Obesity

HbA$_{1c}$ fails the test: Screening for diabetes in the overweight and obese requires glucose measurements

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With mounting needs to identify people at risk of type 2 diabetes and cardiovascular disease, especially in overweight and obese individuals, there is a need for a better, simpler and more reproducible test. While the inconvenience of oral glucose tolerance tests (OGTT) is not in doubt, it is generally appreciated that fasting plasma glucose (FPG) is not a perfect alternative (Diabetes Epidemiology: Collaborative analysis Of Diagnostic criteria in Europe Study Group, 1999) and that this test performs particularly poorly in some at-risk populations (Tomlinson et al, 2010).

It should be no surprise, then, that there is renewed interest in HbA$_{1c}$ as a diagnostic test, despite longstanding concern that it would perform poorly in this role. In the wake of the decision of the American Diabetes Association (2010) to endorse HbA$_{1c}$ as a potential diagnostic test to identify prediabetes and diabetes, there is a need to reassess the performance of this test in the identification of people with, or at risk of, type 2 diabetes.

People who are overweight or obese are a target group for type 2 diabetes screening. The study by Cosson et al (2010; summarised alongside) now adds to this literature. In this study of 1283 overweight and obese people with no history of dysglycaemia, the sensitivities of HbA$_{1c}$, FPG and the OGTT in identifying dysglycaemia were compared, and HbA$_{1c}$ was found to be a very poor predictor of abnormal glucose tolerance. HbA$_{1c}$ results of ≥6% (≥42 mmol/mol) had a sensitivity of just 36.8% and a specificity of 84.4% in predicting dysglycaemia. Thus, the test appears to perform poorly in identifying overweight and obese individuals at high risk of diabetes and cardiovascular disease. This result adds to the recent article by Pajunen et al (2011), who reported that an HbA$_{1c}$ level cut-off of >6.5% (>48 mmol/mol) would have missed the progression from impaired glucose tolerance to type 2 diabetes in 60% of individuals in the Finnish Diabetes Prevention Study.

These limitations of HbA$_{1c}$ are understandable, and arise partly from biological variation in glycation and partly from measurement error. All in all, many consider the recommendation that HbA$_{1c}$ might be a substitute for existing glucose-based tests to be premature. HbA$_{1c}$ is a good test for intra-individual monitoring of glycaemic exposure in those with established diabetes, but when used alone in a diagnostic capacity in asymptomatic people it is liable to miss most individuals with prediabetes and many who have already progressed to diabetes.

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American Diabetes Association (2010) Summary of revisions for the 2010 Clinical Practice Recommendations. *Diabetes Care* **33**(Suppl 1): S3

DECODE Study Group (1999) Glucose tolerance and mortality: comparison of WHO and American Diabetes Association diagnostic criteria. The DECODE study group. European Diabetes Epidemiology Group. Diabetes Epidemiology: Collaborative analysis Of Diagnostic criteria in Europe. *Lancet* **354**: 617–21

Pajunen P, Peltonen M, Eriksson JG et al (2011) HbA(1c) in diagnosing and predicting type 2 diabetes in impaired glucose tolerance: the Finnish Diabetes Prevention Study. *Diabet Med* **28**: 36–42

Tomlinson J, Millward A, Stenhouse E, Pinkney J (2010) Type 2 diabetes and cardiovascular disease in polycystic ovary syndrome: what are the risks and can they be reduced? *Diabet Med* **27**: 498–515

DIABETES & METABOLISM

HbA$_{1c}$ and FPG not as sensitive as OGTT for detecting dysglycaemia

Readability	✓✓✓✓✓
Applicability to practice	✓✓✓✓✓
WOW! factor	✓✓✓

1 The aim of this study was to compare the extent to which fasting plasma glucose (FPG) and/or HbA$_{1c}$ compared with oral glucose tolerance tests (OGTT) misdiagnose dysglycaemia, as well as assessing the prevalence of unrecognised dysglycaemia.

2 HbA$_{1c}$ levels were measured and OGTT was performed in 1283 people with a BMI ≥25 kg/m^2 who had no history of dysglycaemia.

3 Prediabetes was identified in 257 (20%) participants and diabetes in 77 (6%) including 22 who were diagnosed using the WHO criteria of FPG (≥7 mmol/L).

4 The sensitivities of each test were: FPG >6 mmol/L, 29.9%; FPG >5.5 mmol/L, 41.3%; HbA$_{1c}$ ≥6% (≥42 mmol/mol), 36.8%.

5 Factors that were independently associated with diabetes in obese women with FPG <7 mmol/L were age (P=0.049) and FPG (P=0.014). In obese women with an FPG of <6.1 mmol/L, age (P<0.01) and waist circumference (P<0.05) were independently associated with dysglycaemia.

6 Compared with OGTT, FPG alone failed to diagnose 70% of dysglycaemia cases. This study did not show that an HbA$_{1c}$ level of ≥6% (42 mmol/mol) and FPG >5.5 mmol/L would detect the same people as OGTT. It was concluded that obese women who are older and have a large waist circumference with normal FPG may benefit from an OGTT to diagnose dysglycaemia.

Cosson E, Hamo-Tchatchouang E, Banu I et al (2010) A large proportion of prediabetes and diabetes goes undiagnosed when only fasting plasma glucose and/or HbA$_{1c}$ are measured in overweight or obese patients. *Diabetes Metab* **36**: 312–8

ATHEROSCLEROSIS

Decreased visceral adipose tissue mass associated with improved endothelial dysfunction

Readability	✓✓✓✓
Applicability to practice	✓✓✓✓✓
WOW! factor	✓✓✓✓

1 In obese people, increased visceral adipose tissue (VAT) mass is associated with endothelial dysfunction (ED) more than total adipose tissue mass (TAT).

2 The authors of this study hypothesised that lifestyle intervention in people at risk of T2D focused on decreasing levels of VAT, rather than TAT, would improve ED.

3 A total of 189 individuals without diabetes (120 women and 69 men, mean age 45.4±0.8 years) took part in a 9-month lifestyle intervention (the Tübingen Lifestyle Intervention Program).

4 Mean body weight decreased as a result of the intervention (–3%, $P<0.0001$), TAT decreased (–7.6%, $P<0.0001$) and VAT decreased (–12.5%, $P<0.0001$).

5 Flow-mediated dilation (FMD), a measure of ED, increased (+9.1%, $P=0.04$). The change in FMD was associated with a decrease in VAT, ($P=0.009$) but not associated with change in body weight ($P=0.35$) or TAT ($P=0.21$).

6 During this lifestyle intervention, neither weight loss nor decrease in TAT, but only decrease in VAT was associated with improved ED in individuals at risk of T2D.

7 The authors concluded that primary cardiovascular prevention should specifically focus on reducing VAT rather than only reducing body weight in those at risk of T2D.

Rittig K, Hieronimus A, Thamer C et al (2010) Reducing visceral adipose tissue mass is essential for improving endothelial function in type 2 diabetes prone individuals. *Atherosclerosis* **212**: 575–9

JOURNAL OF DIABETES AND ITS COMPLICATIONS

Obesity is rising in people with and without T2D

Readability	✓✓✓✓✓
Applicability to practice	✓✓✓✓✓
WOW! factor	✓✓✓✓✓

1 Trends in average BMI, waist circumference and obesity (BMI ≥30 kg/m^2) were examined in 4162 adults with, and 40 376 adults without, T2D.

2 Data were extracted from the National Health and Examination Surveys between 1976 and 2006.

3 In adults with T2D, mean BMI increased from 29.2 to 34.2 kg/m^2, and from 25.2 to 28.1 kg/m^2 in adults without T2D during the study period (both $P<0.0001$).

4 Mean waist circumference substantially increased in all groups. Total obesity increased by 58% in those with T2D, and increased by 136% in those without T2D ($P<0.0001$).

5 The authors concluded that the prevalence of obesity is rapidly increasing in people with and without T2D.

Kramer H, Cao G, Dugas L et al (2009) Increasing BMI and waist circumference and prevalence of obesity among adults with Type 2 diabetes: the National Health and Nutrition Examination Surveys. *J Diabetes Complications* **24**: 368–74

INTERNATIONAL JOURNAL OF BEHAVIORAL MEDICINE

Participants with "goal ownership" are most motivated

Readability	✓✓✓✓
Applicability to practice	✓✓✓
WOW! factor	✓✓✓✓✓

1 The psychological predictors of participant drop-out from weight-loss studies of people with T2D were examined in this trial.

2 Participants ($n=101$; BMI >27 kg/m^2) with T2D were randomly assigned to either a self-regulation intervention, active control or passive control weight-loss groups.

3 Variables examined as predictors of drop-out from baseline to 6-month follow-up included psychological, somatic, sociodemographic and lifestyle.

4 Using multiple logistic regression, low "goal ownership" (autonomous regulation) was identified as the best predictor of drop-out.

5 The authors concluded that assessing "goal ownership" in participants before initiation of a trial could help identify those who are motivated to take part.

Huisman S, Maes S, De Gucht VJ et al (2010) Low goal ownership predicts drop-out from a weight intervention study in overweight patients with type 2 diabetes. *Int J Behav Med* **17**: 176–81

PLOS ONE

Lack of sleep associated with CVD, obesity and diabetes

Readability	✓✓✓✓✓
Applicability to practice	✓✓✓
WOW! factor	✓✓✓✓✓

1 This study examined an association between perceived lack of sleep or rest and cardiovascular disease (CVD), T2D and obesity in 372 adults.

2 Multivariable logistic regression was used to calculate odds ratios (ORs).

3 Compared with participants reporting 0 days of insufficient sleep, the OR associated with all 30 days of insufficient sleep was 1.67 (95% confidence interval [CI], 1.55–1.79) for any CVD, 1.31 (95% CI, 1.21–1.41) for T2D and 1.51 (95% CI, 1.43–1.59) for obesity.

4 Perceived lack of sleep was found to be independently associated with CVD, T2D and obesity in this cohort.

Shankar A, Syamala S, Kalidindi S (2010) Insufficient rest or sleep and its relation to cardiovascular disease, diabetes and obesity in a national, multiethnic sample. *PLoS One* **5**: e14189

"Perceived lack of sleep was independently associated with cardiovascular disease, T2D and obesity."