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LETTER TO THE EDITOR

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Comments on the article 'Optimum waist circumference-height indices for evaluating adult adiposity: An analytic review': Consideration of relationship to cardiovascular risk factors and to the public health message

We commend the recent review by Hwuang[1] exploring the optimum waist-to-height ratio indices and the subsequent comments by Burton[2] who, along with Nevill,[3] has previously published in this area. These authors have concluded that waist circumference adjusted for height (optimally waist circumference/height $^{0.5}$ known as Waist Circumference Index or WCI) is superior to Body Mass Index (BMI) in its association with body fat. This conclusion contrasts with the recent IAC and ICCR Consensus report on Visceral Obesity, which argued that waist circumference thresholds alone are adequate for assessment of abdominal obesity in clinical practice.[4]

There is an unmet need to promote a consistent and universal public health message that visceral/central/abdominal obesity is associated with adverse health outcomes.[5] We have advocated the use of waist-to-height ratio (WHtR) for nearly 25 years as an adjunct to BMI, because it is a better proxy for central obesity and a superior predictor for cardiovascular risk factors.[6] But is WCI superior to WHtR in this respect?

In our recent analysis of data from an English general population survey, we showed that the predictive power of WHtR for cardiovascular risk factors is superior to the 'matrix' made up of BMI and waist circumference.[7] We have now taken the opportunity to compare WHtR with WCI, waist circumference (WC) and BMI. To our knowledge, no such comparison with individual cardiovascular risk factors has previously been undertaken.

Details of our study have been published previously.[7] Briefly, data from the Health Survey for England 2016 (4112 adults aged 18+ years) were used to identify cardiovascular risk, indicated by raised glycated Hb, hypertension and dyslipidaemia.

Table 1 shows that for HbA1c, correlations were strongest with WHtR and WCI and weakest with BMI. For SBP, there was little difference between WHtR, WCI and WC, and BMI was weakest. For Total:HDL-C ratio, correlations were strongest with WC and weakest with BMI.

Using ROC analysis to compare the area under the curve for each anthropometric measure (Table 2), WHtR was a slightly better predictor than WCI ($p < 0.01$) for raised glycated haemoglobin (HbA1c), and both were superior to WC (and BMI). For high SBP, both WHtR and WCI were better than WC and BMI. However, for high total to HDL cholesterol ratio, WC was the best predictor.

Nevill[3] compared the ability of anthropometric indices including BMI, WHtR, and WCI to predict cardiovascular risk based on a composite score and found that WCI and WHtR were superior to BMI. Hwuang et al.[1] showed that subjects with large WCI at a given BMI and age are more likely to be at elevated cardiovascular risk phenotype than subjects with a small WCI. However, they did not investigate whether similar findings would emerge with WHtR, nor whether WCI or WHtR is superior.

These findings indicate that WHtR and WCI are similar in terms of their ability to indicate cardiovascular risk. It is possible that WCI is more independent of height and may be slightly better than WHtR in predicting % body fat. However, evaluation of the clinical value of new anthropometric indices should also consider their ability to screen for cardiovascular risk because at any given amount of body fat, individuals can exhibit varying degrees of cardiovascular risk. Further consideration should be given to the ease with which indices can be understood and effectively used as simple public health messages.

We urge researchers with access to larger databases to perform analyses of WCI versus WHtR. The similar predictive power of WHtR and WCI for detection of cardiovascular risk in our sample makes us question the wisdom of promoting a new index that is harder for people to calculate and understand and that cannot be widely spread as a simple public health message.

We have proposed using the boundary value WHtR 0.5 in early screening because this threshold indicates increased risk in both men and women, in all age groups and in people in different ethnic groups. Further, this threshold translates to the simple public health message: 'Keep your waist to less than half your height'.[8–13]

In fact, a piece of string can broadly assess if the WHtR is below 0.5; pull a string from head to foot, then fold the string in half and check if it fits around the waist.[14] This simple, cheap and effective method is currently government policy in Thailand.[15] The simpler the message, the better it is received and acted upon.

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TABLE 1 Pearson correlation coefficients for anthropometric indices with CVD risk factors in English adults aged 18 years and over from HSE 2016

	Waist/height (WHtR)	Waist/height $^{0.5}$ (WCI)	Waist circumference (WC)	BMI
HbA1c *n* = 3139	0.35	0.34	0.31	0.25
Systolic BP, *n* = 3545	0.31	0.32	0.32	0.23
TC:HDL, *n* = 3182	0.32	0.36	0.39	0.31

Note: All correlations significantly different from zero ($p > 0.01$).

TABLE 2 Area under the curve for prediction of raised cardiovascular risk factors in English adults aged 18 years and over from HSE 2016

	WHtR	WCI	WC	BMI
HbA1c (>48 mmol/ml)	0.78[a]	0.77[b]	0.75[c]	0.71[d]
SBP (>140 mmHg)	0.645[a]	0.642[a]	0.634[b]	0.594[c]
Total: HDL cholesterol (>4)	0.67[c]	0.69[b]	0.70[a]	0.67[c]

Note: Different superscript letters indicate where values in the same row are significantly different ($p < 0.05$, paired samples test).

AUTHOR CONTRIBUTIONS

Both authors conceived the article and drafted the manuscript. S.G. analysed data from the HSE. Both authors agreed the final manuscript.

CONFLICT OF INTEREST

No conflict of interest was declared.

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