A Study to Investigate the Independent Predictive Contribution of Neck Circumference to Cardio-Metabolic Syndrome.

Vivek Bharadwaj[1]

[1]Senior Specialist (General Medicine), R.B.M. Government Hospital, Bharatpur (Rajasthan).

ABSTRACT

Background: Metabolic syndrome (MetS) is defined as a set of risk factors that includes resistance to insulin, dyslipidemia, abdominal obesity and high blood pressure, and increases the risk of cardiovascular diseases and diabetes. The aim of this study to investigate the independent contribution of NC to cardio-metabolic risks. This study will present a novel approach for screening cardio-metabolic risks. **Methods:** A hospital based observational study 300 subjects were included in the study. Medical history, Vitals, General and physical examination, Anthropometric indices NC, WC, WHpR, WHtR, BMI, FBS, Lipid profile were measured. Correlation of cardio-metabolic risk factors with NC were studied and multivariate analysis were done to assess NC as an independent predictive contributor to cardio-metabolic syndrome. **Results:** In our study showed that the mean age of patients was 44.66 years & Male to female ratio was 1:1.08 (table 1). The abnormal neck circumference was noted among 98.48% overweight (BMI 25.00 to 29.99 Kg/m2) and 100% obese (BMI > 30.00 Kg/m2) patients and this difference was statistically significant (p<0.0001***). The mean value of abnormal Waist circumferences, hypertension and hyper triglyceride was statistical significant (P<0.0001***) but HDL was not significant (P=0.6032). **Conclusion:** We concluded that correlation test revealed that neck circumference was significantly correlating with triglycerides, high density lipoprotein and waist circumference.

Keywords: Metabolic syndrome, Neck circumferences, BMI, Waist circumferences, TG, HDL, FBS.

INTRODUCTION

Metabolic syndrome is also considered as an emerging epidemic in developing East Asian countries including China, Japan, and Korea. The prevalence of metabolic syndrome may range from 8 to 13% in men and 2 to 18% in women depending on the population and definitions used.[1-3] In India, studies have reported prevalence varying from 24.9% in northern India to 41% in Southern India using different definitions.[4]

It is accepted that metabolic syndrome increases the relative risk of cardiovascular disease, though it is still debated whether metabolic syndrome adds to global cardiovascular disease risk assessed by traditional risk factors. It is believed that visceral adiposity lies at the root of the cardio-metabolic risk with the consequent syndrome of central obesity/insulin resistance.

Upper-body fat distribution has long been recognized as related to increased cardiovascular disease risk, and neck skinfold5 or neck circumference (NC) has been used as an index for such an adverse risk profile.[6,7] Free fatty acid release from upper-body subcutaneous fat was reported to be larger than that from lower-body subcutaneous fat.[8]

NC was found to be a simple and time-saving screening measure that could be used to identify overweight and obese individuals. It has been shown that men with a NC of less than 37 cm and women with a NC of less than 34 cm probably have a less chance of developing metabolic syndrome. Patients above these levels require a more comprehensive evaluation of their status as overweight or obese.[9] The aim of this study to investigate the independent contribution of NC to cardio-metabolic risks. This study will present a novel approach for screening cardio-metabolic risks.

MATERIALS AND METHODS

A hospital based observational study 300 subjects were included in the study. Medical history, Vitals, General and physical examination, Anthropometric indices NC, WC, WHpR, WHtR, BMI, FBS, Lipid profile were measured. Correlation of cardio-metabolic risk factors with NC were studied and

Name & Address of Corresponding Author
Dr. Vivek Bharadwaj
Senior Specialist (General Medicine),
R.B.M. Government Hospital,
Bharatpur (Rajasthan)

multivariate analysis were done to assess NC as an independent predictive contributor to cardio-metabolic syndrome.

Inclusion Criteria
18-60 yrs old apparently healthy subjects

Exclusion Criteria
- H/O Malignancy
- H/O thyroid disease
- Subjects taking antihypertensive, anti-lipid, anti-diabetic drugs
- Subjects taking drugs for weight reduction

RESULTS

Table 1: Age distribution

Age group (yrs)	No. of patients	Percentage
20-30 yrs	35	11.66%
31-40 yrs	70	23.33%
41-50 yrs	115	38.33%
51-60 yrs	80	26.66%
Total	300	100%
Mean age	43.56 yrs	
Male : Female	1:1.08	

Table 2: Neck circumference and BMI.

BMI (kg/m2)	Neck circumferences		Total
	Normal	Abnormal	
<18.5	1 (14.28%)	6 (85.71%)	7 (2.33%)
18.5-24.99	25 (26.31%)	70 (73.68%)	95 (31.66%)
25-29.99	2 (1.51%)	130 (98.48%)	132 (44%)
>30	0 (0%)	66 (100%)	66 (22%)

Table 3: Mean neck circumference and waist circumferences.

Waist circumferences	Neck circumferences		t-value	df	P-value
	Mean	SD			
Normal	37.73	1.911	14.08	403	<0.0001***
Abnormal	40.38	1.884			

Table 4: Mean neck circumference and hypertension.

Hypertension	Neck circumferences		t-value	df	P-value
	Mean	SD			
Normal	38.43	2.122	8.860	403	<0.0001***
Abnormal	40.43	2.117			

Table 5: Mean neck circumference and Triglyceride.

Triglyceride	Neck circumferences		t-value	df	P-value
	Mean	SD			
Normal	40.47	1.779	16.55	403	<0.0001***
Abnormal	37.52	1.799			

In our study showed that the mean age of patients was 44.66 years & Male to female ratio was 1:1.08

[Table 1]. The abnormal neck circumference was noted among 98.48% overweight (BMI 25.00 to 29.99 Kg/m2) and 100% obese (BMI > 30.00 Kg/m2) patients and this difference was statistically significant (p<0.0001***) [Table 2].

The mean NC in patients with normal and abnormal waist circumferences were 37.73±1.91 and 40.38±1.88 respectively which was statistically significant (P<0.0001***) [Table 3]. Normotensives and hypertensives were 38.43±2.122 and 40.43±2.117 respectively, which was mean value of NC statistically significant (P<0.0001***) [Table 4]. The mean NC in patients with hypertriglyceridemia was 37.52±1.799. Among patients with normal triglyceride levels the mean NC was 40.47±1.779, which was statistically significant (P<0.0001***) [Table 5]. The mean NC among patients with normal and abnormal HDL levels was 39.12± 2.184 and 39.0 ± 2.538 respectively, which was statistically non significant (P=0.6032) [Table 6].

Table 6: Mean neck circumference and HDL.

HDL	Neck circumferences		t-value	df	P-value
	Mean	SD			
Normal	39.12	2.184	0.5202	403	0.6032 NS
Abnormal	39.00	2.538			

DISCUSSION

The majority of subjects were occurred in above 30 years of age group (88.34%) and only 11.66% patients present in below 30 years of age. The mean age of patients was 43.56 years. In Korean study, the subjects over 70 years of age had a 14- fold increased risk for MetS than those aged 20-29 years, and females had higher prevalence rates than males in age groups older than 50 years.[10]

The incidence of metabolic syndrome increased with increasing age in such a way that the incidence was around 6% in the age group of 20 -29 years peaking to around 65 % in the age group of 60-69 years.[11]

Another study done in Andhra Pradesh which showed metabolic syndrome rates were significantly higher among females.[12] Females accounted for 52.2% (n=307) whereas males were only 34.2% (n=202).

In the present study the abnormal neck circumference was noted among 98.78% overweight (BMI 25.00 to 29.99 Kg/m2) and 100% obese (BMI > 30.00 Kg/m2) patients and this difference was statistically significant (p<0.0001***). Visceral adipose tissue (VAT) is recognized as a unique, pathogenic fat depot, conferring metabolic risk above and beyond standard anthropometric measures, such as body mass index (BMI) and waist circumference.[13]

Another study done in Israel indicated a strong correlation between NC and BMI (total adiposity index),[14] as well as between NC and WC and waist-to-hip ratio (upper-body obesity indexes). NC was

also strongly correlated with SBP, DBP, total cholesterol, LDL-cholesterol, triglycerides, fasting glucose, and uric acid levels. No significant correlation was found between NC and HDL-cholesterol levels, which were similar with our results. This difference in our study and other studies may be because of number of patients in the study group. As a main finding in this cross-sectional analysis of data among patients with metabolic syndrome, we found NC as an indicator of central obesity and metabolic syndrome.

CONCLUSION

We concluded that correlation test revealed that neck circumference was significantly correlating with triglycerides, high density lipoprotein and waist circumference. However, no correlation was seen between neck circumference and blood pressure (both systolic and diastolic) and fasting blood sugar.

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