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# A simple valid tool for measuring obesity-related-CHD risk in Sri Lankan adults

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## KEYWORDS

Obesity;  
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BMI;  
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Optimal risk thresholds

## Summary

**Background:** The significance of anthropometric measures of obesity that determine coronary-heart-disease (CHD) risk varies among populations. This study compares waist circumference (WC) and body mass index (BMI) in identifying the ‘‘obesity-related-CHD risk’’ among Sri Lankan adults.

**Methods:** A population-based cross-section of 515 adults aged 20–64 years, residing in the district of Colombo in 2004 was selected by a multi-stage, stratified, probability sampling method. WC, height and weight were measured. Demographic, socio-economic and lifestyle characteristics, smoking and obesity-related-CHD risk factors (hypertension, dyslipidaemia, diabetes) were assessed by questionnaires, physical measurements and biochemical assessments. ‘‘Obesity-related CHD risk’’ was defined by the presence of  $\geq 1$  obesity-related-CHD risk factors.

**Results:** Compared to BMI, WC was a stronger correlate of systolic and diastolic blood pressure, triglycerides among both sexes and of plasma glucose among males. It was also an independent predictor of obesity-related-CHD risk in both males (beta co-efficient = 0.046; standard error = 0.013) and females (0.024; 0.012) in contrast to BMI, which was significant only among males (0.138; 0.037) in the logistic regression models adjusted for confounders. At the same level of obesity-related-CHD risk

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corresponding with BMI of 25 kg/m<sup>2</sup> (OR = 1.7) and 30 kg/m<sup>2</sup> (OR = 3.5), the corresponding WC values were 90.5 cm and 105.5 cm for males and 100 cm and 129 cm for females. The derived optimal risk thresholds of WC for identifying obesity-related-CHD risk was 88.5 cm for males and 82 cm for females.

*Conclusions:* WC with its sex-specific cutoff values can serve as a better screening tool than BMI in identifying individuals at risk of obesity-related CHD in low-resource settings.

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## Introduction

The relationship of obesity with morbidity and mortality of coronary heart diseases (CHD) has been widely studied in the Framingham Heart Study, Nurses' Health Study and elsewhere [1,2]. Obesity is well known as a predisposing risk factor for conventional risk factors of CHD such as type 2 diabetes mellitus (DM), hypertension (HT) and dyslipidaemia, which have therefore earned the name 'obesity-related-CHD risk factors' [3,4]. In the predisposition of this risk, abdominal (visceral) fat is consistently shown to be more significant than any generalized adiposity [5,6].

A simple anthropometric measure of abdominal obesity is waist circumference (WC) while that of generalized obesity is body mass index (BMI). Current literature shows that both WC and BMI are powerful predictors of individual obesity-related-CHD risk factors [7–9]. This may suggest that these measures are useful as ideal screening tools for identifying "adults who are at risk of developing CHD" [10]. This will be particularly of relevance in South Asia, where the natives of South Asian region are more prone to severe degrees of CHD [11,12]. In addition, they are known to have a higher prevalence of abdominal obesity despite having low generalized obesity [13,14].

A major limitation in using any type of anthropometric measurement is the wide variation of their interpretations according to individual characteristics such as gender and physical structure [15]. As such, the obesity-related-CHD risk denoted by anthropometric measurements too may differ among instruments as well as populations [16]. This signifies a need to develop sex and population-specific anthropometric indicators of this risk.

Sri Lanka has recently experienced a rising trend in the prevalence of obesity [17,18]. Furthermore, its previously traditional societies are increasingly predisposed to acquire CHD risk factors and thereby promote CHD [19,20]. Despite its utmost importance, early identification of CHD risk is hampered in Sri Lanka by the high cost of diagnostic tests carried out to detect obesity-related-CHD risk fac-

tors. In this respect, to our knowledge, the use of anthropometric measurements as a simple screening tool for detecting an individual's 'obesity-related-CHD risk' has not been explored in Sri Lanka.

The anthropometric measures that are commonly used in clinical or public health settings in Sri Lanka are BMI and WC. In this study, we compared these two measures in the context of their use in identifying the obesity-related-CHD risk in adults in the district of Colombo.

## Materials and methods

### Study population

The study was set in the district of Colombo, which is the commercial capital of Sri Lanka. Its residents are of diverse socio-economic backgrounds exposed to different patterns of migration and lifestyles. The study population consisted of 515 adults aged 20–64 years who have been residing in the district of Colombo for a continued period of at least one year. Those with pathological or iatrogenic obesity, e.g. hypothyroidism, Cushing syndrome and those with conditions simulating excess abdominal fat, e.g. ascites, pregnancy up to a postpartum period of 3 months were excluded by perusing medical records available with the participants.

### Sampling method

A sub-sample of 15 randomly-selected clusters ( $n = 525$ ) was obtained from a larger population-based prevalence survey of obesity of 40 clusters ( $n = 1400$ ). Further details on the sampling method and study instruments are given elsewhere [18]. In summary, multi-stage, stratified, probability sampling was carried out to select 40 Grama-Niladari (GN) divisions (smallest administrative units in Sri Lanka of approximately 4000 population) stratified by urban and rural sectors of Colombo district. In each GN division, 35 subjects were randomly iden-

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