



NECK CIRCUMFERENCE AS A SURROGATE MARKER FOR RISK OF HYPERTENSION

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ABSTRACT **BACKGROUND&OBJECTIVES:** Hypertension is one of the major health and development challenges of the 21st century. Hypertension is associated with a greater proportion and abnormal distribution of body fat. Neck circumference has been proposed as an index for upper-body subcutaneous adipose tissue distribution. Aim of this study is to measure the Neck circumference among the hypertensive adults and thereby finds out the correlation between Neck circumference and Blood pressure in adults. **MATERIALS AND METHODS:** This cross-sectional study involved 200 Hypertensive patients attending to NCD clinic for follow-up in Coimbatore medical college hospital. Blood pressure, Neck circumference, Waist circumference and Hip circumference were measured among them. Results were analysed using Pearson's correlation. **RESULTS:** Out of 200 hypertensives, 120 were males and 80 were females. Positive correlation was seen between Systolic Blood Pressure and Neck Circumference in males $r=0.214$ and in females $r=0.242$ ($p=0.043$). Also positive correlation was seen between Diastolic blood pressure and neck circumference in males $r=0.173$ and in females $r=0.202$ ($p=0.05$). **CONCLUSION:** Our study concludes that Neck Circumference could be a potential, inexpensive, surrogate marker for screening hypertension.

KEYWORDS : Neck circumference, Screening tool, Hypertension, Adults

Introduction

Hypertension (HT) is a silent killer due to its invisible signs and symptoms until end organ damage occurs. So screening becomes inevitable for reducing the morbidity and mortality. Hypertension is one of the major health and development challenges of the 21st century. Globally, nearly one billion people suffer from hypertension. Of these, two-thirds are in developing countries and the problem is still growing. An estimated 1.56 billion adults will be living with HT by 2025[1]. Hypertension is associated with a greater proportion and abnormal distribution of body fat[2]. The upper body distribution of fat, especially with increased visceral adipose tissue, is considered predictive of cardio metabolic risk[3]. Hypertension was diagnosed as per JNC 8 criteria, systolic blood pressure (SBP) ≥ 140 mmHg and/or diastolic blood pressure (DBP) ≥ 90 mm Hg[4].

This study related hypertension and neck circumference which is a marker of upper body subcutaneous adipose tissue distribution. It is a relatively new method of differentiating between normal and abnormal fat distribution. Neck circumference has been positively associated with cardio metabolic risk and HT across various ethnicities in the general population [5-13].

Aims and objectives

- To correlate the neck circumference with systolic and diastolic blood pressure.
- To correlate the waist circumference with systolic and diastolic blood pressure.
- To correlate the hip circumference with systolic and diastolic blood pressure.
- To correlate the waist-hip ratio with systolic and diastolic blood pressure.

Materials & Methods

After getting an approval from Institutional Human Ethical Committee, this study was conducted in Coimbatore medical college hospital. The sample size for the study was calculated taking the prevalence of hypertension of 21.4% in India as stated by the reports of WHO with 90% confidence interval and an absolute precision of 5%.[14] The minimum sample to be covered was calculated as 182. Hence, 200 Hypertensive patients belonging to the age group of 40 to 60 years who were attending the NCD clinic for follow-up were selected. The socio demographic information of subjects like age and gender were assessed using a proforma. Informed written consent was obtained. Patients with short stature, Thyroid disorders, Females with Menstrual disorders, chronic illnesses like Carcinoma, Tuberculosis were excluded from the study.

Waist and hip circumferences to within 1 mm with standard inch tape calibrated, waist midway between the lowest rib and the iliac crest with the patient standing at the end of gentle expiration, and hips at the greater trochanter. Neck Circumference was measured at mid-neck height, between mid-cervical spine to mid-anterior neck, to an accuracy of 0.1 cm, with non elastic plastic tape. In men with a laryngeal prominence (Adam's apple), it was measured just below the prominence.[8] Blood pressure (BP) of the subjects was measured by digital sphygmomanometer. Three readings were taken 3 minutes apart and the average of the second & third readings was taken as the final reading. Also history of drug intake for hypertension taken. HT was diagnosed as per JNC 8 criteria, systolic blood pressure (SBP) ≥ 140 mmHg and diastolic blood pressure (DBP) ≥ 90 mm Hg.[4]

Data were analyzed using Epi Info version 7.1 and statistical package for social sciences version (SPSS) 20. Significance level was set at 5% ($p<0.05$). Descriptive statistics like mean, standard deviation and percentages were calculated. The correlation between two variables was done by Pearson's correlation.

RESULTS

Mean value of Neck circumference with males and females are 38.43cm and 34.13cm respectively. Positive correlation was seen between Systolic Blood Pressure and Neck Circumference in male $r=0.214$ and in females $r=0.242$ ($p=0.043$). Also positive correlation was seen Diastolic blood pressure and neck circumference in male $r=0.173$ and in female $r=0.202$ ($p=0.05$). Positive correlation was seen between systolic blood pressure and waist-hip ratio in males $r=0.42$ and females $r=0.56$, also positive correlation was seen between diastolic blood pressure and waist-hip ratio in males $r=0.43$ and females $r=0.53$.

TABLE 1: GENDER BASED CORRELATION OF SYSTOLIC BLOOD PRESSURE

Anthropometric Variables	Males		Females	
	Pearson Correlate (r value)	P value	Pearson Correlate (r value)	P value
Neck Circumference	0.214	0.043*	0.242	0.036*
Waist Circumference	0.43	.0001*	0.56	0.001*
Hip Circumference	0.17	.024*	0.31	0.001*
Waist Hip Ratio	0.42	.0001*	0.53	0.001*

* P value <0.05 is statistically significant.

TABLE 2: GENDER BASED CORRELATION OF DIASTOLIC BLOOD PRESSURE

Anthropometric Variables	Males		Females	
	Pearson Correlate (r value)	P value	Pearson Correlate (r value)	P value
Neck Circumference	0.173	0.034*	0.202	0.37*
Waist Circumference	0.45	0.0001*	0.44	0.0001*
Hip Circumference	0.28	0.0004*	0.23	0.0007*
Waist Hip Ratio	0.36	0.0001*	0.45	0.0001*

* P value <0.05 is statistically significant.

Discussion

The present study results revealed that Neck Circumference had significant association with Hypertension. Positive correlation was seen between Systolic Blood Pressure and Neck Circumference in both genders (males $r=0.214$ and females $r=0.242$) ($p=0.043$). Also positive correlation was seen between Diastolic blood pressure and Neck circumference in males $r=0.173$ and in females $r=0.202$ ($p=0.05$). The findings of the present study are in concordance with study conducted by Ben-Noun et al in 2004, a significant correlation was found between SBP and NC (men, $r=0.40$; women, $r=0.58$; each, $P=0.0001$) and between DBP and NC (men, $r=0.42$; women, $r=0.53$; $P=0.0001$). [15]

Ben-Noun et al also showed a positive correlation between changes in NC and changes in BP ($r=0.54$ in males; $r=0.56$ in females, each $P<0.0001$). [15] Dr.Niniya J study says that NC is positively correlated with hypertension. NC >36.5cm for males and >33.5cm for females was the best cut-off levels for screening for Hypertension [16] Also Dr.Liubov(Louba) Ben-noun study strongly correlated the neck circumference with the factors of the metabolic syndrome like SBP,DBP,total cholesterol, LDL-cholesterol,triglycerides,fasting glucose and uric acid levels.[9]. Dr.Liubov (Louba) Ben-Noun study shows the neck circumference measurement of >37cm for men and >34cm for women require additional evaluation of overweight or obesity.[8] NC >36cm for males and >32cm for females was the best cut-off levels for determining the overweight/obese subjects in the study conducted by Aswathappa J et al.[17] The slight variations in the cut off could be attributed to the difference in ethnicity and geographic distribution of the study population of the different studies..

Conclusion

On the background of increasing prevalence of Hypertension, this study is useful in screening and predicting hypertension at an early stage with neck circumference as a surrogate marker. Neck circumference is an easy, inexpensive, non-invasive, socially acceptable and potential anthropometric parameter. This study creates awareness among adults in adopting good healthy lifestyle. Health care workers can also be trained to use this tool for mass screening of Hypertension.

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