An investigation of risk factors for the later development of Type 2 Diabetes Mellitus, using HbA1c as a measure of glycaemia in a group of Auckland school children.

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Abstract

Background: A glycated haemoglobin (HbA1c) test is recommended in diagnosing type 2 diabetes mellitus (T2DM) and to identify prediabetics. This test is advocated over other methods due to ease of application and processing. Few studies have examined associations between HbA1c levels and T2DM risk factors (RFs) in children.

Aim and hypotheses: To investigate the relationship between HbA1c levels and selected RFs associated with T2DM risk in a group of Auckland children. It is hypothesized that ethnicity and waist circumference (WC) will be reliable indicators of later T2DM risk. Body fat percentage (%BF) will likely be positively correlated with HbA1c level.

Study design: A cross-sectional study involving children aged 8-11 years from six Auckland primary schools. Physical measures included weight, height, WC and %BF. A finger-prick blood test was collected for HbA1c levels. Ethnicity, gender, age, usual beverage intake and physical activity (PA) behaviours were assessed by self-completed questionnaires. Stepwise multiple linear regression analysis was used to explore which independent variables best predicted variance in HbA1c level.

Results: When children (n=451, 10.4$\pm$0.6 years) were classified by glycaemic status, 71 children (15.7%) had HbA1c levels indicative of prediabetes. This was greatest in Pacific (n=29) and South Asian (n=13) children. Maori and Pacific children had higher BMI than European children ($p<0.0001$). For HbA1c, Pacific and South Asian children had higher levels than European ($p<0.0001$), as did Maori children ($p<0.05$). Asian children exhibited high %BF for a low BMI. In regression analysis to explain the variance in HbA1c, WC was the most significant predictor for South Asian, Pacific and Asian children.

Conclusion: Ethnicity and adiposity (both central and overall) are key RF for T2DM risk. Waist circumference, waist-to-height ratio (WtHR) and BMI may all be used as measures in screening for T2DM risk. Glycated haemoglobin was a useful screening tool alongside RFs and not dependent on obesity.

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2hPG:	2-hour plasma glucose
ADA:	American Diabetes Association
BIA:	Bioelectrical impedance analysis
BF:	Body fat
BP:	Blood pressure
BMI:	Body mass index
CHD:	Coronary heart disease
CVD:	Cardiovascular disease
FPG:	Fasting plasma glucose
GI:	Glycaemic index
HbA1c:	Glycated haemoglobin
HDL-C:	High-density lipoprotein cholesterol
IGT:	Impaired glucose tolerance
IR:	Insulin resistance
LDL-C:	Low-density lipoprotein cholesterol
MetS:	Metabolic Syndrome
NHS:	Nurse's Health Study
NZ:	New Zealand
NZSSD:	New Zealand Society for the Study of Diabetes
OGTT:	Oral glucose tolerance test
PA:	Physical activity
PoC	Point of care
RF:	Risk factor
SES:	Socioeconomic status
SSB:	Sugar-sweetened beverage
T1DM:	Type 1 diabetes mellitus
T2DM:	Type 2 diabetes mellitus
WC:	Waist circumference
WHO:	World Health Organisation
WHtR:	Waist-to-height ratio
WHR:	Waist-to-hip ratio