Accoson Dekamet 300mmHg conventional mercury sphygmomanometer) on the left arm with appropriate cuff after 10 minutes rest, in the sitting position. Systolic blood pressure (SBP) and Diastolic blood pressure (DBP) were calculated from two readings (mean value of all measurements) with a minimum interval of 3 minutes. A cutoff point of 140/90mmHg for hypertension was adopted based on JNC 7 classification. Respondents with BP of less than or equal to 140/90mmHg were considered normotensives while those with higher values or on anti-hypertensive were classified as hypertensive. For individuals whose SBP and DBP fell into different categories, the higher category was used for classification.

B. Height was measured with a Health 'O' Meter stadiometer (to the nearest 0.1cm) with the subject standing barefooted in an erect position and with the head positioned so that the top of the external auditory meatus was in line with the inferior margin of the bony orbit. Weight was measured to the nearest 0.5kg using the weighing scale on the stadiometer with the subject standing erect and motionless on the scale, barefooted, wearing minimum clothes that maintained privacy, with both upper limbs down by his/her side.

C. The waist and hip circumferences were measured with a non-stretchable flexible measuring tape. Measurements were made with the patient standing erect, arms by the side, feet together with weight equally distributed over both legs, abdomen relaxed and at the end of normal expiration. Waist circumference (WC) was measured mid-point between the lower margin of the last palpable rib and the superior border of the iliac crest. Hip circumference was measured at the level of the widest portion of the buttocks. The tape was snugly applied around the body and not pulled so tight as to constrict.

D. BMI was calculated by dividing weight in kilograms by height in meters squared. The waist-hip ratio (WHR) was calculated by dividing waist circumference by hip circumference. The waist-height ratio (WHtR) was calculated by dividing the waist circumference by height.

Using the WHO classification. BMI was categorized as follows: Underweight (<18.5kg/m^2). Normal (≥18.5 – 24.9kg/m^2), Overweight (25.0 – 29.9kg/m^2), Obesity class I (30.0 – 34.9kg/m^2), Obesity class II (35.0 – 39.9kg/m^2) and Obesity class III (≥40kg/m^2).[13]

The WHO cut off point of central obesity was used and it is as follows; Men (WC >102cm or WHR >1) while Women (WC >88cm or WHR >0.85).[13] A WHtR cutoff of 0.5 was used for central obesity.[14]

Data Analysis

The data analysis was carried out using SPSS version 22 software (Chicago, Illinois, USA). Categorical variables were presented as percentages while continuous variables were presented as mean ± standard deviation. Chi-square test was used to analyse the association between anthropometric parameters and hypertension. Linear regression analysis was also used to assess the influence of the different anthropometric indicators on blood pressure, Receiver Operating Characteristics (ROC) curve was constructed and the area under the curve (AUC) was used to measure the discriminatory power of the various anthropometric parameters for predicting hypertension.

Sensitivity, specificity, positive predictive value, negative predictive value and relative risk were calculated for each anthropometric variable.

The level of significance of all test was set at $p<0.05$.

RESULTS

A total of 210 respondents participated in the study (92[43.8%] males and 118[56.2%] females), giving a male: female ratio of 1: 1.3. The ages of the respondents ranged from 20 to 75 years with a mean age (± Standard Ddeviation) of 40(±11) years. The majority of the respondents were in the 40–49 years age group. The general characteristics of the respondents are presented in Table 1.

Table 2 shows the anthropometric and clinical characteristics of the participants. The mean (± standard deviation) height (m), weight (kg), BMI (kg/m^2), WC (cm), WHR, WHtR of the respondents were 1.63±0.08, 62.40±11.85, 23.52±4.40, 87.22±13.19, 0.93±0.07 and 0.54±0.09 respectively.

The males were slightly taller and heavier than the females, however in the BMI, HC, and WHtR, the females have higher anthropometric parameters, than males. Only in the WC and WHR did the males have higher values than the females. The blood pressure values in this study were however higher in females than males.

The mean BP (mmHg) of all the participants was 133 ± 22 and 82±11 for SBP and DBP respectively.

Table 3 shows the prevalence of hypertension categorized by the various sexes among the respondents. Eighty-one (38.6%) of the respondents were hypertensive with the prevalence higher in the females compared to males.

Table 4 shows the chi-square analysis of the association between anthropometric parameters and hypertension. The chi-square test revealed a statistically significant association between hypertension and the anthropometric variables (WC, WHR, WHtR and BMI).

Table 5 shows linear regression analysis of the respondents. Only WC and WHtR were significantly associated with hypertension ($p<0.05$). Those with

Table 1: Sociodemographic Characteristics of Respondents

Variables	Frequency N =210	Percentage (%)
Age group (in years)		
20 – 29	41	19.5
30 – 39	65	31.0
40 – 49	68	32.4
50 – 59	24	11.4
≥60	12	5.7
Sex		
Male	92	43.8
Female	118	56.2
Tribe		
Nupe	109	51.9
Hausa	51	24.3
Yoruba	25	11.9
Igbo	18	8.6
Others	7	3.3
Religion		
Christianity	55	26.2
Islam	155	73.8
Occupation		
Farming	30	14.3
Trading	62	29.5
Artisan	17	8.1
Student	22	10.5
Unemployed	55	26.2
Civil servant	24	11.4

Table 2: Anthropometric and Clinical Characteristics of the Respondents

	General n = 210	Male n_1 = 92	Female n_2 = 118
Variables	**Mean(SD)**	**Mean(SD)**	**Mean(SD)**
Height (m)	1.63 ± 0.08	1.67 ± 0.08	1.60 ± 0.06
Weight (kg)	62.40 ± 11.85	65.59 ± 9.84	59.84 ± 12.69
BMI (kg/m^2)	23.52 ± 4.40	23.49 ± 3.64	23.55 ± 4.93
Waist Circumference (cm)	87.22 ± 13.19	87.27 ± 11.36	87.18 ± 14.51
Hip Circumference (cm)	94.12 ± 12.42	93.00 ± 10.53	95.00 ± 13.70
Waist-Hip Ratio	0.93 ± 0.07	0.94 ± 0.06	0.92 ± 0.07
Waist-Height Ratio	0.54 ± 0.09	0.53 ± 0.09	0.55 ± 0.09
SBP (mmHg)	133 ± 22	131 ± 21	134 ± 23
DBP (mmHg)	82 ± 11	82 ± 11	83 ± 11

abnormal waist-height ratio had approximately 5 times the risk of developing hypertension (OR>6.5) while those with abnormal waist circumference had about 4 times the risk of developing hypertension (OR>3.4).

Figure 1 shows graphical representation of the ROC curve of the anthropometric indicators. Receiver operating characteristics curve shows that waist circumference and waist-height ratio had over 80% accuracy to correctly classify respondents into those with hypertension and those without hypertension. The AUC of WC (0.842) was just slightly higher than WHtR (0.838). Hence WC and WHR are the best predictors of hypertension.

DISCUSSION

Hypertension has continued to be one of the leading causes of mortality among cardiovascular disorders. It is at times described as a silent killer as its onset is often not detected early or because it is often idiopathic.[15] It could also be secondary if its cause (such as renal arterial stenosis) is known. The impacts of hypertension on the human body and the general population are quite worrisome. Many people have died from this condition silently as it is at times not diagnosed early or treated properly, hence the need to actively look out for it and commence management early.

The prevalence of hypertension in this study was 38.6%. This is slightly lower than the estimated prevalence of 42.8% for Nigeria according to the WHO.[16] This high prevalence underscores the huge burden of the disease in our community. The observed prevalence of hypertension in this study despite being lower than the WHO estimated prevalence, is similar to the prevalence of 30.4% reported by Adedoyin *et al* in Southwestern Nigeria and 32.3% reported by Gezawa *et al* in Northeastern Nigeria.[8,17] Both studies were in a similar population like this study, while Adedoyin *et al* studied adults between 20 and 100 years, Gezawa *et al* study was on consenting adults 15 to 70 years. Although both studies were population-based studies unlike this hospital-based study, the closely related prevalence rate suggests that hypertension is really common. In a community-based study by Abegunde et al in Southwestern Nigeria, the prevalence rate of hypertension among elderly patients (60 years and above) was 36.5%.[18] This rate is close to what was observed in our study although it was a community-based study and also the age group studied differs.

Community-based studies conducted by Olanrewaju *et al,*[19] Ekanem *et al,*[20] Olufemi *et al,*[21] Ahaneku *et al*[22] and Bello *et al*[23] revealed the prevalence of hypertension of 30%, 47%, 22.7%, 44.5% and 55.9% respectively. In a systematic review and meta-analysis by Adeloye *et al,* an overall prevalence rate of 28.9% was reported.[24] While the differences in prevalence rates across the country as highlighted above could be as a result of the age group (20–75yrs) and the type of population studied (black Africans), the trend shows the high prevalence rate of hypertension across the country.

A community-based study in South Africa showed a prevalence of 63.4%.[25] Another study in the same country

Table 3: Prevalence of Hypertension

	Male n_1=92		Female n_2=118		Total n = 210	
	Frequency	Percentage (%)	Frequency	Percentage (%)	Frequency	Percentage (%)
Blood Pressure						
Normal	61	66.3	68	57.6	129	61.4
Hypertensive	31	33.7	50	42.4	81	38.6

Table 4: Association between Anthropometric Measurements and Hypertension

Variables	Categories	Normal n_1=118 (%)	Hypertensive n_2=70 (%)	χ^2	P-value
WC	Normal	101(78.9)	27(21.1)	44.707	<0.001
	Abnormal	17(28.3)	43(71.1)		
WHR					
	Normal	71(74.7)	24(25.3)	11.776	0.001
	Abnormal	47(50.5)	46(49.5)		
WHtR					
	Normal	58(92.1)	5(7.9)	34.801	<0.001
	Abnormal	60(48.0)	65(52.0)		
BMI					
	Normal	95(67.9)	45(32.1)	6.082	0.016
	Abnormal	23(47.9)	25(52.1)		

**Patients on anti-hypertensive were excluded from this analysis as the drugs might have modified the natural relationship.*

Table 5: Linear Regression Analysis of Relationship between Anthropometric Measurements and Hypertension

Model	Unstandardized		Standardized Coefficients			
	B	S.E.	B	t	95% CI	P-value
Constant	0.519	0.130	–	4.003	0.264 – 0.775	0.000
WC	0.309	0.080	0.293	3.860	0.151 – 0.467	<0.001
WHR	–0.034	0.069	–0.035	–0.488	–0.170 – 0.102	0.610
WHtR	0.334	0.073	0.325	4.557	0.190 – 0.479	<0.001
BMI	–0.035	0.072	–0.031	–0.484	–0.178 – 0.108	0.635

** Unstandardized coefficients represent measurements taken in the same original unit of measurement; standardized coefficient are normalized unit less coefficient.*

Table 6: Specificity, Sensitivity, Predictive Values and Relative Risk

Parameters	SEN	SPE	PPV	NPV	OR
WC	61	86	72	79	3.4
WHR	66	60	49	75	1.96
WHtR	93	49	52	92	6.5
BMI	36	81	52	69	1.68

revealed a prevalence of 46.3%[26] while a similar study in Brazil revealed a prevalence of 29.2%.[27] These variations in prevalence could be as a result of the genetic and racial factors which are documented non-modifiable risk factors of hypertension. This high prevalence of hypertension in this study and other studies quoted in Nigeria may not be unconnected to the nutritional (major reduction in the overall quality of carbohydrates in the diet) and epidemiological (lengthening of the life expectancy and urbanization of the population) transition going on and will continue to rise if not addressed early.

The higher prevalence of hypertension in women (42.4%) compared with men (33.7%) observed in this study is in keeping with recent hospital and population-based surveys in Nigeria and across Africa.[15,17,21,24–26] It is generally believed that oestrogen has a cardio-protective effect which is responsible for the lower prevalence of hypertension in pre-menopausal women compared to post-menopausal women. The relatively higher prevalence of hypertension in females has been referred to as reversed dichotomy. One explanation given for reversed gender dichotomy was higher indices of obesity and elevated level of insulin resistance in women. However, among the pre-menopausal women secondary causes are taught to be responsible.

The anthropometric measurements analysed in this study include indices of global obesity (BMI), and indices of central obesity (waist circumference, waist-height ratio) and waist-hip ratio. BMI, WHtR, WC, and WHR were all significantly associated with blood pressure (BMI χ^2 – 6.082, p - 0.016, WC χ^2– 44.707, p-0.000, WHR χ^2 – 11.776, p-0.001 and WHtR χ^2 – 34.801, p-0.000). In a similar hospital-based study conducted by Okamkpa *et al* in Southeastern Nigeria, a similar result was obtained as all the obesity-related anthropometric measurements were statistically significantly associated with blood pressure.[15]

A population-based study by Gezawa *et al*[17] and Olorunshola *et al*[28] also showed that the anthropometric measurements related to obesity were associated with blood pressure. This is similar to the trend demonstrated in other similar studies (both hospital-based and population-based) across the world.[25,26,29–31] The correlation among the anthropometric indices observed in this study and similar studies quoted shows that general obesity and abdominal

Table 7: Area under Receiver Operating Characteristics Curve of the Anthropometric Variables

Anthropometric variables	Area
BMI	0.703
WC	0.842
WHR	0.638
WHtR	0.838

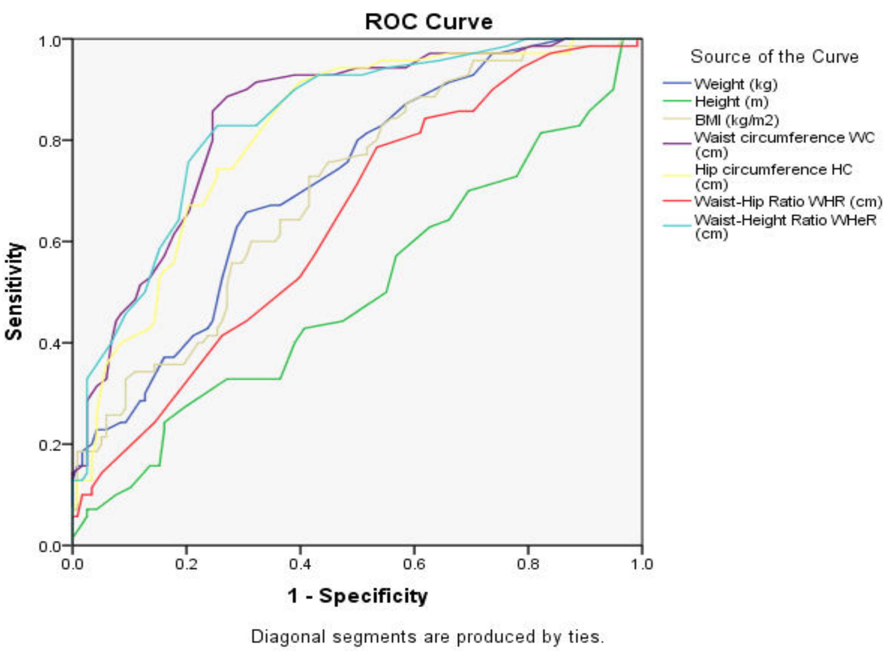

Fig. 1: Receiver Operating Characteristics Curve of the Anthropometric Variables.

adiposity are associated with hypertension to varying degrees.

Linear regression analysis revealed that the indices of central obesity (WC and WHtR) were positively and significantly related to blood pressure with p-values of 0.001 and 0.010 respectively. This study result is consistent with other similar studies[5,32–39] and further reinforces the theory that central obesity carries more cardiovascular risk than global obesity.[40]

In order to determine which anthropometric measurement best predict hypertension risk, the anthropometric measurements were subjected to a screening test. WHtR had the highest sensitivity (93%), negative predictive value (92%) and a relative risk of 6.5%. WC had the highest specificity (86%) and positive predictive value (72%) with the second-best relative risk of 3.4. BMI had a sensitivity of 36%, specificity of 81%, positive predictive value of 52%, negative predictive value of 69% and relative risk of 1.68. Further analysis of the Receiver Operating Curve (ROC) curve suggested that WC is the best predictor of hypertension, closely followed by WHtR.

WC is an index of abdominal obesity and is related to the percentage of abdominal fat mass. Similar hospital-based study done in southeastern Nigeria by Okamkpa *et al* reveal similar findings that WC best predict hypertension risk with WC having AUC of 0.67, WHtR with 0.48, and BMI with 0.52.[15] Population-based study by Adediran *et al* in FCT,[21] Nkeh-Chungag *et al* in South Africa,[26] and Cassani *et al*[27] further corroborated the result of this study that WC is the best predictor of hypertension risk.

Another population-based study by Murphy *et al* in Uganda found WC to be the best predictor of hypertension risk but did not assess waist-height ratio.[5] Some studies have shown that WHtR is the best predictor of hypertension. In a population-based study in Zaria by Olorunshola et al,[28] WHtR was found to be the best predictor of hypertension risk, however that study was done on non-obese adults. A similar population-based study in South Africa by Lategan et al also revealed WHtR to be the best predictor of hypertension.25

WHtR takes into account the distribution of body fat in the abdominal region which has been shown to be more associated with cardiovascular risk and hence an important index of central obesity. While the screening tests agree with WHtR as the best predictor of hypertension risk, analysis of the ROC curve shows that WC has the largest AUC hence best predict the hypertension risk. BMI from the result of this study shows that it is well behind WC and WHtR in the prediction of hypertension.

BMI is a measure of global obesity but cannot distinguish fat from muscle, it under-represents body fat distribution and not a measure of central adiposity. From the findings of this study corroborated by findings from similar hospital and population-based studies, indices of central obesity (WC and WHtR) best predict hypertension risk than BMI which is a measure of global obesity. This further authenticated the theories of obesity-related hypertension and the usefulness of these anthropometric measurements as screening tools, especially in the primary care setting.

CONCLUSION

From this study, the prevalence of hypertension is high among the study population, therefore healthy life style/ NCD clinics should be strengthened to prevent and control hypertension by making early health check-up followed by counseling. As the anthropometric parameters WC and WHtR are associated with hypertension, and a strong predictor of hypertension risk, so measurements of WC and WHtR, should be made compulsory in healthy life style/NCD clinics. WC and WHtR are simple clinical assessments tools that can be employed as screening tools for hypertension.

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Organisation

Federal Medical Centre, Bida.

Conflicting Interest (If present, give more details)

Nil.

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