Scholars Journal of Applied Medical Sciences
Abbreviated Key Title: Sch J App Med Sci
ISSN 2347-954X (Print) | ISSN 2320-6691 (Online)
Journal homepage: www.saspublishers.com

OPEN ACCESS

Medicine

Prediabetes in First Degree Relatives of Type 2 Diabetes Mellitus Patients: A Study from Rural Hospital

Jayakumar Papanna[1], Shruthi Bettegowda[2*]

[1]Assistant Professor, Department of Medicine, Adichunchanagiri Institute of Medical Sciences, Balagangadharanatha Nagar, Nagamangala, Mandya - 571448, India
[2]Associate Professor, Department of Medicine, Adichunchanagiri Institute of Medical Sciences, Balagangadharanatha Nagar, Nagamangala, Mandya - 571448, India

***Corresponding author:** Shruthi Bettegowda
| **Received:** 13.03.2019 | **Accepted:** 27.03.2019 | **Published:** 30.03.2019
DOI: 10.36347/sjams.2019.v07i03.071

Abstract **Original Research Article**

Prediabetes is a condition that involves impaired glucose tolerance or impaired fasting glucose. Studies have shown that people with prediabetes tend to develop type 2 diabetes over a period and are at increased risk for cardiovascular disease and death even before the development of diabetes. Early detection of prediabetes status becomes more important when first-degree relatives of patients with Type 2 diabetes are concerned as genetics is an unmodifiable risk factor. The objective of our study was to determine the prevalence of prediabetes in first-degree relatives of patients with Type 2 diabetes mellitus in a rural population of south India.100 first-degree relatives of patients with Type 2 diabetes mellitus were included in this study. Study protocol included detailed clinical history, examination and investigations. Blood samples for fasting blood sugar and 2 h post glucose blood sugar were taken. In the present study of a total of 18 subjects had prediabetes based on their FBS levels and 12% of the individuals had newly detected diabetes mellitus by this method. In this study impaired glucose tolerance was present in 20% of the study population and14% of the individuals had newly detected diabetes mellitus by this method. Prevalence of prediabetes is increasing in rural sectors of our nation. Early detection of prediabetes in a susceptible group is important. Lifestyle modifications (dietary restriction and exercise) and certain medications can prevent the development of diabetes in persons with prediabetes. More prospective studies with a larger population are needed.

Keywords: Impaired Fasting Glucose, Impaired Glucose Tolerance, Prediabetes, First Degree Relatives, Type 2diabetes mellitus.

INTRODUCTION

Diabetes is a common non communicable disease and emerging as a serious medical and social problem. The prevalence of type 2 diabetes mellitus (T2 DM) is rapidly increasing worldwide. The prevalence of diabetes, as well as prediabetes, has significantly increased in India during recent years [1]. The prediabetes is a condition that involves impaired glucose tolerance (IGT) or impaired fasting glucose (IFG)[2]. Majority of persons with prediabetes progress to diabetes in the long run [3]. Previous studies reported that IGT increase the risk for certain microvascular complications that are typically associated with diabetes [4, 5]. Multiple studies have showed the increased risk of cardiovascular disease (CVD) in patients with IGT[6]. Many previous studies proved that patients with a positive family history of diabetes experience 3- to 4-fold higher risk of developing diabetes than those with a negative family history [7]. Some studies proved that risk of diabetes increases with the number of affected relatives. Level of risk of diabetes is related to the nature of relationship with the affected relatives [7]. Some studies shown that first-degree relatives (FDR) of diabetes patients are associated with a higher risk than that of second-degree relatives [8]. Even though the family history of diabetes is a non-modifiable risk, having knowledge of association between prediabetes and family history of diabetes can help to make healthy life style modification. These healthy life styles can be implemented in early life of at risk individuals as a preventive measure before the development of diabetes. Although diabetes is very common in south India, studies on prediabetes in FDR of T2DM patients from rural Indian areas are lacking. Therefore, the aim of this study was to find out the prevalence of IFG and IGT in the FDRs of patients with T2DM in a rural population of south India.

MATERIALS AND METHODS

This was cross sectional hospital based study. A total of 100 subjects were selected. After taking consent, patients were subjected for blood investigations. Study protocol included detailed clinical history and examination and investigations. A detailed clinical work up incorporating details of age, diet, smoking, alcohol consumption, physical activity, reproductive history, socioeconomic status, body mass index and pedigree chart was made. Height, waist and hip circumference were measured in centimetres by using a non-stretchable standard tape with a metal buckle at one end over the light clothing. Waist circumference was measured in the centre of the iliac crest and the coastal margin, and hip circumference was measured at the widest point on buttocks below the iliac crest. Patients were divided in to non-obese and obese on the basis of body mass index (BMI).Fasting blood sugar (FBS): After an overnight fasting of 10 h, venous blood samples were taken and the FBS was estimated. 2 h post glucose loading blood sugar (PLBS): 75 g of anhydrous glucose was given in 200 ml of water to the patient after taking the venous blood sample for FBS. After 2 h, venous blood samples were taken again to measure the 2 h PLBS. Ethics committee approval was taken for the study.

Inclusion Criteria

- Persons Aged >20 years who were first degree relatives of T2DM patients.

Exclusion Criteria

- Patients with liver cell diseases
- Patients with endocrine disorders such as insulinoma, postpancreatectomy
- Patients on drugs such as somatostatin, beta blockers, diazoxide, thiazide diuretics,
- Patients with renal disease both acute and chronic
- Patients with type 1 DM

Definition of terms

Impaired glucose tolerance(IGT) is defined by a 2-h oral glucose tolerance test plasma glucose concentration >140 mg/dL (7.8 mmol/L) but <200 mg/dL (11.1 mmol/L).Impaired fasting glucose (IFG) is defined by a fasting plasma glucose concentration≥100 mg/dL (5.6mmol/L), but <126 mg/dL (7.0 mmol/L).Patients on oral hypoglycemic drugs, Insulin or those having fasting blood sugar > 126 g/dl or 2 h PLBS >200 mg/dl or Symptoms of diabetes and random plasma glucose concentration >200 mg/dl were regarded as having diabetes mellitus. A body mass index (BMI) of 29.9 Kg/m**2** or more in subjects indicates obesity.

$$BMI=\frac{\text{Body weight (Kg)}}{\text{Height}^2 \text{ (meters)}}$$

Data Analysis

Data were compiled and tabulated by using standard appropriate statistical technique, which includes numbers and percentages.

RESULTS

Sex distribution

In our study 58 were males and 42 were females (Table 1).

Age distribution

In this study maximum number of prediabetics belonged to 3rd decade (24%). Maximum number of diabetics detected in 5th decade (Table 2).

Obesity

In present study 25 prediabetics had obesity and 13 people were overweight (Table 3).

Table-1: sex distribution

Sex	Number	Percentage
Male	58	58%
Female	42	42%
Total	100	

Table-2: Age distribution

Age (years)	Numbers	Prediabetes	Diabetes
20-29	22	2	0
30-39	42	24	7
40-49	20	12	9
50-59	16	0	10
Total	100	38	26

Table-3: Association of Body Mass Index with prediabetics

Category	Body mass index(kg/m^2)	Number of prediabetics	Normal subjects	Diabetes
Under weight	<18.5	0	2	0
Normal weight	18.5-24.9	1	26	1
Over weight	25-29.9	13	6	7
Class 1 obesity	30-34.9	10	2	8
Class 2 obesity	35-39.9	14	0	10
Extreme obesity	40	0	0	0
Total		38	36	26

FBS values

A total of 18 subjects had prediabetes based on their FBS levels which included almost 6% of women and 12% of the men.12% of the individuals had newly detected DM by this method. (Table 4)

Table-4: FBS values

FBS (in mg/dl)	Males	Females	Total
< 100 (normal)	42	28	70 (70%)
≥100<126(IFG)	12	6	18(18%)
≥126(Diabetes)	4	8	12(12%)
Total	58	42	100

2h Post loading blood sugar values

In this study IGT was present in 20% of the study population affecting 10% of women and 10% of men. 14% of the individuals had newly detected DM by this method (Table 5).

Table-5: 2h post loading blood sugar values

2 h postloading blood sugar (in mg/dl)	Males	Females	Total
< 140 (normal)	40	26	66(66%)
≥140<200(IGT)	10	10	20(20%)
≥200(Diabetes)	8	6	14(14%)
Total	58	42	100

DISCUSSION

Previous studies have identified that prediabetes, family history of T2DM are associated with the development of T2DM [9-11]. IFG and IGT have different pathophysiological mechanism. Increased hepatic glucose output production is main problem in persons with IFG along with dysfunction in early insulin secretion. Moderate to severe insulin resistance in muscles causes IGT [12]. Many studies have shown that through lifestyle and pharmacologic interventions in prediabetes patients, progression to T2DM can be delayed or prevented [13-16]. The finding of association between prediabetes and family history of diabetes emphasizes the fact that knowledge can be utilized to initiate healthy life style in the risk population.

In our study, the prevalence of IFG was found to be 18% in the FDR of T2DM and 12% of the study population was found to have newly diagnosed DM on the basis of their fasting sugar levels. One of the studies done in Madhya pradesh reported an overall prevalence of prediabetes by IFG to be 14.5% which is comparable to the prevalence reported in our study [17]. A study done in Andra Pradesh reported an overall prevalence of prediabetes by IFG to be 15.5% [18]. In this study IGT was present in 20% of the study population affecting 10% of women and 10% of men. 14% of the individuals had newly detected DM by this method. Similar findings were observed in other studies [17, 18].

CONCLUSION

This study concludes that prediabetes is observed in high prevalence among FDR of T2DM patients. Treatment of prediabetes in FDR of T2DM patients should probably be included in the primary preventive program for diabetes. More longitudinal cohort studies are needed to give high level of evidence to confirm this association in order to establish the need to be more aggressive in risk factor control in these individuals. The main limitation of our study is small sample size. More population based studies with large sample size needed in future; various geographical areas and populations should be considered.

REFERENCES

1. Rajadhyaksha V. Managing diabetes patients in India: Is the future more bitter or less sweet?. Perspect Clin Res. 2018;9(1):1-3.
2. Genuth S, Alberti KG, Bennett P, Buse J, Defronzo R, Kahn R. Expert Committee on the Diagnosis and Classification of Diabetes Mellitus. Follow-up

report on the diagnosis of diabetes mellitus. Diabetes Care. 2003;26:3160 –3167.
3. Edelstein SL, Knowler WC, Bain RP, Andres R, Barrett-Connor EL, Dowse GK, Haffher SM, Pettitt DJ, Sorkin JD, Muller DC, Collins VR. Predictors of progression from impaired glucose tolerance to NIDDM: an analysis of six prospective studies. Diabetes. 1997 Apr 1;46(4):701-10.
4. Singleton JR, Smith AG, Russell JW, Feldman EL. Microvascular complications of impaired glucose tolerance. Diabetes. 2003;52:2867–2873.
5. Diabetes Prevention Program Research Group. The prevalence of retinopathy in impaired glucose tolerance and recent-onset diabetes in theDiabetes Prevention Program. Diabet Med. 2007;24:137–144.
6. The DECODE Study Group, European Diabetes Epidemiology Group. Is the current definition for diabetes relevant to mortality risk from all causes and cardiovascular and noncardiovascular diseases?Diabetes Care. 2003;26:688 –96.
Zhang J, Yang Z, Xiao J, Xing X, Lu J, Weng J, Jia W, Ji L, Shan Z, Liu J, Tian H. Association between family history risk categories and prevalence of diabetes in Chinese population. PLoS One. 2015 Feb 9;10(2):e0117044.
7. Valdez R, Yoon PW, Liu T, Khoury MJ. Family history and prevalence of diabetes in the US population: the 6-year results from the National Health and Nutrition Examination Survey (1999–2004). Diabetes care. 2007 Oct 1;30(10):2517-22.
8. Charles MA, Fontbonne A, Thibult N, Warnet JM, Rosselin GE, Eschwege E. Risk factors for NIDDM in white population: Paris prospective study. Diabetes. 1991 Jul 1;40(7):796-9.
9. Eastman RC, Cowie CC, Harris MI. Undiagnosed diabetes or impaired glucose tolerance and cardiovascular risk.2002.
10. Tuomilehto J, Knowler WC, Zimmet P. Primary prevention of non-insulin dependent diabetes mellitus. Diabetes Metab Rev.1992;8:339-353.
11. Unwin N, Shaw J, Zimmet P, Alberti KG. Impaired glucose tolerance and impaired fasting glycaemia: the current status on definition and intervention. Diabet Med. 2002;19(9):708–723.
12. Chiasson JL. Prevention of type 2 diabetes: fact or fiction. Expert Opin Pharmacother. 2007;8:3147-3158.
13. Eriksson KF, Lindgärde F. Prevention of Type 2 (non-insulin-dependent) diabetes mellitus by diet and physical exercise The 6-year Malmö feasibility study. Diabetologia. 1991 Dec 1;34(12):891-8.
14. Pan XR, Li GW, Hu YH, Wang JX, Yang WY, An ZX, Hu ZX, Xiao JZ, Cao HB, Liu PA, Jiang XG. Effects of diet and exercise in preventing NIDDM in people with impaired glucose tolerance: the Da Qing IGT and Diabetes Study. Diabetes care. 1997 Apr 1;20(4):537-44.
15. Knowler WC, Barrett-Connor E, Fowler SE, Hamman RF, Lachin JM, Walker EA, Nathan DM. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. The New England journal of medicine. 2002 Feb;346(6):393-403.
16. Knowler WC, Barrett-Connor E, Fowler SE, Hamman RF, Lachin JM, Walker EA, Nathan DM. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. The New England journal of medicine. 2002 Feb;346(6):393-403.
17. Chow CK, Raju PK, Raju R, Reddy KS, Cardona M, Celermajer DS, Neal BC. The prevalence and management of diabetes in rural India. Diabetes care. 2006 Jul 1;29(7):1717-8.