Non-insulin dependent diabetes mellitus: prevalence and predisposing factors in Sri Lankans

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Summary

Prevalence of diabetes mellitus and predisposing factors of diabetes mellitus have been studied in 852 middle aged Sri Lankan males.

The prevalence of diabetes mellitus as determined by a single urine glucose analysis and later confirmed by a fasting blood sugar test was 5.8%. Men with first degree relation with known diabetes were found to be at higher risk of developing diabetes than men with none.

Those with diabetes mellitus also had other features associated with insulin resistance such as obesity, higher body mass index levels and high blood pressure.

Introduction

The prevalence of non-insulin-dependent diabetes mellitus has been reported to be high in South-Asian populations[1,2]. Several population studies have shown that obesity is one of the predisposing factors for non-insulin dependent diabetes mellitus[3,4]. Hereditary factors as expressed by history of diabetes in a close relation also seems to be important[5]. As far as we are aware there are no published data on the prevalence of diabetes mellitus or its risk factors in the general population in Sri Lanka.

The objective of the present study was to investigate the prevalence of non-insulin dependent diabetes in a middle aged male population and to find the risk factors for non insulin dependent diabetes by using metabolic features, anthropometric measurements and history of diabetes mellitus among relatives.

Materials and methods

Between January 1990 and December 1991, 975 males aged 35-59 years were randomly selected from the electoral lists of 12 Gramasevakas divisions in Kandy and Matale districts. Eight hundred and fifty two men responded comprising 108 subjects from Wattarantanne, 103 subjects from Bowala, 97 subjects from Deekirimadawela, 97 subjects from Welata, 87 subjects from Godagandeniya, 83 subjects from Yatiwawala, 70 subjects from Gatambe, 54 subjects from Ambilmegama, 48 subjects from Talgahagoda, 47 subjects from Dodanwela, 37 subjects from Daulagala and 21 subjects from Deiyannewela. The overall response rate was 87.4%.

A questionnaire was administered and each participant was personally interviewed. Questions were asked concerning family history of diabetes mellitus, physical activity at work and during leisure time, smoking and regular medication.

All measurements were made by a team of two medical officers and two field Assistants. Resting, sitting blood pressure was recorded twice with an aneroid sphygmomanometer. Height was measured without shoes and the weight measured in casual clothes. Body mass index was calculated as weight in (kg) divided by height (m) squared.

Serum was separated from venous blood drawn from subjects after an overnight fast. Total cholesterol and high density lipoprotein cholesterol were estimated by enzymatic methods using reagent tests obtained from Boehringer Manheim, Germany (Cat no 816302). A quality control serum sample was analyzed with every batch of estimations and the coefficient of variation was less than 2.7%.

A single sample of urine was tested for glycosuria using test strips (medi test glucose). The detection is based on the glucoseoxidase — peroxidase — chromogen reaction. Apart from glucose no other compound in urine is known to give a positive reaction. Those who had glycosuria were later confirmed as having diabetes mellitus by blood glucose assay.

Statistical analyses was done using the Systat program package. Statistical significance was assessed using the student's t-test and the chi square test.

Results

Forty nine subjects had glycosuria and later were confirmed as having non insulin dependant diabetes mellitus. Thirty of them (61%) were aware they were diabetics. There was a prevalence of diabetes mellitus with age but statistically this was not significant ($p > 0.05$, Table 1)

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Table 2 shows that the prevalence of diabetes mellitus increased from 4.9% (35 out of 706 subjects), in men who had no history of diabetes mellitus in a parent, to 10.6% (11 out of 104) in those with a history of diabetes mellitus in a parent. This difference was statistically significant ($p > 0.05$).

Blood pressure of diabetic subjects is compared with non-diabetics in Table 3. Diastolic and mean blood pressure [SBP+2x DBP)/3] was significantly high in diabetic subjects. Among hypertensives (DBP > 90mmHg) the prevalence of diabetes mellitus was 6.3%. Among normo-tensives the prevalence of diabetes mellitus was 5.6%. This difference was statistically not significant.

The mean body mass index of diabetics was significantly higher (22.25) than in non diabetics (20.69, $0.05 > p > 0.02$).

Comparison of serum cholesterol, serum high density lipoproteins (HDL) and cholesterol/HDC ratio in diabetics and non-diabetics did not show any significant difference (Table 5).

Table 1. Prevalence of diabetes mellitus in middle aged males by age.

Age group	*Number of subjects*	*Number with diabetes mellitus*	*Prevalence %*
35-39	207	10	4.8
40-44	183	11	6.0
45-49	149	8	5.3
50-54	147	9	6.1
55-59	166	11	6.6
	852	49	5.8

No significant difference in prevalence in different age groups

Table 2. Relationship of diabetes mellitus and family history of diabetes in parents

	Family history positive	*No family history*	*Family history unknown*	
Diabetes	11 (10.6%)	35 (4.9%)	3	49
No diabetes	93 (89.4%)	671 (95.1%)	39	803
	104 (100)	706 (100%)	42	852

Table 3. Comparison of blood pressure in diabetics and others

Blood pressure (mm Hg)	*Diabetic subjects mean (SD)*	*Others mean (SD)*	*P*
Diastolic	86.9 (9.5)	83.0 (10.4)	0.05
Systolic	127.0 (13.1)	123.3 (14.6)	NS
Mean	100.3 (10.3)	96.4 (11.1)	0.01

Table 4. Comparison of prevalence of hypertension, obesity, smoking and lack of physical activity in diabetics and non-diabetics

	Diabetics	*Others*	*P*
Hypertension (DBP > 90 mm Hg)	20.4%	18.7%	NS
Obesity (BMI > 25)	24.5%	10.9	0.01
Smoking	55.2%	57.5%	NS
Physical inactivity (sedentary)	28.6%	20.7%	NS

Table 5. Serum cholesterol, high density lipoprotein and cholesterol/HDL ratio in diabetics and non diabetics

	Diabetics mean (SD)	*Non diabetics mean (SD)*
Serum cholesterol ((mmol)/1)	5.11 (1.37)	5.08 (1.28)
HDL (mmol/1)	1.04 (0.23)	1.05 (0.32)
Cholesterol/HDC	5.08 (1.66)	5.22 (1.89)

Discussion

The prevalence of diabetes mellitus in Sri Lankans is not known. The prevalence of diabetes mellitus in middle aged Sri Lankan males is 5.8% in the present study. This is likely to be an underestimate as the screening test used to diagnose diabetes mellitus in this study is a single urine sugar test. Yet the results indicate that the prevalence in our population is significantly higher than in Europeans and comparable to Asian immigrants in London (Table 6).[2]

Diabetic individuals have a higher mean and diastolic blood pressure, a higher body mass index and a higher prevalence of obesity. Obesity is probably the most important underlying preventable risk factor for diabetes being to a large degree a consequence of life style.

Blood pressure has been reported to be positively correlated with insulin concentrations (reflecting insulin resistance) and hypertension has been demonstrated to be an insulin resistant state in itself[6]. Several mechanisms have been proposed to explain why raised insulin concentration may lead to high blood pressure[7-10]. Thus when blood pressure is found to be a risk factor of diabetes mellitus in the present study it may be regarded as an indicator of insulin resistance.

In the present study men with first degree relatives with known diabetes were found to be at higher risk of developing diabetes than men with no first degree relatives with known diabetes, as has been found in other studies[5].

Although diabetes is often regarded as a disease of insulin deficiency, insulin concentrations are commonly above normal in some non-insulin dependent diabetics[11]. The idea that insulin resistance may be responsible for both non-insulin dependent diabetes and increased cardiovascular risk has begun to gain support from other lines of evidence especially from studies of the health consequences of obesity. It may explain the increased cardiovascular risk in diabetics compared with non-diabetics.

Table 6. Prevalence of diabetes mellitus in Sri Lankans compared with Asian immigrants and Europeans in London

Sample	*Screening test*	*Age*	*Prevalence (%)*	
	Urine sugar	30-59	5.8	
Sri Lankan males				
			Asians	Europeans
Southhall survey	Questionnaire (Known diabetes)	35-39	1.7	0.5
		40-44	3.6	0.9
		45-49	6.0	1.1
		50-54	8.4	1.7
		55-59	9.0	1.9

The only environmental influences on insulin resistance are dietary energy intake and physical activity[12]. Non insulin dependent diabetes mellitus and other disturbances associated with insulin resistance such as hypertension may be a consequence of low physical activity and high energy intake in populations adapted to survive under conditions of unreliable food supply and physically demanding work. If the insulin resistance hypothesis is correct, correction of obesity and greater physical activity are likely to be the most effective means of preventing diabetes and other disorders like hypertension and coronary heart disease associated with insulin resistance in our population.

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