

Familial early onset of type-2 diabetes mellitus and its complications

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Abstract

Background: Globally, the prevalence of chronic, non-communicable diseases is increasing at an alarming rate. Furthermore, approximately 197 million people worldwide have impaired glucose tolerance. Consequently, diabetes is rapidly emerging as a global health problem that threatens to assume a pandemic level by 2030. In Indian population, genetic predisposition to trigger diabetes at an early age as compared to western counterpart has been focused very much. **Aim:** To gain further insight into the positive correlation between the diabetes and family history was the objective of this study. **Materials and Methods:** Patients attending the Diabetes Centre, K.L.E.S Dr. Prabhakar. Kore Hospital and Medical Research Centre; J. N. Medical College; KLE University Belgaum, Karnataka- India, were recruited, diagnosed and analyzed as per WHO criteria. **Results:** The prevalence of diabetes was higher among patients with diabetic mother (25.6%) compared to patients with diabetic father (21.2%) and there was early onset of type -2 diabetes among patients having both parents with diabetic when compared to other patients. **Conclusion:** Based on the present observation, it would be appropriate to emphasize again that a strong family history for diabetes, would signal at an early age, the onset of diabetes perhaps with its complications.

Keywords: Family history, type-2 diabetes mellitus, retinopathy, nephropathy.

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Introduction

Diabetes a global public health problem associated with its devastating consequences has assumed epidemic proportion in developing countries of the world. The prevalence of diabetes for all the age groups worldwide was estimated to be 2.8% in 2000 and 4.4% in 2003. The total number of persons with diabetes is projected to rise from 171 million in 2000 to 366 million in 2030 [1]. There is strong evidence that Indians have a greater degree of insulin-resistance and a stronger genetic predisposition to diabetes. As several of the factors associated with diabetes are potentially modifiable, this epidemic of diabetes can be

curbed if proper measures are taken to increase physical activity and reduce obesity rates in adults and children [2]. In India the prevalence is 2.4% in rural population and 11.6% in urban population [3].

We conducted a study to find the association between heredity, and type-2 diabetes mellitus and its relation to onset of type - 2 diabetes mellitus and its complications.

Materials and Methods

A cross-sectional study was undertaken on 1000 patients

attending the Diabetes Centre, K.L.E.S Dr. Prabhakar. Kore Hospital and Medical Research Centre; J. N. Medical College; KLE University Belgaum, Karnataka- India. Each patient was examined by a Diabetologist and asked whether any of his / her family members (living or not) had diabetes, diagnosed as per WHO criteria [4]. Patients with diabetic mother, diabetic father, diabetic relatives other than parents and no known diabetic relatives considered separately. Informed consent was obtained from all the study subjects.

Patients were examined at least 3 times in a year. The nurse measured height (H), weight (W), W/H, Body Mass Index (BMI) and blood pressure. Blood pressure was reported as average of the last three determinations; their glycosylated haemoglobin (using high pressure liquid chromatography) measured every 3 months and was screened for chronic complications. The current age was defined as the age at the time of examination; age at onset of diabetes, was defined as the age at the time the diagnosis was first recorded by physician.

Coronary artery disease (CAD) was established by a conventional 12-lead resting electrocardiogram interpreted by cardiologist and / or presence of documented events, recorded by a physician (previous myocardial infarction, coronary artery bypass graft or any invasive procedures to treat coronary artery disease). Retinopathy was defined by ophthalmoscopic examination. Ophthalmologists experienced in diabetic retinopathy performed Funduscopy through dilated pupils. Nephropathy was diagnosed by Micral test and presumed to be present if any two readings out of three of urinary albumin were ranging from 30-300 mg/day. Peripheral artery disease (PAD) was defined when conditions such as ischemic foot ulcers, gangrene, amputation, vascular surgery, transient ischemic attacks, strokes, intermittent claudication, and absent pedal pulses were present. Peripheral neuropathy was defined as vibratory threshold of the great toe 25 (using Biothesiometer) and by the history of pain, tingling numbness and paraesthesias.

Statistical analysis was done by using Chi-square test and P value ≤ 0.05 is taken as statistical significant.

Results

Our Study population constituted more male patients (56.6%) without family history of diabetes and female patients (60.5%) with family history of diabetes. The results were statistically significant as shown in Table 1.

Table 1 Distribution of patients according to sex

Sex	Patients with family history	Patient without family history	Total
Male	267 (43.4%)	348 (56.6%)	615
Female	233 (60.5%)	152 (39.5%)	385
Total	500	500	1000

$X^2 < 27.710$; $DF < 1$; $P < 0.001$

There was early onset of diabetes among patients with

family history of diabetes that was in the age groups 20-30 years, 30-40 years, and 40-50 years. Contrary to previous belief the accidental finding was that, there was late onset of diabetes among patients with age group 50-60 years and >60 years who were having family history of diabetes and the results were statistically significant as shown in Table 2.

Table 2 Distribution of patients according to age of onset of Type 2 diabetes mellitus

Age of onset (years)	Patients with family history	Patients without family history	Total
20-30	34 (89.5%)	4 (10.5%)	38
30-40	76 (57.1%)	57 (42.9%)	133
40-50	164 (54.5%)	137 (45.5%)	301
50-60	116 (48.5%)	123 (51.5%)	239
>60	110 (38.1%)	179 (61.9%)	289
Total	500	500	1000

$X^2 < 45.499$; $DF < 4$; $P < 0.001$

The development of retinopathy and neuropathy is less in patients with family history of diabetes than those without. Further role of PAD and CAD is more in patients with family history of diabetes than those without. Risk is same in both groups with respect to nephropathy. These findings were statistically significant as shown in Table 3.

Table 3 Distribution of patients according complications of Type 2 diabetes mellitus

Complications	Patients with family history	Patients without family history	Total
Retinopathy	85 (40.1%)	127 (59.9%)	212
Nephropathy	76 (51.7%)	71 (48.3%)	147
Neuropathy	116 (47.9%)	126 (52.1%)	242
PAD	127 (54.9%)	104 (45.1%)	231
CAD	96 (57.1%)	72 (42.9%)	168
Total	500	500	1000

$X^2 < 14.623$; $DF < 4$; $P < 0.006$

While our study showed 32.4% patients with both parents with diabetes were having greater risk for diabetes compared to others. Further, prevalence of diabetes was higher among patients with diabetic mother (25.6%) compared to patients with diabetic father (21.2%). and also chances of getting diabetes from father to son is 18.3% and mother to daughter is 37.3%. The findings were statistically significant as shown in Table 4.

Table 4 Distribution of patients by sex according to role of family history of Type 2 diabetes mellitus

Sex	Patients with diabetic father	Patients with diabetic mother	Patients with both diabetic parents	Patients with diabetic relations	Total
Male	49 (18.3%)	41 (15.4%)	109 (40.8%)	68 (25.5%)	267
Female	57 (24.5%)	87 (37.3%)	53 (22.7%)	36 (15.5%)	233
Total	106 (21.2%)	128 (25.6%)	162 (32.4%)	104 (20.8%)	500

$X^2 < 44.232$; $DF < 3$; $P < 0.001$

Moreover our study showed that the early onset of type-2

diabetes among patients with both parents with diabetes when compared to other patients whose parents were non-diabetic. However the findings were statistically not significant as shown in Table 5.

Table 5 Distribution of patients by age of onset according to role of family history of Type 2 diabetes mellitus

Age of Onset	Patients with diabetic father	Patients with diabetic mother	Patients with both parents diabetic	Patients with diabetic relatives	Total
20-30	6 (17.6%)	5 (14.7%)	15 (44.1%)	8 (23.%)	34
30-40	12 (15.8%)	19 (25.0%)	35 (46.1%)	10 (13.1%)	76
40-50	34 (20.7%)	45 (27.4%)	52 (31.8%)	33 (20.1%)	164
50-60	29 (25.0%)	26 (22.4%)	33 (28.5%)	28 (24.1%)	116
>60	25 (22.7%)	33 (30.0%)	27 (24.6%)	25 (22.7%)	110
Total:	106	128	162	104	500

Discussion

Diabetes is the single most important metabolic disease, widely recognized as serious risk for target organ damage. In our study younger age of onset of diabetes had been noted which implies that these subjects develop diabetes in most productive years of their life and have a greater chance of developing complications. Ramachandran et al [5] observed similar findings in their study of parental influence on the spectrum of type 2 diabetes in the offspring among Indians. Familial clustering of type-2 diabetes is well-known and is high in Indians [6-8]. We found that, prevalence of diabetes was higher among patients with diabetic mother (25.6%) compared to patients with diabetic father (21.2%). Knowler et al [9] and Karter et al [10] observed similar findings in their study to assess diabetes incidence in Pima Indians and excess maternal transmission of type -2 diabetes respectively. The Framingham offspring study found that, maternal and paternal diabetes conferred equal risk for offspring type-2 diabetes, but offspring with maternal diabetes were at excess risk for exceeding sub diabetic glucose tolerance [11]. However, Vishwanathan et al [6] and Alcolado et al [12] found absence of excess maternal transmission of diabetes to the offspring, in contrast to our findings. Bo et al [13] conducted a study to note the on influence of a family history of diabetes on the clinical characteristics of patients with type- 2 diabetes mellitus and found that the prevalence of diabetes in mother, father, and other relatives was 25.5%, 6.54% and 21.2% respectively.

Our study showed that the early onset of type -2 diabetes among patients having both parents with diabetic when compared to other patients. Ng et al [14] confirmed the similar findings in their study of a familial early onset of type-2 diabetes in Chinese patients. We found a significant association of PVD and CAD in patients with the family history of diabetes. Our findings are consistent with the

results of Ramachandran et al [15]. Diabetes is an independent risk factor for CAD, PAD, neuropathy, nephropathy and blindness. Thus diabetes can be considered as a vascular disease since it causes both micro-vascular and macro-vascular complications and a strong genetic component in the etiology of type -2 diabetes and a preponderance of maternal transmission has been reported [12, 16, 17].

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