Evaluation of waist-to-hip ratio as a predictor of cardiovascular risk factors

Manjunath Hemberal1, Veena H Chandregowda2, Raju H Taklikar1, Vijayanath Itagi3

1Department of Physiology, Navodaya Medical College, Raichur, Karnataka, India.
2Department of Physiology, Hassan Institute of Medical Sciences, Hassan, Karnataka, India.
3Department of Physiology, Koppala Institute of Medical Sciences, Koppala, Karnataka, India.

Correspondence to: Manjunath Hemberal, E-mail: aaryanmunch@gmail.com

Received February 4, 2015. Accepted February 20, 2015

Abstract

Background: Abdominal obesity judged by increased waist-to-hip ratio (WHR) is an important risk factor for atherosclerosis. One of the mechanisms postulated by which truncal obesity increases coronary risk is high blood pressure (BP). It is essential to identify the best anthropometric index in any population to predict cardiovascular risk.

Objective: The objective of this study was to establish the correlations between anthropometric data such as body mass index (BMI) and WHR with BP.

Materials and Methods: A representative clinically healthy sample of 150 individuals (75 men and 75 women) aged between 20 and 80 years was selected and anthropometric indices and BP were measured according to standard protocol. Pearson's correlation coefficient test was applied to evaluate the correlation.

Result: There was a positive correlation between BMI and WHR with BP in both the male and female subjects. The WHR had strongest correlation in men and women with both systolic and diastolic BPs.

Conclusion: It can be concluded that WHR is a better predictor of cardiovascular risk than BMI.

KEY WORDS: Abdominal obesity, waist-to-hip ratio, cardiovascular risk

Introduction

The prevalence of obesity in industrialized and developed countries has increased dramatically to such an extent that the World Health Organization (WHO) reported overweight and obesity to be an escalating epidemic worldwide.1-4 Obese people are susceptible to other chronic diseases such as diabetes, cardiovascular disease (CVD), and some type of cancers.4 Body mass index (BMI) has been recommended as an index of obesity by WHO and is related to disease risk.5,6 But some studies suggest that the pattern of body fat distribution is a more important determinant of disease risk.7-9 A high proportion of abdominal fat has been indicated as a risk factor for diabetes, hypertension, and CVD.10-12 Unfortunately, there is no standard measure of abdominal obesity that is widely accepted. Although, the majority of studies recommend waist circumference (WC) as a better indicator of abdominal obesity and a better predictor for cardiovascular risk than either BMI or waist-to-hip ratio (WHR), such findings have not been confirmed in Asians.13-17 The best index of obesity that is predictive of cardiovascular risk still remains controversial. The present study was designed to evaluate the correlation between anthropometric data such as BMI and WHR with cardiovascular parameters such as systolic blood pressure (SBP) and diastolic blood pressure (DBP).

Materials and Methods

This was a cross-sectional observational study that included a clinically healthy sample of 150 subjects (75 men...
and 75 women) aged between 20 and 80 years. The study protocol was approved by the institute’s ethics committee and the subjects signed an informed consent statement before participation. Subjects with any systemic diseases were excluded from the study. Anthropometric indices were measured according to standard protocol. The height was recorded during inspiration using a stadiometer to the nearest 0.1 cm, and weight was measured by a digital standing scale to the nearest 0.1 kg with the subjects wearing light indoor clothes and without shoes. BMI was then calculated using the formula weight (in kg)/height (m)\(^2\). Waist and hip circumferences were measured according to WHO guidelines by using a stretch-resistant tape. Blood pressure (BP) was measured by using a sphygmomanometer in supine position after giving adequate rest to the subject. Pearson’s correlation coefficient \(r\) was used to examine the correlation between BMI and WHR with BP (SBP and DBP). A two tailed \(p\)-value less than 0.05 was considered significant.

### Results

The WHR (mean±SD) in men was 0.92±0.04 and in women 0.91±0.06, and the BMI (kg/m\(^2\)) in men was 23.06±2.40 and in women 24.16±3.54. The SBP (mm Hg) in men was 125.0±8.6 and in women 122.1±11.6. The DBP in men was 81.3±7.7 and in women was 78.2±6.4 Table 1.

There was a positive correlation between BMI and WHR with BP in both men and women. The WHR had strongest correlation in men and women with both SBP and DBP [Tables 2–5].

### Discussion

From this study, it is clear that though BMI and WHR are positively correlated with both SBP and DBP, the strongest correlation is with WHR. In line with our findings, some other investigators have also reported WHR to be a better predictor of cardiovascular risk factors than WC and BMI. Another study carried out on Canadian adult men and women showed that WHR can predict CVD risk factors more accurately than BMI and is as capable as WC in identifying subjects at risk for CVD. This is based largely on the rationale that increased visceral adipose tissue is associated with a range of metabolic abnormalities, including decreased glucose tolerance, reduced insulin sensitivity, and adverse lipid profiles, which are risk factors for type 2 diabetes and CVD. The principal limitation of this study was the use of cross-sectional data to compare the ability of anthropometric indices to predict CVD risk factors. Future studies using longitudinal data and including other cardiovascular parameters such as lipid profile will provide stronger evidence on this evaluation.

### Conclusion

It can be concluded that WHR is a better predictor of cardiovascular risk than BMI alone.

### References


