Quantifying the excess risk of type 2 diabetes by body habitus measurements among Australian Aborigines living in remote areas

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ABSTRACT

Objective: To quantify the risk for type 2 diabetes carried by body habitus measurements among remote living Australian Aborigines relative to the general Australian population (AusDiab).

Methods: Anthropometric measurements and diabetic status was assessed by standard procedures among Aborigines (n=1,456) and Australians aged 25+(n=11,247). Age adjusted odds ratios (OR) for diabetes among Aborigines relative to AusDiab participants were calculated by commonly used categories of body size measurements.

Results: OR (95% CI) for diabetes among normal, overweight and obese (by waist) Aboriginal females relative to AusDiab females were 2.6(0.6-11.5), 13.1(6.7-25.7) and 6.1(4.6-8.0) respectively. Among Aboriginal males relative to AusDiab males, they were 7.6(4.6-12.5), 7.6(4.3-13.4) and 5.2(3.4-8.0) respectively. Rates of diabetes were also excessive in Aborigines for each standard category of BMI.

Conclusions: Higher rates of diabetes even at normal and lower body habitus measurements among Aborigines suggest that strategies for prevention should expand beyond exclusive focus on diet and weight management.
A ustralian Aborigines have different body habitus than non-
Aborigines, with a low sitting height to stature ratio, and a higher
percentage of body fat (1; 2). Early studies showed an average body mass
index (BMI) of less than 20 kg/m², which contrasts with the current situation
where overweight and obesity are common.

Overweight and obesity correlate with, and predict, chronic diseases,
which are now rife in most communities (3). Waist circumference (WC) is said to
be the best anthropometric predictor of type 2 diabetes in Aborigines (4).
However there are no comparisons of the risk for chronic diseases among
Aborigines associated with specific body size measurements relative to other
groups.

We quantified the risk of diabetes in remote-living Aborigines relative to
participants in the AusDiab study, by categories of body size measurements.

METHODS
People from four remote Aboriginal communities from the Top End of
Australia’s Northern Territory participated in a screening program,
which included measurement of height, weight, waist and hip circumferences
and tests for type 2 diabetes. The AusDiab study is a stratified cluster
sample survey of 11,247 consenting Australian adults aged 25 and above,
whose design and methodology are described elsewhere (5).

Body size was measured by standard procedures, with a few
differences (6). In the AusDiab study, waist and hip circumferences were
measured twice, and if they varied more than two centimetres, a third
measurement was taken, and a mean of the two closest measurements derived.
Undiagnosed diabetes was identified by an oral glucose tolerance test in all
AusDiab participants; while, in the Aboriginal population, it was identified
by fasting and/or random glucose levels, with suspicious levels confirmed by
further testing.

Overweight by waist was defined as
a level of 94 to < 102 cm for men and of
80 to < 88 cm for women, while obese
was defined as WC ≥ 102 cm for men
and ≥ 88 cm for women. A BMI of 25 to
< 30 kg/m² was considered overweight
and ≥ 30 kg/m² was considered obese.

Age adjusted rates for diabetes among Aborigines relative to AusDiab
participants were calculated by logistic regression by categories of
anthropometric measurements. The frequency of diabetes was predicted by
anthropometric measurements with fractional polynomial logistic regression
models, with goodness-of-fit assessed by Hosmer and Lemeshow's test. Stata
for Windows (version 9.2) was used for statistical analyses.

RESULTS
Included in the analysis are 1,456
adult Aborigines aged 25-74 (females,
53%), and 10,434 adults in the same
age group from the AusDiab study
(females, 55%; Aborigines, 0.8%).

Aboriginal women were younger
when compared to their AusDiab
counterparts and were significantly
lighter but had higher WC and WHR.
Aboriginal males were younger and
shorter with lower body weight, BMI,
and waist and hip circumferences than
their AusDiab counterparts, but with
higher WHR.

The crude prevalences of diabetes
were 25% and 17% for Aboriginal
females and males respectively, and 6%
and 8% for AusDiab females and males.
After adjusting for age, Aboriginal
females and males had odds ratios
(95%CI) for diabetes of 10.3(8.2-13.0)
and 5.1(3.9-6.6) respectively, relative to
their AusDiab counterparts.
Relative to their AusDiab counterparts, the odds ratios (95% CI) for diabetes among normal, overweight and obese (by waist) Aboriginal females were 2.6(0.6-11.5), 13.1(6.7-25.7) and 6.1(4.6-8.0) respectively, and for Aboriginal males they were 7.6(4.6-12.5), 7.6(4.3-13.4) and 5.2(3.4-8.0). For Aboriginal females who were normal, overweight and obese by BMI, they were 17.1(11.1-26.4), 15.5(9.6-25.1) and 6.6(4.4-10.0), while for Aboriginal males they were 7.9(4.8-13.0), 7.9(4.8-12.8) and 6.3(3.6-10.9).

Figure 1 shows the predicted probabilities of diabetes by Aboriginal status and sex, for WC and BMI, with post estimation diagnostics showing a good fit of data. Even at lower levels of body size measurements, Aboriginal females and males had higher predicted probabilities of diabetes compared to their AusDiab counterparts. For example, for Aboriginal females to have the same risk for diabetes as AusDiab females with WC of 80 and 88 cms (defining overweight and obesity), their WC need to be 73 and 76.5 cms respectively. Aboriginal BMIs that predict a risk for diabetes equivalent to their AusDiab counterparts were either biologically not feasible, or almost impossible to attain as population means.

DISCUSSION

In both these populations, larger body size was strongly correlated with the presence of diabetes. Aboriginal adults have much higher rates of diabetes than their AusDiab counterparts.

We have previously shown that Aboriginal body habitus profiles differ from AusDiab profiles (6). The current study demonstrates, in addition, that the risk for diabetes in both sexes relative to the AusDiab participants is excessive at all levels of body size, including levels that are normal or low. Thus, factors other than body size make important contributions to diabetes risk in Aborigines.

In view of the virtual absence of type 2 diabetes a few decades ago, we assume that most of these additional risk factors derive from rapid social and environmental change. Disadvantage is pervasive in current environments, with overcrowding in substandard housing, poor quality western food, little exercise, excessive smoking and alcohol abuse, together with low birthweight, repeated and persistent infections, high levels of inflammation, and serious psychosocial stress. Most of these factors have been shown to influence the risk of diabetes among other population groups. A multideterminant model of diabetes probably applies, similar to “polyfactorial” models described for ischemic heart disease (7).

Modification of lifestyle has shown promise in preventing type 2 diabetes, and is cost-effective in high risk populations (8). Our findings suggest that strategies for prevention and modification of type 2 diabetes in Aboriginal populations should expand beyond the dominant focus on diet, exercise and weight containment to more comprehensively address the risk factors for diabetes.
REFERENCES
