DETERMINANTS OF NIDDM IN SOUTH INDIANS : URBAN – RURAL CONTRAST

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Epidemiological studies in several Asian countries, including India have shown that the prevalence of non insulin dependent diabetes mellitus (NIDDM) is on the increase. Recent studies showed that urbanization and economic development are causing high prevalence of NIDDM even in most of the developing countries. These studies have also helped in identifying risk factors for NIDDM.

The major risk factors are :

1. Genetic Inheritance
2. Insulin Resistance Syndrome (syndrome 'x')
3. Obesity and Central Adiposity
4. Urbanization with adoption of Western life style
5. Unhealthy diet habits
6. Sedentary life style

The interaction of diet, obesity and physical activity is complex and migration to affluent life style, within the country or abroad, are associated with changes in all the three factors, each of them having immense influence on the etiology of diabetes. The western diet rich in energy and low in fibre promotes weight gain and insulin resistance, even in the low risk populations such as the Europeans. Studies in Australian Aborigines, Pima Indians and peri-urban rural population in India showed that the impact of physical inactivity are manifested more markedly in populations who have been accustomed to heavy physical activity initially.

FAMILIAL AGGREGATION AND GENETIC OF DIABETES

Strong familial aggregation of NIDDM has been noted in Asian Indians. It was found that 45% of the Indians compared to 38% of the European had positive family history of diabetes. A recent analysis of family history in the NIDDM patients attending the Diabetes Research Centre, Madras showed that the 54%of the probands had atleast one parent with known diabetes and in additional 22.8% sibling had diabetes. With increasing degree of genetic component, not only does the risk of NIDDM increase in the offspring, but also the onset of the disorder occurs at a younger age than in their parents.

When exposed to changing environment a high frequency of diabetes is seen in some ethnic populations providing a strong evidence for the presence of a genetic trait. This trait in the past had been of selective advantage for survival, as first proposed by Neel as the "Thrifty Genotype."

INSULIN RESISTANCE

Insulin resistance and beta cell deficiency are the two major pathogenic factors in diabetes. Epidemiological studies in southern India have highlighted that normoglycaemic Indians with ideal body mass also have hyperinsulinaemic response, when compared with the reported values of Europids. Recent studies in India and in the UK have shown that the hyperinsulinaemic response in the Indians are due to higher concentration of specific insulin and not due to increased secretion of proinsulin or its split products. Hyperinsulinaemic and lower insulin sensitivity have been reported in normoglycaemic offspring of diabetic parents, from south India.

OBESITY

The relationship between obesity and NIDDM is complex and is confounded by many heterogeneous factors. The 1980 WHO expert committee on diabetes concluded that the most powerful risk for NIDDM is obesity. In several ethnic populations, including the relatively nonobese Indian population, the android pattern of body fat typyfied by more upper body adiposity measured as waist to hip ratio (WHR) was found to be a greater risk factor for NIDDM than general obesity. Studies in south Indian suggested that increase in body weight, although within the ideal levels of body mass could increase the risk of diabetes. Insulin resistance which was found to be a characteristic feature of the Asian Indians, despite their lean body mass, could be adversely affected by even small increments in the body mass.

IMPACT OF URBANIZATION

The wide urban-rural difference in the prevalence of NIDDM is south India is a strong evidence of the impact of urbanization on its prevalence. Population studies in south India showed that the prevalence of IGT was similar in urban and rural populations (8.7%, 7.5% in urban and rural respectively) despite four fold higher prevalence of diabetes in the urban areas (2.4% in rural and 8.2% in urban areas), probably a common genetic basis for the disease. It was probably the favourable environmental conditions that protected the rural population from a upsurge of diabetes. Urban-rural difference in the prevalence of NIDDM

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are evident in several other countries. Evidence in support of the above hypothesis were obtained in a recent study of periurban population in south India which is in a transitional stage of urbanization. Although living in rural areas, they had access to modern amenities like electricity, water supply and home appliances. This had brought down the physical activity level considerably in several persons. In addition, there was a also change in the diet pattern from the conventional rural pattern, with higher intake of fats, and refined carbohydrates. The most interesting feature was the impact of decreased physical activity on the development of glucose intolerance. In the peri-urban population, decreasing physical activity resulted in increased risk of glucose intolerance which was markedly different from the results in the rural or urban population (Table 1). Prevalence of diabetes in this population has doubled in comparison with the rural population who are still living in the conventional style (5.9%).

Table 1
Variables Significantly Associated With Glucose Intolerance In The South Indian Study Populations

	Urban	ODDS Ratios Urbanising Rural	Rural
Prevalence	11.6	5.9	2.4
Age	1.76	1.34	1.59
BMI	1.38	1.42	1.22
WHR	1.80	1.29	1.08
Physical Activity	0.96	7.96	0.88
FH DM	2.7	-	-

P value < 0.05
Gender, Occupation, Family Income, Factors of diet were non significant

Life style and food habits which have been advantageous for survival of human population at the time when they were hunter-gathers and agriculturists, have given way to modernisation, leading to more consumption of energy, refined carbohydrates and fats and also for minimal physical activity. Thus the energy balance has tilted towards the conservation of energy as depot fat, which is rarely utilised. The modern diet rich in energy and low in fiber promotes weight gain and insulin resistance. The adverse mechanisms operate more strongly in the high risk population, which already have insulin resistance. Evidence from several epidemiological studies support the hypothesis that the high fat, low carbohydrate diet prevalent in the westernised societies are contributory to the excess obesity and NIDDM in those societies. The recent study in India has shown that consumption of fats was higher in urban compared to the rural population (Table 2). No significant differences were seen between the normoglycaemic and diabetes groups, with respect to the dietary principles.

Table 2.
Dietary Principles in Non-Diabetic And Diabetics

	CHO%		Protein%		Fat%	
	M	W	M	W	M	W
Non-diabetics						
Urban	67	65	14	14	19	21
Urbanising Rural	70	69	11	11	18	20
Rural	76	74	10	10	14	16
Diabetics						
Urban	65	64	15	15	20	21
Urbanising Rural	70	67	12	10	18	22
Rural	74	70	10	13	16	17

SUMMARY

These epidemiological studies have thus show that south Indians have a high risk for diabetes mellitus on account of strong familal aggregation of disease, added are of insulin resistance with increasing modernisation. Changes occur in the dietary habits and physical activity with urbanization which lead to further rise in the risk of diabetes.

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