TITLE: TOTAL BODY FAT, PROINFLAMMATORY CYTOKINES AND INSULIN RESISTANCE IN INDIAN SUBJECTS

CSI: C.S. YAJNIK

INSTITUTE: Director Diabetes Unit, King Edward Memorial Hospital and Research Centre, Pasta Peth, Pune-411011
INDIA

BACKGROUND

Urban and migrant Indians are experiencing a rapidly escalating epidemic of diabetes and CHD. This may be related to high body fat percentage in Indians and its central distribution which have been shown to be detrimental for metabolism.

AIM

To investigate the contribution of body fat and indices of central adiposity to the increasing prevalence of insulin resistance variables in 3 geographic populations i.e. rural, urban slums and urban middle class.

SAMPLE AND METHODS

- We sampled ~150 men (30-50y) by multistage random method from the 3 geographic locations, subjects with diabetes, hypertension, CHD and chronic illness were excluded.
- Total body fat was assessed by 4 skinfolds (Durnin's equation), bioimpedance, D_2O method and DEXA. Fat distribution was assessed by anthropometry and MRI.
- Circulating glucose, insulin and lipids were measured by standard methods and HOMA insulin resistance variable calculated. Blood pressure was measured by automated method.
- Data was analyzed by multiple ANOVA to assess the contribution of total body fat and central adiposity to differing prevalence of hyperglycemia, insulin resistance and hypertension in the 3 groups. Multiple linear regression was used to define associations between different variables. Correlations and Bland Altman plots were used to compare different methods of body fat assessment. D_2O method was used as the reference.

RESULTS

- BMI, body fat percent and central adiposity progressively increased from rural to urban slums and to middle class Indian men. Plasma glucose, cholesterol and triglyceride concentrations and blood pressure also progressively increased in these 3 groups. Body fat percent explained ~17% of the variance of 2h plasma glucose concentration (OGTT) and indices of central adiposity (WHR and Subscapular-Triceps ratio) explained an additional 1.5%.
- Four methods of body fat measurement showed a good correlation amongst them. Anthropometric method and D_2O method gave very similar results, bioimpedance overestimated and DEXA underestimated in comparison to D_2O method.

CONCLUSIONS

- Body fat is an important determinant of insulin resistance in Indians and explains a substantial component of the differences between rural and urban people. Central adiposity explains a significant but relatively smaller proportion.
- Anthropometric estimates of body fat closely reflect D_2O assessment. Appropriate modifications will be necessary for bioimpedance and DEXA methods before they are made available for widespread use.

MESSAGE

Measurement of body fat and its central distribution by appropriate methods should form an essential part of further studies of insulin resistance and CV risk in Indians. Careful attention should be paid to anthropometric measurements. Appropriately designed bioimpedance programs should be made available for widespread use.

WORK IN PROGRESS

Pending laboratory assays of insulin, cytokines, endothelial markers etc.
More detailed statistical analysis
Expand the study to include women, to define the predictive equations of body fat from anthropometry and bioimpedance measurements

FUTURE PLAN

Follow up of the subjects for different morbidity to test the predictive value of body fat and distribution
Set up an intervention study for prevention of obesity and insulin resistance syndrome

MAIN FINDINGS

- Prevalence of obesity and central obesity progressively increased from rural to urban slums to urban middle class men.
- This reflected in increasing prevalence of diabetes (0, 4 and 10%), impaired glucose tolerance (9, 12 and 20%), hypertension (2, 4 and 10%) and plasma cholesterol and triglyceride concentrations.
- Body fat percent was a significant predictor of increasing cardiovascular risk in these populations, central obesity increased the risk further, though numerically to a smaller extent.

ISOTOPE TECHNIQUES USED

- Deuterated water method for estimation of TBW
- Radioimmunoassays
- DEXA for body fat (and BMD)
- CT-Scan for muscle mass (thigh) and intramuscular fat
- MRI for visceral and abdominal subcutaneous fat