

GIBSON, S. & ASHWELL, M. 2015. Non-overweight 'apples' have higher cardiometabolic risk factors than overweight 'pears': waist-to-height ratio is a better screening tool than BMI for blood levels of cholesterol and glycated haemoglobin. *Obesity Facts*, 8 (Supplement 1), 139.

## **Non-overweight 'apples' have higher cardiometabolic risk factors than overweight 'pears': waist-to-height ratio is a better screening tool than BMI for blood levels of cholesterol and glycated haemoglobin**

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### **Introduction**

We have previously shown that using BMI as a sole proxy for obesity and ignoring measures of central obesity such as waist to height ratio (WHtR) would misclassify around 10% of the whole UK population, and more than 25% of those of normal weight, as "not at risk"<sup>1</sup>.

### **Objective**

To explore the implications of this 'misclassification' in screening for the cardiometabolic risk factors, total cholesterol (TC) and glycated haemoglobin (HbA1c) using data from the Health Survey for England 2009 (HSE).

### **Results**

In HSE adults aged 16y and over (n=2917), 41% of men and 29% of women classified as 'normal' by BMI, have WHtR exceeding 0.5. Overall, 12% of the total population who would be missed by BMI screening (non-overweight 'apples').

When the HSE population was classified into four groups (2x2) using standard boundary values of BMI ( $\leq 25\text{kg/m}^2$ ) and WHtR ( $\leq 0.5$ ), mean TC was, as expected, lowest in the group with low/normal BMI and low WHtR (mean 5.1mmol/L) and highest among those with high BMI and high WHtR (mean 5.7mmol/L). Of greater interest, the group with 'low/normal BMI but high WHtR' ('non-overweight apples') had significantly higher mean TC than the group with high BMI but low WHtR overweight 'pears' (5.73mmol/L SE 0.08 vs 4.98mmol/L; SE 0.11;  $P < 0.0001$ ). Similarly, HbA1c levels were higher among non-overweight 'apples' than among overweight 'pears' (5.62% SE 0.03 vs 5.33% SE 0.04;  $P < 0.0001$ ). These differences were also significant in both sexes.

### **Conclusions**

This study not only supports our previous findings on the superiority of WHtR over BMI as a primary screening method for morbidity<sup>2</sup> and mortality<sup>3</sup> risk, but it also demonstrates the potentially severe implications of misclassification by BMI alone in screening for cardiometabolic risk factors.

1. Conflict of interest: none disclosed

2. No funding

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