

IN THE LITERATURE

Is waist-to-hip ratio a better marker of cardiovascular risk than body mass index?

Yusuf S, Hawken S, Ôunpuu S, et al. Obesity and the risk of myocardial infarction in 27 000 participants from 52 countries: a case-control study. *Lancet* 2005;366(9497):1640-9.

Background: It has been unclear which measure of obesity — body mass index (BMI), waist or hip circumference, or waist-to-hip ratio — shows the strongest relation to risk of cardiovascular disease (CVD). This study compared the relation between these measures of obesity and risk of myocardial infarction.

Methods: The researchers performed a case-control study. Consecutive patients presenting with their first myocardial infarction within 24 hours of symptom onset were enrolled from 52 countries. These patients were matched by sex and age to at least one patient with no previous history of CVD.

Results: A total of 27 098 participants were enrolled. The researchers found that although BMI values were directly related to risk of myocardial infarction, the relation disappeared after adjustment for waist-to-hip ratio and other risk factors.

Increasing waist-to-hip ratio was also found to be associated with increasing risk of myocardial infarction (odds ratio [OR] 2.52, 95% confidence interval [CI] 2.31–2.74 in highest v. lowest quintile), but, in contrast to BMI, the relation remained significant after adjustment for BMI and other risk factors and even among those regarded as being very lean or of normal weight (BMI < 25 kg/m²). Furthermore, unlike that for BMI, this association was evident across all world regions (Table 1).

Waist circumference was also more strongly related to myocardial infarction risk than BMI (OR 1.77, 95% 1.59–1.97 for highest v. lowest quintiles). Among Chinese and black African people it was the strongest predictor of myocardial infarction (Table 1). In con-

Table 1: Increase in odds ratio* for myocardial infarction for 1 standard deviation increase in body mass index, waist circumference and waist-to-hip ratio by ethnic group

Ethnic group	Odds ratio (95% confidence interval)		
	Body mass index†	Waist circumference‡	Waist-to-hip ratio‡
Overall	1.10 (1.07-1.13)	1.19 (1.16-1.22)	1.37 (1.34-1.41)
European	1.14 (1.09-1.20)	1.25 (1.19-1.31)	1.44 (1.36-1.51)
Chinese	1.19 (1.11-1.27)	1.24 (1.16-1.33)	1.08 (1.03-1.14)
South Asian	0.99 (0.93-1.05)	1.03 (0.97-1.10)	1.52 (1.41-1.64)
Other Asian	1.29 (1.17-1.43)	1.58 (1.41-1.78)	2.60 (2.25-3.01)
Arab	1.00 (0.93-1.07)	1.07 (0.99-1.16)	1.43 (1.31-1.57)
Latin American	1.12 (1.04-1.21)	1.20 (1.11-1.29)	1.43 (1.32-1.56)
Black African	1.29 (1.10-1.52)	1.57 (1.31-1.88)	1.36 (1.09-1.69)
Mixed-race African‡	1.07 (0.94-1.22)	1.16 (0.99-1.34)	2.25 (1.79-2.84)

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*Adjusted for age, sex and region.

†The standard deviation for body mass index is 4.15, for waist circumference 12.08, and for waist-to-hip ratio 0.085.

‡Black and white mixed-race in South Africa.

trast, increasing hip circumference appeared to be protective (OR 0.73, 95% CI 0.66–0.80 for lowest v. highest quintiles). Both waist and hip measurement relations with myocardial infarction remained after adjustment for BMI, height and other risk factors.

Discussion: The results of this study support other research that abdominal obesity is a better risk indicator of CVD than BMI,^{1,2} although the cross-sectional design does not offer biologic explanations for the association.³

Directly measured data for obesity measurements in varied population groups were previously unavailable, and this study provides sound evidence for a stronger relation of waist-to-hip ratio with myocardial infarction risk than BMI across all ethnic groups. It also holds for men and women, across all ages and in the presence of other metabolic risk factors (diabetes, lipoprotein abnormalities), smoking and hypertension, and across all levels of BMI. In contrast, BMI had a variable relation with myocardial infarction in different ethnic subgroups and no association in patients with hypertension or a raised apolipoprotein B/apolipoprotein A1 ratio.

Using waist-to-hip ratio rather than BMI as a measure of obesity and hence risk for CVD makes a considerable difference to the proportion of people considered at risk of myocardial infarction. The

researchers estimate that a waist-to-hip ratio cut-off of 0.83 for women and 0.9 for men would result in a 3-fold increase in population attributable risk for myocardial infarction. This is particularly important in regions such as Asia, which have not had significant problems with obesity as measured by BMI but would have considerably greater cardiovascular risk if waist-to-hip ratio was used.

Practice implications: Physicians should measure waist-to-hip ratio rather than BMI to help determine the risk of CVD in their patients. Waist circumference is also useful for predicting risk, especially in certain ethnic populations. The findings of this study support reducing abdominal obesity, and the authors suggest benefits may be derived from increasing hip circumference, perhaps through increased muscle mass.

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