Diabetes in South African Indians

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Diabetes mellitus has a wide global distribution. It knows no barriers, affecting both the developed and the developing countries and various population groups. In the recent years, numerous studies have highlighted a high prevalence of diabetes mellitus in migrant Indians compared with native Indians or other population groups living in their new countries of adoption [1]. This trend has been observed in virtually every migrant Indian group all over the world and those that migrated to South Africa are no exceptions.

The first known Asian migration to South Africa occurred in the 17th century when the Dutch introduced people from the Malay Archipelago and North-east India as slaves to the Cape Colony. Subsequently, there were further huge migrations from India starting in 1860 when Indians were introduced as indentured laborers to Natal [2]. They were followed by other Indians who migrated as traders not only to Natal but also to other parts of South Africa whereas South Africa and Mauritius had immigrants from both, South India (Dravidians) and North India (Aryans). In other countries, the migrant Indians mainly came from the latter part of India. South Africa houses the largest Indian group born outside India numbering almost a million and comprising two-thirds North Indians and one-third South Indians.

Prevalence of Diabetes Mellitus

Ever since Cosnett [3] described a large group of South African Indians with diabetes, numerous workers have highlighted the high prevalence of the disease in this population group compared with the indigenous people as well as other migrant groups. Based on the revised WHO criteria, South African Indians show 13% prevalence rate i.e. more than twice as that seen in Blacks (5.2% - 6%) or Whites (3%) [4-6].

As mentioned earlier, Indians may be divided into those of North Indian and of South Indian origin. However, based on a large study in South Africa, prevalence rates were similar between the two groups [4]. If socioeconomic status is considered, similar rates are seen in South African Indians of lower income class compared to those of upper/middle class [4].

Impaired Glucose Tolerance

Populations wherein NIDDM is very common, show a lower prevalence of IGT, which nonetheless still carries a major risk of NIDDM. This characteristic is also seen in South African Indians who show an IGT prevalence rate of 7% [4]. Moreover, such a combination is associated with a bimodality in plasma glucose distribution, as has been shown in this and other population groups [4]. One point of relevance, is that South African Blacks show a higher prevalence of IGT (10%) than that of diabetes [6]. It should be noted that a high IGT to NIDDM ratio represents a lifestyle preventing the emergence of diabetes whilst a falling ratio is seen in obese inactive populations [7].

In terms of progression to NIDDM, South African Indians show the highest rate (12.6% per annum) yet seen in any population group, with about 50% doing so in the first year [8].

Patterns of Diabetes Mellitus

NIDDM is by far the commonest type of diabetes seen in all migrant Indian populations in Africa and elsewhere. Both population-based as well as clinic-based studies in Durban, South Africa have shown that about 98% of diabetes subjects have NIDDM and that the overall prevalence of IDDM is only 0.018% [4, 9]. Moreover, even in young Indians, IDDM is less common, being found in less than one-third of such subjects with diabetes [7]. In contrast, South African Blacks not only have a higher prevalence of IDDM (0.07%) but also show a much higher proportion of IDDM in those with younger age of onset. Beta-cell function based on C-peptide measurements has been shown to be deficient in South African Indians with IDDM, in keeping with classical IDDM [10].

NIDDM of the young (NIDDY) in this population group is similar to the classical NIDDM seen in the older age group in terms of the high prevalence of obesity, familial predisposition and propensity for vascular complications [9, 11].

Malnutrition Related Diabetes Mellitus (MRDM)

MRDM appears to be extremely rare in migrant Asian groups based on a study of young South African Indian diabetic subjects in whom it represented only 2% of the total number [9].

Pathogenesis of Diabetes Mellitus (IDDM)

Autoimmunity [12] as well as HLAB8 and DR3 [13] play a part in the a etiology of IDDM in South African Indians, as has been found in most other

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population groups. Data on the DQ region are not available. An unexpected finding is the high prevalence of NIDDM in first degree relatives of South African Indian subjects with IDDM, suggesting that the gene for NIDDM somehow also predisposes this population group to IDDM [14].

NIDDM

The reason for the high prevalence of diabetes mellitus in migrant Indian groups remains obscure as to date, no environmental factor has been definitely implicated. It is possible that urbanization which invariably accompanies migration, somehow triggers the development of NIDDM in a genetically predisposed population. A possible a etiological factor is obesity, which is positively associated with NIDDM in Indians of South Africa, particularly in females [4]. It is possible that the greater degree of obesity in females could account for the somehow higher prevalence of NIDDM seen in Indian females in South Africa [4].

A change in diet to one with greater energy / fiber ratio that often accompanies migration and the consequent affluence associated with it would be an attractive hypothesis to explain the high prevalence of NIDDM in migrant Indians (Neel's thrifty genotype hypothesis). However, no specific dietary factor has been found that satisfactorily proves such a hypothesis.

To what extent lack of physical exercise by itself contributes to the emergence of diabetes, as has been suggested in the past, is difficult to gauge because of methods and lack of standardized criteria used to evaluate this parameter. To date, there has been no study that has addressed this specific question in South African Indians.

Based on a high familial aggregation of NIDDM, it is apparent that genetic factors play a role in the pathogenesis of NIDDM. In South African Indian diabetics, two-thirds gave a family history of diabetes in a first degree relative [4]. Of interest is that a positive family history was more common in the obese than in the non-obese [4], suggesting that an interplay between genetic factors and obesity unmasks the diabetic state. Since migration from India to South Africa had virtually ceased after 1911 and miscegenation with other South African population groups has been virtually non-existent, it does seem that the putative gene has been concentrated over a period of time as a result of inbreeding. However, the precise genetic abnormality remains obscure.

A relationship between NIDDM and HLABW61 has been shown but the association is weak [15]. The maternal genetic contribution may be more important since a recent study on South African Indians showed a greater frequency of NIDDM in the mother (40%) rather than the father (26%) of probands [16].

The role of insulin resistance and the consequent hyperinsulinaemia or of impaired beta-cell function in the pathophysiology of NIDDM in Indians remains obscure. Migrant as well as native Asian Indians with NIDDM and normal glucose tolerance have higher insulin levels compared with Europeans and Africans [17 – 18]. Motala and Omar found hyperinsulinaemia in South African Indians with IGT compared with those who had diabetes or normal glucose tolerance, akin to the "Starling Curve" of insulin levels and glucose tolerance [19]. However, the role of a secretary defect cannot be ignored because IGT was associated with a defect in the early phase (30-minute response to oral glucose loading) of insulin release [19]. A similar defect has also been observed in White Caucasians [20-21].

Complications of Diabetes

It has been suggested that migrant Indians are at greater risk for developing vascular complications of diabetes compared to other population group [22]. Recent studies conducted on South African Indians does lend support to this hypothesis, particularly as regards to macro vascular disease. In a field study, Seedat et al found that 21.6% of Indians with ischaemic heart disease had diabetes whereas only 10.6% of those without this complication had diabetes [23]. The prevalence of this complication in a large group of NIDDM subjects attending a primary health care center was 15% [24]. A high prevalence of hypertension in NIDDM subjects attending a primary health care center was 15% [24]. A high prevalence of hypertension in NIDDM subjects (45%) has also been documented in a field study [25]. African Black diabetic patients showed a very low prevalence (0.3%) of ischaemic heart disease (unpublished observation). Gill and Huddle also commented on the rarity of this complication in Black diabetic patients in Johannesburg (0.2%), despite of a high prevalence of hypertension (34.9%) [26].
It is possible that the relative hypinsulinaemia, characteristic of NIDDM in Blacks [18], serves to protect this group from ischaemic heart disease, if insulin or proinsulin has any role to play in its pathogenesis.

Micro vascular complications are also common in South African Indians with NIDDM. In the aforementioned cohort of NIDDM subjects 44% had retinopathy and 27% nephropathy [28]. Though data on these complications in the local Black population are scanty, it appears that their prevalence rates would

not be much different after adjusting for duration of NIDDM. A study involving Indians with IDDM showed that 32% had neuropathy, 22% retinopathy and 7% nephropathy, whilst in Blacks with the disease the figures were 22%, 14% and 3% respectively. Of relevance is that the Indians had a longer mean duration of IDDM (5.4 years) than the Blacks (3.8 years) [27, 28].

Conclusion

This review has highlighted the high prevalence of NIDDM in South African Indians. Genetic susceptibility coupled with obesity probably play an important role in the a etiology of the disease. In addition, a high prevalence of vascular complications is evident. NIDDM has, therefore, become a major public health problem requiring research into its precise a etiology in order to undertake possible preventive measures.

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