Prevalence of diabetes amongst the family members of known diabetics

M. V. Jali*, Sanjay Kambar**

*Chief Diabetologist, Medical Director and CEO, **Specialist in Preventive Diabetes, Diabetes Centre
K.L.E.S. Hospital and Medical Research Centre, Belagavi, India

AIM: To find the prevalence of diabetes amongst the family members of known diabetics.

METHODOLOGY: The present study was a cross-sectional, hospital-based study. The family members of already registered diabetic patients were invited to participate in this study. Totally, 513 families with one family member from each family responded and family members with diabetic mother, diabetic father, and or parents being diabetic were considered separately.

RESULTS: The prevalence of diabetes among males was 10.38%, females was 7.69% and the prevalence was 18.24%, in the age group 40-49 years, which was quite high compared with other age groups. According to the family history of diabetes, the prevalence of diabetes among family members with diabetic father was 6.48%, diabetic mother 10%, and both parents being diabetic was 14.94%.

CONCLUSIONS: This study indicates that there is a strong association between heredity and diabetes mellitus. Further, stronger the family history, greater is the tendency of getting diabetes. This study confirms the utility of family history as public health tool for risk determination and prevention of diabetes.

KEY WORDS: Family members, hereditary, prevalence, type 2 diabetes.

Introduction

Diabetes mellitus is the single, most important metabolic disease recognized worldwide as one of the leading causes of death and disability.[1] The problem has reached pandemic proportions. Type 2 diabetes is the commonest form of diabetes constituting almost 90% of diabetic population. Prevalence of diabetes in the adults worldwide was estimated to be 4.0% in 1995 and expected to be 5.4% by the year 2025. Its incidence is higher in developing countries than developed countries.[2]

Today, India leads in the world with its largest number of diabetic subjects as compared with any given country. It has been estimated that presently 19.4 million individuals are affected by diabetes and these numbers are expected to increase to 57.2 million by the year 2025 (one-sixth of the world total).[2] World Health Organisation (WHO) has already declared India as the global capital of diabetes. In 1970s, the prevalence of diabetes among urban Indians was reported to be 2.1%, and this has now risen to 12.1%.[3] There is an economic paradox of wealthier being healthier in developed countries and wealthier being not healthier in developing countries. Shockingly, WHO has revised the predicted number of diabetics in India to be nearly 80 million by 2030.[4]

Family history information may serve as a unique and useful tool for public health and preventive medicine because family history reflects both genetic and environmental factors. Thus, family history could be used to identify individuals at different levels of risk or to influence health-promoting behaviors. Further, preventive efforts could be extended to family members who may be at an increased risk, or who may be influential in helping to modify a relative's health behavior.[5]

Asian Indians have strong familial aggregation of diabetes with high prevalence of diabetes among first-

Correspondence to **M. V. Jali**, Chief Diabetologist, Medical Director & CEO, K.L.E.S. Hospital and MRC, Belagavi - 590010, India.
E-mail: drmvjali@yahoo.com

degree relatives and vertical transmission through two or more generations.[6] Further, diabetes is a major health hazard with its attendant acute and long-term complications. People with diabetes are 25 times more likely to develop blindness, 17 times more likely to develop kidney disease, 30-40 times more likely to undergo major amputations, 2-4 times more likely to develop myocardial infarction, and twice as likely to suffer from stroke than individuals without diabetes.[1]

Methodology

A cross-sectional, hospital-based study was conducted over a period of 1 year to know the prevalence of diabetes among family members of known diabetics. The study was conducted at the Diabetes Centre of the KLES Hospital and Medical Research Centre, Belagavi.

The family members of already registered diabetic patients were motivated by a special educational program on primary prevention of diabetes, following which they were invited to participate in this study. They were called through mail, phone calls, and advertisements in local newspapers. The new patients attending Diabetes Centre were also counseled regarding primary prevention of diabetes and requested to send their family members to participate in this study. Thus, 513 families, with one family member from each family, participated by the end of study period [Figure 1]. Each family member was examined and asked whether any of his/her family members had diabetes diagnosed by a physician. The family members with diabetic mother, diabetic father, or diabetic parents were considered separately. A detailed, pretested questionnaire was used to collect information regarding the demographic profile, clinical examination, investigations, and diagnosis. Age was recorded to the

nearest completed year.

The diagnosis of diabetes was established considering the American Diabetes Association criteria of more than or equal to 200 mg/dl casual plasma glucose (CPG) concentration (regardless of the time since the last meal was taken) plus symptoms of diabetes, viz., polyuria, polydipsia, polyphagia, and an unexplained weight loss.[7] The family members whose CPG was less than 200 mg/dl were asked to come back for plasma glucose test regularly once a month.

Results

The study population consisted of 513 family members, among whom 318 were males (61.99%) and 195 females (38.01%). The maximum number of subjects (40.55%) were in the age group 30-39 years. The family history of diabetes was noted as follows: 216 (42.10%) subjects with paternal diabetes, 210 (40.93%) subjects with maternal diabetes, and 87 (16.96%) subjects with both parents having diabetes. 88.68% of males had waist-hip ratio more than or equal to 0.9; 81.54% of females had a waist-hip ratio of more than or equal to 0.85. In this study group, 171 (33.33%) subjects had a body-mass index of more than or equal to 25 and 342 (66.67%) subjects had less than 25.

The prevalence of diabetes among males was 10.38% (33 cases), females was 7.69% (15 cases), and 18.24% in the age group of 40-49 years, which is quite high compared with other age groups. The findings were statistically significant [Table 1].

In the study population considering only the parental history of diabetes, i.e., family members with diabetic father, diabetic mother, and both parents diabetic, the prevalence was 6.48%, 10.00%, and 14.94%, respectively. However, findings were statistically not significant [Table 2].

Further, the prevalence was more among family members with both parents being diabetic (14.94%) when compared with a single parent being diabetic (8.22%). The findings were statistically significant.

Discussion

Diabetes mellitus and cardiovascular diseases lead the list of all non-communicable diseases. Diabetes is fortunately one of the most preventable diseases of all noncommunicable diseases. Primary prevention
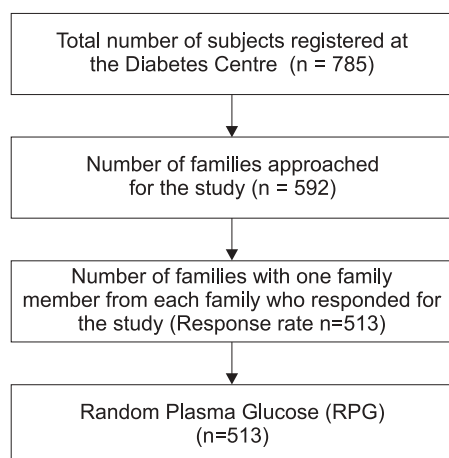
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┌─────────────────────────────────────────┐
│ Total number of subjects registered at   │
│ the Diabetes Centre  (n = 785)            │
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│ Number of families approached             │
│ for the study (n = 592)                   │
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│ Number of families with one family       │
│ member from each family who responded for │
│ the study (Response rate n=513)           │
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│ Random Plasma Glucose (RPG)               │
│ (n=513)                                   │
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Figure 1: Flow-chart depicting diabetes study at the diabetes centre

Table 1: Prevalence of diabetes according to sex and age

Age (years)	Male	Diabetes	Female	Diabetes	Total subjects	Total diabetes	Percentage
20-29	82	0	40	0	122	0	0
30-39	146	12	62	8	208	20	9.62
40-49	79	20	69	7	148	27	18.24
50-59	9	1	12	0	21	1	4.76
60 and above	2	0	00	0	14	0	0
Total	318	33	195	15	513	48	9.36

$\chi^2 = 28.133$, df = 3, $P = 0.000003$

Table 2: Prevalence of diabetes according to parental history

Family	Subjects	Cases	Percentage
Group A[a]			
Father	216	14	6.48
Mother	210	21	10.00
Both parents	87	13	14.94
Total	513	48	9.36
Group B[b]			
Both parents	87	13	14.94
Single parent	426	35	8.22
Total	513	48	9.36

[a]$\chi^2 = 5.40852$, df = 2, $P = 0.066920$
[b]$\chi^2 = 3.854$, df = 1, $P = 0.049620$

strategies can be formulated based on the risk factors for diabetes.[8] Among all the known risk factors, the family history of diabetes is most important and it is considered in the present study.

In the present study, the prevalence of diabetes was more among males (10.38%) compared with females (7.90%) but the findings were statistically not significant. According to the age, the prevalence of diabetes was more in the age groups 30-39 (9.62%) and 40-49 years (18.24%). This shows that the changing trends in disease occurrence are affecting the people of productive age group and making them socioeconomically inefficient.

The risk of developing diabetes is more among individuals with a family history. Further, stronger the family history, higher the chances of getting diabetes. In our study the prevalence of diabetes was more among family members with both parents being diabetic (14.94%) compared with family members with a single parent being diabetic (8.22%).

In another study by Ramachandran *et al.*,[9] an urban population in a township in South India was screened for diabetes with an OGTT. Totally, 678 people (346 men and 332 women) were tested, 34 (5%) had diabetes, and 14 (2%) had impaired glucose tolerance (IGT). Diabetes was present in 21% (37/179) of people aged over 40. A family history of diabetes was present in 16 of the 34

subjects with diabetes and 9 of the 15 with IGT.

Mehta and Ghosh[10] conducted the population-based study among 462 persons in 111 families. The prevalence of IGT and frank diabetes mellitus was 8.7% and 3.23%, respectively. The prevalence of diabetes among the siblings was quite high when one parent was diabetic, compared with neither of the parents being diabetic.

Further, in our study the prevalence of diabetes was more among family members with diabetic mother alone (10%), when compared with family members with diabetic father alone (6.48%). This indicates excess maternal transmission of type 2 diabetes among offsprings.

Similarly, Andrew *et al.*[11] conducted a study to assess excess maternal transmission among 42533 survey respondents with type 2 diabetes (probands) by calculating the prevalence of diabetes in their siblings and offsprings. Siblings (n=60532) of probands with affected mothers had a greater prevalence of diabetes (20%) than those with affected fathers (17%). This was an evidence for excess maternal transmission of mitochondrial genes to their siblings.

Meigs *et al.*[12] found that maternal diabetes conferred excess risk for both IGT and IFG, placing specific offspring at varying stages in progression from normal to diabetic glucose tolerance.

In another study by Viswanathan *et al.*,[13] the prevalence of type 2 (non-insulin-dependent) diabetes among offsprings of conjugal type 2 diabetic parents in India was determined by performing OGTT. Diabetes was present in 50% of offsprings, and 12% had IGT according to the National Diabetes Data Group criteria. Thus, 62% of all offsprings had abnormal glucose tests.

Bo *et al.*[14] conducted a study on influence of a family history of diabetes on the clinical characteristics of patients with type 2 diabetes mellitus. All 2113 patients attending the diabetes clinic were recruited and those

with diabetic mothers, diabetic fathers, diabetic relatives, and non diabetic relatives were considered separately. The prevalence of diabetes in mother, father, and other relatives was 25.5, 6.54, and 21.2%, respectively.

Thus, these research studies indicate that there is a strong association between heredity and diabetes mellitus. Further, stronger the family history, greater is the tendency of getting diabetes.

Conclusion

India is going to face a big challenge posed by the prevalence of diabetes and its complications, unless severe steps are taken to implement the primary and secondary prevention of diabetes. It is essential to identify the risk factors for diabetes and also for the vascular complications.

Primary prevention of diabetes is possible by modifying the environmental factors influencing diabetogenesis, such as obesity, diet, and physical activity. Long-term studies have shown the beneficial effects of lifestyle modifications on reducing the risk of diabetes.[15]

India needs to implement the preventive measures to reduce the burden of diabetes as it poses a big medical challenge, which is not matched by proper budget allocations for diabetes care in India. It is estimated that the annual cost of diabetes is approximately INR 90200 million. The average expenditure per patient per year would be a minimum of INR 4500.[16]

Epidemiological studies examining the relationship between type 2 diabetes and family history have consistently found that a positive family history among first-degree relatives results in an increased risk of type 2 diabetes and that the risk is greater when both parents are affected. Using family history information as a screening tool is appealing because it is easy and inexpensive to collect in both clinical and community settings and also because prevention can be targeted to the individual or extended to the family. The relevant advice on diet, weight reduction, physical exercise, healthy habits, and lifestyle would reduce the risk of developing type 2 diabetes among first-degree relatives.

Based on the findings of the present study, the following recommendations are suggested for the control and prevention of diabetes mellitus.
1. Similar studies can be conducted in community

settings for early detection of asymptomatic individuals.
2. All the persons of 30 years and above can be encouraged to visit voluntarily to counseling centres and undergo blood glucose tests (or at screening camps).
3. Health education programs may also be conducted in the local schools and children should cultivate healthy lifestyles such as an appropriate dietary habits, physical activities (sports), and good habits.
4. Involvement of non-governmental and voluntary organizations in every step in adopting healthy lifestyles among people and diabetes related health education activities.

To conclude, the use of eliciting detailed family history information as a public health tool appears very promising, but it requires further in-depth research for considering risk perception.

Acknowledgments

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