Original Research Article

Assessment of Prevalence of Pre-Diabetes and Cardio-Metabolic Risk Factors in First Degree Relatives of Patients with Type-II Diabetes Mellitus

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Abstract

Background: Diabetes and cardiovascular diseases may have interlinked under lying mechanism, in addition to multiple common risk factors. The present study was conducted to assess prevalence of pre-diabetes and cardio-metabolic risk factors in first degree relatives of patients with type-II diabetes mellitus.

Materials & Methods: 110 first degree relatives of patients suffering from Type 2 DM of both genders were included. Parameters such as weight (Kg) and height (cm) and BMI was measured. Waist circumference, fasting lipid profile, fasting blood sugar (FBS), post prandial blood sugar (PPBS), glycated haemoglobin (HbA1c) was performed.

Results: Out of 110 patients, males were 65 and females were 45. Age group 30-34 years had prediabetics seen in 7, 35-39 years in 13, 40-44 years in 11 and 45-49 years in 9. The difference was significant ($P< 0.05$). Pre diabetic patients were detected with only IFG in 4, only IGT in 8 and in both IFG and IGT in 28. The difference was significant ($P< 0.05$). The mean value in subjects with absent diabetes and present diabetes of BMI (kg/m2) was 23.1 and 26.8, LDL (mg/dl) was 126.2 and 146.4, HDL (mg/dl) was 44.2 and 35.2, TG (mg/dl) was 130.2 and 154.9, FBS (mg/dl) was 92.3 and 110.4 and HbA1c (%) was 5.6 and 5.7 respectively.

Conclusion: First degree relatives of patients with type 2 DM patients have high prevalence of prediabetes and other cardio metabolic risk factors.

Keywords: prediabetes, Metabolic syndrome, cardiovascular disease

Introduction

Metabolic syndrome (MetS) is an important public health problem worldwide, and its prevalence is increasing. [1] Patients with MetS are at greater risk of cardiovascular disease and type 2 diabetes. [2] According to the International Diabetes Federation, approximately 415 million people were suffering from diabetes worldwide, and this number is expected to exceed 640million by the year 2040. It is estimated that half of patients with diabetes are unaware of their disease and are thus more prone to developing diabetic complications. Type2 DM has become an observably global public health problem. [3]

The World Health Organization (WHO) has defined prediabetes as a state of intermediate hyperglycemia using two specific parameters, impaired fasting glucose (IFG) defined as fasting plasma glucose (FPG) of 6.1-6.9 mmol/L (110 to 125 mg/dL) and impaired glucose tolerance (IGT) defined as 2 h plasma glucose of 7.8-11.0 mmol/L (140-200 mg/dL) after ingestion of 75 g of oral glucose load or a combination of the two based on a 2 h oral glucose tolerance test (OGTT). [4]

This is particularly relevant in first degree relatives (FDRs) of people with type 2 diabetes, who are at even greater cardiovascular and diabetes risk. There is a high prevalence of pre-diabetes in relatives of type-2 diabetes mellitus patients observed in many western studies. [4] There are only few Indian studies done on this topic. The prevalence of Diabetes is on rise worldwide. Type 2 DM is the more prevalent form of diabetes. [5] Research indicates that in addition to the lifestyle factors, there is a significant genetic predisposition amongst the cases of Type 2 DM, as evidenced by higher risk with positive family history and concordance at in twins. Recently, it has also been realized that the Diabetes and cardiovascular diseases may have interlinked under lying mechanism, in addition to multiple common risk factors. [6] The present study was conducted to assess prevalence of pre-diabetes and cardio-metabolic risk factors in first degree relatives of patients with type-II diabetes mellitus.

Materials & Methods

Results

The present observational study was conducted between 15 March 2021 to 14 March 2022 in Medicine OPD and ward at ABVIMS & Dr Ram Manohar Lohia Hospital, New Delhi.

It comprised of 110 first degree relatives of patients suffering from Type 2 DM of both genders. The consent was obtained from all enrolled patients.

Inclusion criteria

- Not diagnosed with any chronic diseases.
- Not associated with any illness or infections that affect blood glucose levels
- Male or female aged between 30 years to 60 years

Exclusion criteria:

- Established cases DM
- any known comorbidity eg CKD/CLD/ ASCVD/ dyslipidemia

Data such as name, age, gender etc. was recorded. Parameters such as weight (Kg) and height (cm) and BMI was measured. Waist circumference was measured by using measuring tape. Waist: hip ratio was also calculated. Supine blood pressure was recorded for both arms. The estimation of plasma sugar was carried out by Glucose Oxidase and Peroxidase method. The estimation of fasting lipid profile, fasting blood sugar (FBS), post prandial blood sugar (PPBS), glycated haemoglobin (HbA1c) was performed. Results were analyzed statistically. P value < 0.05 was considered significant.

Table 1: Distribution of patients

Total- 110		
Gender	**Males**	**Females**
Number	65	45

Table 1 shows that out of 110 patients, males were 65 and females were 45.

Table 2: Age and prediabetes status wise distribution

Status of diabetes	AGE (in years)				
	30-34	35-39	40-44	45-49	total
Pre-diabetes absent	10	15	20	25	70
Pre-diabetes present	7	13	11	9	40
P value	0.05				

Table 2, Figure 1 shows that age group 30-34 years had prediabetics seen in 7, 35-39 years in 13, 40-44 years in11 and 45-49 years in 9. The difference was significant (P< 0.05).
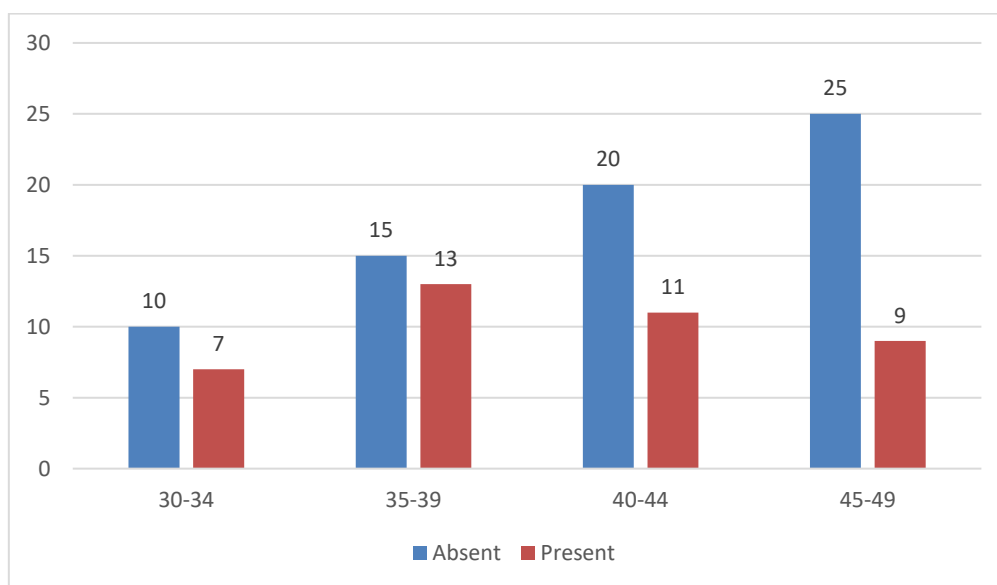

Figure 1: Age and prediabetes status wise distribution

Table 3: Pre diabetic patients detected with impaired fasting glucose (IFG) and impaired glucose tolerance (IGT) tests

Parameters	Number	P value
Only IFG	4	0.01
Only IGT	8	
Both IFG and IGT	28	
Total	40	

Table 3 shows that pre diabetic patients were detected with only IFG in 4, only IGT in 8 and in both IFG and IGT in 28. The difference was significant (P< 0.05).

Table 4: Laboratory investigations in the study population

Parameters	Pre-diabetes Absent	Pre-diabetes present	P value
BMI (kg/m2)	23.1	26.8	0.05
LDL (mg/dl)	126.2	146.4	0.01
HDL (mg/dl)	44.2	35.2	0.02
TG (mg/dl)	130.2	154.9	0.05
FBS (mg/dl)	92.3	110.4	0.01
HbA1c (%)	5.6	5.7	0.15

Table IV shows that the mean value in subjects with absent diabetes and present diabetes of BMI (kg/m2) was 23.1 and 26.8, LDL (mg/dl) was 126.2 and 146.4, HDL (mg/dl) was 44.2 and 35.2, TG (mg/dl) was 130.2 and 154.9, FBS (mg/dl) was 92.3 and 110.4 and HbA1c (%) was 5.6 and 5.7 respectively. The difference was significant (P< 0.05).

Discussion

With the increasing prevalence of diabetes and obesity worldwide and the number of first degree relatives (FDRs) of people with type 2 diabetes, and thus an increased risk of developing MetS, will also increase. [7] Identifying risk factors associated with susceptibility to MetS becomes increasingly important. [8] Accurate information regarding the incidence of MetS and associated risk factors in FDRs of people with diabetes is important to get a better understanding of the etiology and possibly to prevent or delay its development and complications of disease in this population. [9] However, based on the high prevalence and high incidence of obesity and type 2 diabetes in the FDRs of people with type 2 diabetes, one can expect that the inheritance pattern may play an essential role in the development of MetS. [10] The present study was conducted to assess prevalence of pre-diabetes and cardio-metabolic risk factors in first degree relatives of patients with type-II diabetes mellitus.

We found that out of 110 patients, males were 65 and females were 45. Kishore et al [11] found that the prevalence of prediabetes amongst the first- degree relatives of type 2DM was found to be 26%. The prevalence of cardio metabolic risk factors observed amongst the first- degree relatives of patients of Type 2 DM were: history of CVD in 12%, Over weight by BMI in 73%, Overweight by WHR in 54%, Hypertension in 32%, Dyslipidemia in 47%. The prevalence of Prediabetes was found to be more in the first degree relatives

of diabetes patients who were overweight (by BMI) (32.88%) than those first degree relatives with the normal weight (by BMI) (7.41%). The prevalence of Prediabetes was more in the first degree relatives of Type 2diabetes patients who were Overweight (by WHR) (37.04%) than the first degree relatives with the normal weight (byWHR) (13.04%). The mean BMI and WHR was higher in the first degree relatives of Type2 diabetes patients with Prediabetes. The mean levels of LDL and TG were higher and mean HDL was lower in the first degree relatives of Type 2 diabetes patients with Prediabetes. The mean levels of FBS and PLBS was higher in the study population with Prediabetes amongst the first degree relatives of Type2 DM.

We found that age group 30-34 years had prediabetics seen in 7, 35-39 years in 13, 40-44 years in11 and 45-49 years in 9. Janghorbani et al [12] assessed the incidence of and risk factors for the development of Met S in FDRs of patients with type 2 diabetes. A total of 3217 (842 men and 2375 women) FDRs of consecutive patients with type 2 diabetes aged 30-70 years in 2003-2005 were followed through 2010. At baseline participants underwent a standard 75g 2-h standard OGTT and HbA1c measurements. Met S was defined by the NCEP-ATP III. The study group consisted of 734 participants without Met S and history of known diabetes at baseline and had at least one subsequent review in mean (SD) follow-up period of 5.5 (1.2) years. The prevalence of Met S was 35.8% (95% CI: 34.2, 37.5). The incidence of Met S was 4.3% (95% CI: 3.7, 4.9) (4.6% men and 4.2% women) per year. Multivariate analysis revealed that impaired glucose tolerance (IGT) (RR 1.89 (95% CI: 1.28, 2.79)), impaired fasting glucose (IFG) (RR 1.39 (95% CI: 1.10, 1.73)) and lower HDL (RR 1.34 (95% CI: 1.12, 1.60)) were associated with Met S. Zheng S. et al [13] assessed the associations of TG, glucose and waist circumference with the

prevalence of prediabetes and diabetes in 1544 first degree relatives of Type 2 DM patients, they found that the mean age of the population having Prediabetes (52 years) was higher than the population without prediabetes (47 years). The mean BMI of the population having Pre diabetes (25.12 kg/m2) was more than the population without Prediabetes (24.39 kg/m2) and the difference was found to be statistically significant.

We observed that pre diabetic patients were detected with only IFG in 4, only IGT in 8 and in both IFG and IGT in 28. Gholi Z. et al [14] studied the characteristics of pre-diabetic patients associated with body composition and cardiovascular disease risk factors in the Iranian population. They included 193 Pre diabetic first- degree relatives and 193 age and gender matched controls (also first- degree relatives). [15] They observed that the mean systolic and diastolic blood pressures were higher in the Pre diabetic cases (SBP:115.26±16.07 mm Hg, DBP:78.36± 12.11 mm Hg) than in the controls (SBP:112.79 ± 13.69mmHg, DBP: 73.98 ± 12 mmHg). However, only the difference in the mean diastolic blood pressure was statistically significant.

Conclusion

Authors found that first degree relatives of patients with type 2 DM patients have high prevalence of prediabetes and other cardio metabolic risk factors.

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