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Original Research Article

A CROSS SECTIONAL STUDY ON SYSTEMIC HYPERTENSION AND ITS RELATIONSHIP WITH WAIST TO STATURE RATIO(WSR)IN AN URBAN POPULATION IN CHENNAI

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Abstract

BACKGROUND: Hypertension is a Silent Killer disease. Worldwide , the most frequent disease causing Cardiovascular morbidity and mortality is Systemic Hypertension . It is expected that approximately 1 in 3 adults aged above 20 years will have the disease by the year 2025 . **OBJECTIVES:**To study the Prevalence of Systemic Hypertension , Mean Waist-to-Stature ratio (WSR) and its screening potentialin an urban Chennai population. **METHODS:**A total of 440 study participants aged 20 to 60 years selected by two stage Simple Random sampling from T.P.Chathram, an urban locality in Chennai, the field practice area attached to Govt. Kilpauk Medical College were administered a structured Questionnaire in 2015 for Socio demographic data and basic anthropometric measurements. **RESULTS:** The Overall prevalence of hypertension was 27.5% with 95% C. I. of 23.33% to 31.67% . The Mean Waist to stature Ratio was 0.506 (±0.03) with 95% C.I. of 0.503 to 0.509.The Receiver operating Characteristic (ROC) Curve analysis done revealed area under the curve (AUC) of WSR > Waist Hip Ratio > Body Mass Index. The Maximum Sensitivity of 96.7% and Specificity of 26.6% of WSR as a predictor of Hypertension was established at 0.502 . Waist to Stature Ratio can be used for initial screening for hypertension at the Community level.

KEYWORDS: Hypertension, Waist to Stature Ratio, Waist Hip Ratio, Area under the Curve (AUC) , Receiver operating Characteristic (ROC)Curve.

BACKGROUND

Hypertension is a Silent Killer disease. Worldwide , the most frequent disease causing Cardiovascular morbidity and mortality is Systemic Hypertension [1].It is expected that approximately 1 in 3 adults aged above 20 years will have the disease by the year 2025[2]. Prevalence of Systemic hypertension in India, for the last three decades has increased by 30 times among residents in urban area[3].In developing countries like India, several epidemiological studies to assess the prevalence of hypertension are needed for determining the baseline against which future trends in risk factors can be assessed and henceforth preventive measures can be planned . Amidst a background of increasing prevalence of Hypertension, compounded by increasing mortality and morbidity from cardiovascular diseases, we were interested to investigate the prevalence of Systemic Hypertension and various screening anthropometric measurements among adults of 20 to 60 years of age in our field practice area T.P.Chathram, Ward no.59, zone VIII attached to Department of Community Medicine, Government Kilpauk Medical College, Chennai .In many cross sectional studies , the relationship of the different measurements of fat distribution with the prevalence of disease has been extensively evaluated[4].Abdominal obesity has been recognized as a better predictor for cardiovascular disease. Waist to Stature ratio (WSR) as an anthropometric indicator of risk of Hypertension and Cardiovascular diseases has emerged as a new option that is more feasible, practical and attractive when compared to other indices[5] .While Body mass index (BMI) has been always considered as the reliable indicator of obesity, BMI does not take into account the muscle mass, which could incorrectly indicate obesity.

Our objective here is to estimate the prevalence of Systemic Hypertension and Mean Waist to Stature ratio

in an urban Chennai population and to estimate the screening potential of Waist to Stature Ratio (WSR) as an indicator of Systemic Hypertension and to compare it with other anthropometric indices.

METHODOLOGY

An analytical cross-sectional study was carried out in the urban population of Chennai during February 2015 to May 2015 among adults aged twenty years and above up to 60 years in the study area so that it can help in initiating a specific community based risk factor intervention **for** the Urban population of Chennai. 1200 families in 24 streets of T.P.Chathram (an urban locality in zone VIII Chennai), constituted the study population. Adults in the age group of 20 years and above upto 60 years of age, living in T.P.Chathram constituted the Study population, with an average family size of 4 and an average size of 2/ family in the age group of 20 to 60 years.Those unable to stand erect, Pregnant women were also excluded .

For an expected prevalence (p) of 20% with Z value of 1.96 at 95% confidence interval, and with limit of accuracy (L) at 20 % of p (Relative precision) , the sample size required was 440 study participants aged 20 to 60 years **(z_α pq/L^2)**with an expected non response rate of 20%.To achieve a sample size of 440, with an average size of 2 members between 20 and 60 years of age in a family, an estimated 220 families were required to be sampled. A two stage random sampling method as used. In first stage, 10 streets were selected from the list of 24 streets of the field practice area. In second stage, 22 families were selected from each street using Family registers maintained by Urban Health Nurses at the urban health centre of T.P. Chathram as the sampling frame. Simple random sampling was employed to select Families by Random number Tables from each street . A house-to-house visit was made in the morning and in the evening time to enroll all members of the family. The objectives of the study and the benefits to the people being examined were explained to the adults and their oral informed consent was obtained.

Data collection was done only by the Principal Investigator. The selected family was approached . Informed consent was taken from them for their participation after clarifying all their doubts. This study was approved by theInstitutional Ethical Committee of Kilpauk Medical College and data collection was done duringthe months of February and March 2015.

Using a structured Questionnaire, Sociodemographic data regarding Non modifiable risk factors such as Age, Sex and Modifiable risk factors such as Alcoholism, Smoking, Physical activity was collected and entered by the investigator besides Name, Residential address, Hypertension status, Occupation and Education.Modified KUPPUSWAMY Scale (All india consumer price index – November 2014) was used to assess the Socio economic status of the family.

In this study, a person, either male or female aged 20years and above is considered hypertensive if " his/ her systolic blood pressure (SBP) is 140 mmHg or greater, diastolic blood pressure (DBP) is 90 mmHg or greater or taking any antihypertensive medication. **(JNCVII criteria)**[6].The definition recommended by Indian Heart Journal in 2006 was followed to categorise smoking and Alcoholism as Current, Past and Non smoker/alcoholic. The definition recommended by Exercise Physiology "Energy, Nutrition and Human Performance" was followed to grade physical activity as Bedridden, Sedentary, Moderate and Rigorous activity.

All Anthropometric indices were measured using standardized protocols. According to the WHO Stepwise Approach to Surveillance (STEPS) protocol, " the Waist Circumference should be measured at the midpoint between the top of the iliac crest (hip bone) and the lower margin of the last palpable rib [21] (WHO 2008)", which is the method most commonly used. Mean of two readings was taken as WC. Hip circumference was measured at the level of maximum extension of the buttocks. Auscultatory method was used to record blood pressure with a standard Diamond mercury sphygmomanometer. The accuracy of the instrument was periodically checked and compared with another mercury sphygmomanometer. All the subjects detected to be hypertensives were referred to the nearest health center for further investigations, management and follow-up.

The data was entered in Microsoft excel after double checking. Statistical analysis was done with SPSS 20.0 Trial version. The Prevalence of hypertension is expressed as Proportion with 95% confidence intervals. The Mean Systolic and Diastolic Blood pressure, Mean Waist circumference, Waist Hip ratio and Waist Stature ratio are expressed with 95% confidence intervals. The Risk of Hypertension for each risk factor was estimated by Univariate analysis with logistic regression model (SPSS 20.0 trial version software) . To adjust for all the risk estimates , we then used theMultivariate logistic regression model. The covariates considered were age, sex, education, occupation, Socio Economic status status, smoking, alcohol, level of physical activity, Waist Hip Ratio, Waist Stature Ratio and Body Mass Index. Then ROC curve (Receiver Operator Characteristic Curve) analysis was done to determine the capacity of Waist Stature Ratio as a predictor of Systemic Hypertension compared to Waist Hip ratio and BMI.

RESULTS AND DISCUSSION

In this study, as shown in Table 1, there were 222 females and 218 males and were equally distributed among the 4 age groups. About 80% of the population had completed high school as shown in Educational status of the study population in Table 1. About 55.23% of

the study population was unemployed ,largely contributed by the House wives.The overall prevalence of Systemic Hypertension in the study population was 27.5% (with 95% C.I. of 23.33% – 31.67%) as shown in Table 1.

TABLE 1 : DISTRIBUTION OF THE BASIC SOCIODEMOGRAPHIC CHARACTERISTICS OF STUDY POPULATION

STUDY VARIABLE	TOTAL SUBJECTS	TOTAL NUMBER OF HYPERTENSIVES
I. AGE GROUP IN YEARS, p< 0.001 *		
20-29	110 (25%)	13 (11.82%)
30-39	111 (25.2%)	21 (18.92%)
40-49	109 (24.8%)	41(37.61%)
50-59	110 (25%)	46 (41.82%)
II. GENDER, p = 0.9		
Male	218 (49.55%)	60 (27.5%)
Female	222 (50.45%)	61 (27.48%)
III. EDUCATION, p = 0.15		
Professional	6 (1.4%)	3 (50%)
Graduate or post graduate	96 (21.8%)	18 (18.75%)
Intermediate or post high school diploma	137 (31.1%)	39 (28.5%)
High school	110 (25%)	35 (31.8%)
Primary school	49 (11.1%)	19 (38.8%)
Middle school	40 (9.1%)	6 (15%)
Illiterate	2 (0.5%)	1 (50%)
IV. OCCUPATION, p = 0.09		
Professional	45 (10.23%)	14 (31.1%)
Semi professional	6 (1.36%)	2 (33.3%)
Clerical,shop owner or farmer	61 (13.86%)	19 (31.1%)
Skilled	65 (14.77%)	21 (32.3%)
Semi skilled	18 (4.09%)	7 (38.9%)
Unskilled	2 (0.45%)	0
Unemployed	243 (55.23%)	58 (23.9%)
TOTAL	440 (100%)	121 (27.5%)

The prevalence of hypertension was almost similar among males compared with females (27.5 versus 27.48 %).With increasing age groups , the prevalence of Systemic Hypertension also increased, and the maximum prevalence (42.59%) was observed in the older age group of 50 to 59 years . Although overall prevalence of Hypertension in males and females were similar, there was a difference in age wise prevalence of Hypertension between males and females in the different age groups which was not statistically significant .The increase in prevalence of Hypertension with the increasing age groups was statistically significant. (Chi square test for Trend , $p < 0.001$.Mohan V et al [7] reported a prevalence of 20% in his study, lower than the estimated prevalence of systemic hypertension in our study whereas Prabhakaran D et al [8] reported a prevalence of 30% in his study.

Table 2 shows the baseline anthropometric characteristics of our study population.The Mean Waist to Stature Ratio in our study population was 0.506 with standard deviation of 0.03 and 95% confidence interval of 0.503 to 0.509. The Mean Waist to Stature Ratio in males was 0.505 (± 0.03) with 95% C.I. of 0.501 to 0.509 and in females was 0.508 (± 0.03) with 95% C.I. of 0.504 to 0.512

TABLE 2: DISTRIBUTION OF ANTHROPOMETRIC MEASUREMENTS

ANTHROPOMETRIC MEASUREMENTS	MEAN	95% C.I. FOR MEAN		SD	MIN.	MAX.
		LOWER BOUND	UPPER BOUND			
WAISTCIRCUMFERENCE(CM)	83.82	83.36	84.27	4.88	74	100
HIP CIRCUMFERENCE (CM)	90.01	89.49	90.53	5.58	78	112
WEIGHT (KG)	63.5	62.5	64.5	10.72	45	100
HEIGHT (CM)	165.69	165.04	166.35	7.02	148	186
BMI	23.18	22.8	23.55	3.96	14.45	40.57
WAIST HIP RATIO (WHR)	0.932	0.928	0.936	0.039	0.769	1.05
I. WHR MALE	0.937	0.932	0.942	0.037	0.833	1.05
II. WHR FEMALE	0.927	0.922	0.933	0.042	0.769	1.023
WAIST STATURE RATIO (WSR)	0.506	0.503	0.509	0.032	0.43	0.629
I. WSR MALE	0.505	0.501	0.509	0.033	0.43	0.629
II. WSR FEMALE	0.508	0.504	0.512	0.03	0.438	0.61

The Mean Systolic Blood Pressure in our population was 126.41 mm of Hg and Mean Diastolic Blood pressure in our population was 79.68 mm of Hg. There was a difference of 1.27 mm of Hg in Systolic Blood pressure between Males and Females in our study population which was not statistically Significant ($p = 0.23$).

The Prevalence of Systemic Hypertension in Overweight and Obese individuals as determined by various anthropometric criteria is shown in Table 3.

We took a

1) BMI of ≥ 25, (WHO STANDARDS[9])
2) BMI of ≥ 23, (WHO Asian Criteria [9] for BMI classification)
3) WSR of ≥ 0.5 ,
4) WHR of ≥ 0.85 in Female s, ≥ 0.9 in Males as Overweight and Obese and calculated the prevalence of Hypertension .

Of all the Criteria, WHR determined the Prevalence of Overweight and/or Obesity as 86.81%, the highest as compared to WSR (53.18%) and BMI ≥ 23(46.14%).

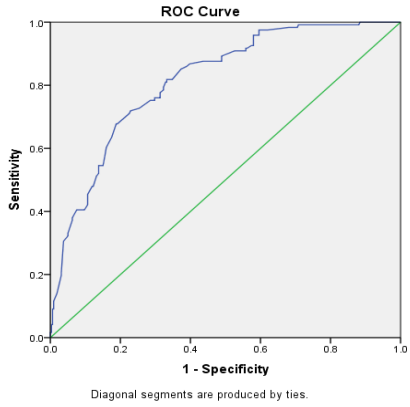
About 51.28% of the study participants classified as Obese and / or Overweight by WSR Criteria had Systemic Hypertension compared to 31.41% by WHR Criteria. Waist Hip Ratio Criteria , on the other side classified 86.81 % of the study population as overweight and obese, but only 31.4% of those identified had Systemic Hypertension.

TABLE 3: PREVALENCE OF OVERWEIGHT AND OBESITY BY VARIOUS ANTHROPOMETRIC INDICES WITH HYPERTENSION

ANTHROPOMETRIC CRITERIA (n = 440)	OVERWEIGHT AND OBESE INDIVIDUALS		HYPERTENSIVES IN OVERWEIGHT AND OBESE INDIVIDUALS	
	NUMBE	%	NUMBER	%
BMI ≥25	134	30.45	44	32.84
BMI ≥23 (ASIANS)	203	46.14	60	29.56
WSR ≥0.5	234	53.18	120	51.28
WHR ≥ 0.85 Female ≥ 0.9 Male	382	86.81	120	31.41

ROC CURVE ANALYSIS - PREDICTOR OF HYPERTENSION:

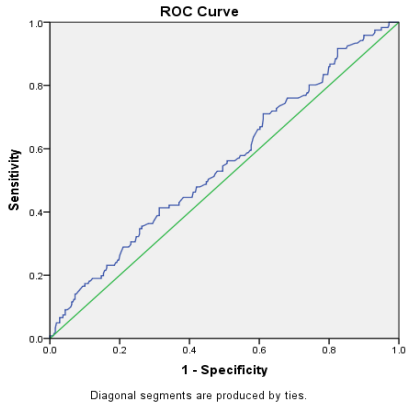
FIGURE 1: WAIST HIP RATIO – ROC CURVE



Area under the Curve: 0.816 (with 95% C.I. 0.774 – 0.858) , p < 0.001 Maximum (97.5% sensitivity and 41% specificity) at Waist Hip Ratio of 0.913511.

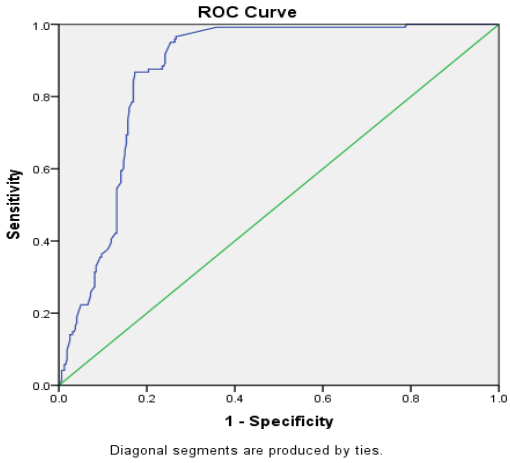
In our ROC curve analysis we found that area under the curve for different anthropometric indicators as a predictor of Hypertension were in the order of WSR > WHR > BMI. AUC for WSR was 0.871 with 95% C.I. of 0.838 – 0.904 , p = 0.000. The Maximum sensitivity and specificity was attained at WSR of 0.502859. A Maximum of 96.7 % sensitivity and 26.6 % specificity was attained at this point as shown in Figure 5.

FIGURE 2: BODY MASS INDEX – ROC CURVE



Area under the Curve: 0.541(with 95% C.I. 0.480 – 0.602), p = 0.187 Maximum (71 % sensitivity and 39 % specificity) at BMI of 21.23841

FIGURE 3: WAIST STATURE RATIO – ROC CURVE



Area under the Curve: 0.871(with 95% C.I. 0.838 – 0.904), p < 0.001
Maximum (96.7 % sensitivity and 26.6 % specificity) at WSR of 0.502859

In our study we found that WSR had the Maximum sensitivity of 96.7% although Specificity was low. WSR identifies the Population at cardiometabolic risk with single cut off point of 0.5 unlike Waist Hip Ratio which has genderwise different cut off points, but at the cost of False positives upto 73.4%.

Hence WSR may prove to be a very good initial screening tool but of very little value in definitive risk of Hypertension when compared with Waist Hip Ratio in terms of Specificity and Sensitivity. Lee meta analysis [10] also found that the AUC values were ranked in this order:WSR (highest)> WHR > BMI (lowest). WSR is considered to be superior in discriminating cardiometabolic risk because WSR takes into account height, which is important particularly in individuals who are short[11].

Risk factors contributing to Hypertension were analysed independently by finding the association and strength of

association.The risk factors which had statistically significant association in univariate analysis in our study were subjected to Multivariate logistic regression modeling to adjust all risk estimates for covariates. Possible covariates considered were either Modifiable or Non Modifiable. The Risk factors such as Age, Sex, Occupation, Education, Socio-economic status, Smoking, Alcohol intake , Level of physical activity, Body Mass Index, Waist Hip ratio, Waist Stature Ratio were subjected to Univariate analysis initially as shown in Table 4.

The Risk factors that had statistically significant association by Univariate analysis were Age, Smoking, Level of Physical activity ,Waist Stature Ratio and Waist Hip Ratio and were subjected to Multivariate analysis.

TABLE 4: UNWEIGHTED UNIVARIATE ANALYSIS OF RISK FACTORS FOR HYPERTENSION

VARIABLE	Examined (n=440)	Hypertensives		OR	95%CI		p value
		No.	%				
I. AGE GROUP IN YEARS							
20-29	110	13	11.8	1	Reference		
30-39	111	21	18.9	1.74	0.823	3.681	0.147
40-49	109	41	37.6	4.5	2.242	9.029	1
50-59	110	46	41.8	5.36	2.685	10.71	1
II. GENDER							
Female	222	61	27.5	1	Reference		
Male	218	60	27.5	1	0.66	1.523	0.991
III. SOCIO ECONOMIC CLASS							
Class I	29	7	24.1	0.64	0.174	2.329	0.495
Class II	275	78	28.4	0.79	0.287	2.184	0.652
Class III	86	18	20.9	0.53	0.175	1.605	0.261
Class IV	32	12	37.5	1.2	0.357	4.038	0.768
Class V	18	6	33.3	1	Reference		
IV. ALCOHOLISM							
Non – Alcoholic	397	107	27	1	Reference		
Alcoholic **	43	14	32.6	1.31	0.666	2.57	0.435
V.SMOKING							
Non – smoker	400	96	24	1	Reference		
Past Smoker	5	1	20	0.79	0.087	7.168	0.835
Current smoker	35	24	68.6	6.91	3.265	14.62	<0.001
VI. BODY MASS INDEX							
< 18.5	31	5	16.1	0.52	0.189	1.407	0.197
18.5 – 22.99	206	56	27.2	1	Reference		
23 – 24.99	69	16	23.2	0.81	0.427	1.53	0.514
25 – 29.99	108	33	30.6	1.18	0.707	1.966	0.529
≥ 30	26	11	42.3	1.96	0.851	4.534	0.114
VII .LEVEL OF PHYSICAL ACTIVITY							
Sedentary	234	105	44.9	10.1	5.417	18.76	0
Moderate	174	13	7.5	1	Reference		
Heavy/rigorous	32	3	9.4	1.28	0.344	4.778	0.712
VIII . WAIST HIP RATIO							
< 0.85 (Females) < 0.9 (Males)	58	1	1.72	1	Reference		
≥ 0.85(Females) ≥ 0.9 (Males)	382	120	31.4	26.1	3.57	190.8	<0.001
IX . WAIST STATURE RATIO							
WSR < 0.5	206	1	0.49	1	Reference		
WSR ≥ 0.5	234	120	51.3	216	29.7	1565	<0.001

** There were no past alcoholics in our study

TABLE 5: MULTIVARIATE ANALYSIS OF RISK FACTORS FOR SYSTEMIC HYPERTENSION

Contributing risk factors	Odd's Ratio	95% CI		p value
		Lower	Upper	
1.Age group (in years)				
20-29	1			
30-39	1.838	0.6	5.33	0.26
40-49	6.032	2.2	16.9	0
50-59	13.589	4.2	44.3	0
2.Level of physical activity				
Sedentary	21.919	9.1	52.8	0
Moderate	1			
Heavy/rigorous	1.875	0.4	9.01	0.43
3.BMI (kg/m^2)				
< 18.5	0.461	0.1	3.33	0.44
18.5 – 22.99	1			
23 – 24.99	0.444	0.1	1.37	0.16
25 – 29.99	0.317	0.1	0.76	0.01
≥ 30	1.02	0.2	4.44	0.98
4.Smoking				
Non Smoker	1			
Current Smoker	8.617	1.8	40.9	0.01
Past Smoker	0.677	0	22.5	0.83
5.Waist Stature Ratio				
< 0.5	1			
> 0.5	459.156	56	3764	0
6.Waist Hip Ratio				
< 0.85 Female , < 0.9 Male	1			
≥ 0.85 Female , ≥ 0.9 Male	10.691	1	115	0.05

R^2 = 0.516 , Pseudo R^2 = 0.746

The individual risk factors that were identified as playing a major role in developing hypertension by univariate analysis from our study were then subjected to a multivariate analysis and the findings are as follows:

Age related increase of hypertension is a common but not a universal phenomenon. The study revealed that there is a strong association between the age and the risk of systemic hypertension. These findings compare well with that of other studies. In CURES 52 study done among 26,001 individuals, Mohan V et al [12] showed that there is a strong association of age with hypertension. In our study we explored the association of hypertension with **smoking** and found that the risk of hypertension was 8.6 times higher among current smokers when compared to non-smokers.[OR:8.6 (95%CI:1.8-40.9) (p = 0.007)] as shown in Table 5, when adjusted for other covariates . Gupta R et al. also in their study among 2122 subjects

aged 20 years or more found that smoking was independently associated with higher prevalence of hypertension in both sexes. [13].Regular **aerobic physical activity** is adequate to achieve at least a moderate level of physical fitness.

In our study increased levels of physical activity had protective effect on hypertension in Moderate Workers in Comparison to Sedentary workers. When Compared to Moderate Workers, Sedentary Workers had 21.9 times higher odds of hypertension [OR: 21.9 (95%CI:9.1- 52.8) (p = 0.000)].Paffenbarger RS. et al showed that, When compared to their fit and more active peers , the Sedentary and unfit normotensive individuals, in the next few years, had 20% to50% increased risk of developing hypertension [14].Various studies across the Globe and India indicated that Sex [15,16](Male) , **alcohol use** [17]and **socio-economic status** [18]were risk factors of hypertension. However, in our study Sex, Alcohol use and Socio-economic status were not found to be associated with hypertension and the difference was not statistically significant as shown in Table 4.

In our study, the association of BMI with Systemic Hypertension was weak. Obese people with BMI ≥ 30 had 1.02 times greater odds of Hypertension compared to those with BMI in the Range of 23 to 24.99 as shown in Table 5 [OR: 1.02(95%CI: 0.235 – 4.435), p = 0.979] which was not statistically significant.In CUPS study , with increase in BMI , there was increase in prevalence of Hypertension in various age groups .[19]The **Framingham Heart study** [20]showed that for gain in weight of every 900 gram , there was a rise of one mm of Hg in systolic blood pressure.

The reason for insignificant association in our study could be because a person with a small skeletal frame could have a BMI that underestimates their true body fat therefore categorizing them as underweight and people with excess weight around the waist face more health risks than those who carry more weight around the hips.[21]

In Multivariate analysis, the odds of Hypertension among those with WHR above the defined criteria was about 10.7 times higher than those with WHR below the defined levels (OR = 10.69 [95% C.I. of 0.996 to 114.821]) at a p value of 0.05 as shown in Table 5. As the 95% confidence interval includes 1, the significance of Waist Hip Ratio as a Risk Factor for hypertension was lower than Waist Stature Ratio, but was greater than BMI.

In the Atherosclerosis Risk in Communities (ARIC) Study, Harris [22] examined the relation between high blood pressure and fat distribution in 15,063 African American and White participants between the ages of 45 to 64 years in Maryland, Mississippi, Minnesota and North Carolina using BMI, waist-to-hip ratio (WHR), and waist to stature ratio as indices.

Studies have shown that the fat deposits present centrally in the abdomen, that is the intra abdominal fat, release a huge amount of free fatty acids when compared to the fat deposits which are present peripherally (gluteal fat and the subcutaneous fat), which in turn reduces the hepatic clearance of insulin . Insulin levels had also begun to emerge as an independent risk factor for Hypertension [23] . In our model we used the cut off point for Waist to Stature Ratio as 0.5 as used by many authors[24] in previous studies which was also revealed by our ROC curve analysis as shown in Figure 7. In our Multivariate Regression model ,people with Waist to Stature Ratio ≥ 0.5 had 469 times higher odds of Hypertension than those with WSR < 0.5. [OR: 469 (95%CI: 56 - 3764)] as shown in Table 5 and this observed difference was statistically highly significant (p=0.000). There are many factors why Waist to Stature Ratio will be the most useful anthropometric index to determine cardiometabolic risk.The results from our study and the meta-analyses done by Lee CM et al [24] , together, justify the use of Waist Stature Ratio as a single screening anthropometric tool for predicting the risk of Systemic Hypertension and Cardiometabolic risk than other indicators.

One of the greatest advantages with Waist to Stature Ratio over BMI is the ability to use only one single cutoff point (0.5) in all ages, both sexes, and all ethnicities.[25]The association of Height/ Stature is usually inverse with cardiometabolic morbidity and mortality[26] because Stature besides a genetic component , indirectly explains general early life exposures .The explanation lies in the fact that high visceral fat depots within the abdominal cavity [27] have high metabolic and inflammatory activity when compared to depots which are subcutaneous in other parts of the body such as the gluteo-femoral region.

Measurement of Body Mass Index requires Weight and Height , While WSR measurement requires Height and Waist Circumference which requires a simple tape rather than a weighing apparatus and also Self-assessment of Weight is less accurate than that of Height [28]. With Waist Circumference being measured at different sites by different authors , it has been demonstrated that there is no alteration in risk prediction[29] . WSR has an important advantage of a simple , single boundary value for men and women of all ethnic groups and may be also for children [5]. The mean proposed boundary value for WSR was 0.5. Within these study populations, there were subjects with various (Caucasian, Asian and Central American) ethnic backgrounds [25].

CONCLUSION

The Overall prevalence of hypertension was 27.5% with 95% C. I. of 23.33% to 31.67% .The Mean Waist to Stature Ratio was 0.506 (±0.03) with 95% C.I. of 0.503 to 0.509.AUC of Waist to Stature Ratio > Waist Hip Ratio > BMI as a predictor of Hypertension. The

Maximum Sensitivity of 96.7% and Specificity of 26.6% of WSR as a predictor of Hypertension was established at a level of WSR of 0.50286.

The use of only one single cutoff point (0.5) in all ages, sexes, and ethnicities, simplicity and feasibility of Waist to Stature Ratio (WSR) adds to its screening potential compared with other anthropometric indices.

CONFLICT OF INTEREST: Nil or Nothing to disclose

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