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Research Article

IMPAIRED FASTING GLUCOSE AND IMPAIRED GLUCOSE TOLERANCE IN THE FIRST DEGREE RELATIVES OF PATIENTS WITH TYPE 2 DIABETES MELLITUS

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Abstract :

Impaired fasting glucose (IFG) and impaired glucose tolerance (IGT) are prediabetic stages and in approximately, 40 % of the people it progresses to diabetes in 5-10 years. This study was undertaken keeping in mind that early detection of IFG & IGT in the first degree relatives (FDR) of patients with T2DM can delay the progression to DM by modification of the environmental factors.

It was a hospital based; cross sectional study with a sample size of 300 subjects of ages > 20 years. Informed, written consent was taken from each subject. Blood samples were collected for fasting blood sugar after an overnight fast for 2 hrs and 2 hr post loading blood sugar samples after oral intake of 75 grams anhydrous glucose in 200 ml of water. The samples were analyzed on fully automated analyzer Hitachi 917, using Rosch Kit – by enzymatic colorimetric method. Glucose levels were classified according to the American Diabetic Association & WHO criteria.

On statistical analysis, it was seen that 31.3% (94/300) subjects had IFG and 16.7% (50/300) had IGT. Both IFG & IGT were higher in males. Based on the FBS values, 12.3% (37/300) subjects had DM and based on 2hrPLBS values 5.7% (17/300) subjects had DM. The mean FBS and 2hrPLBS in the study were 106 mg% and 123 mg% respectively. Using both FBS and 2hrPLBS, 5% subjected had undetected DM.

We conclude that the occurrence of IFG & IGT is higher in the FDR of patients with T2DM and it is important that measures be taken for their early detection, diagnosis and treatment to prevent it from progressing to T2DM.

Keywords: First degree Relatives , Impaired Fasting Glucose, Impaired Glucose Tolerance, Prediabetes, Type 2 Diabetes Mellitus,

INTRODUCTION

Diabetes Mellitus (DM), a constellation of heterogeneous chronic metabolic disorders, is defined as a 'relative or absolute deficiency of insulin due to impairment of insulin action and/or moderate to gross inadequacy of insulin secretion'. ([1]) It is a globally occurring health problem as there are 240 million people with diabetes worldwide and this figure is anticipated to rise to 380 million by 2025. ([2])

Prediabetes, as defined by the American Diabetic Association (ADA), is that state in which the blood glucose levels are higher than normal but not high enough to be diagnosed as DM but people with prediabetes are at an increased risk to develop type 2 DM (T2DM), heart disease and stroke.([3]) Impaired fasting glucose (IFG) and impaired glucose tolerance (IGT)

represent the two stages of prediabetes depending on the blood sugar levels in fasting and 2 hrs post glucose loading respectively.

First degree relatives (FDR) are individuals who share similar genetic characteristics as the patient (parents, siblings, and offspring). T2DM has a multifactorial etiolog where genetics plays a significant role as an unmodifiable risk factor. Family members of people with diabetes are at a high risk of developing diabetes. ([4]),([5])

India is at the helm of facing a big challenge posed by the rising prevalence of diabetes and its complications unless steps are taken to implement the primary and secondary prevention in diabetes. Studies are known to show the beneficial effects of life style modifications (diet, physical activity etc) on reducing the risk of diabetes. Indians need to implement the preventive measures to reduce the burden of diabetes as it poses a medical challenge that is not matched by the budget allocations for diabetes care in India.

This study aims to highlight the present scenario of prevalence of IFG & IGT specifically in a highly susceptible group, namely the FDR of the patients with known T2DM living in the industrial city of Ludhiana, Punjab. The focus of the study was limited to identifying individuals (FDR) exhibiting abnormal IFG &/or IGT. Early diagnosis of prediabetes, while the individual is asymptomatic helped us to advise the potential diabetic patient to avoid, delay or decrease the severity of symptoms or complications of diabetes who are genetically prone to developing the disease and helped the subjects to be aware of their impending health problems as regard to their diabetogenic potential and motivated them to take the necessary steps to alter their lifestyle and dietary habits.

MATERIAL AND METHOD

The study was conducted at Christian Medical College & Hospital, Ludhiana for a period of 2 years. It was a hospital based, cross sectional study approved by the institutional research and ethics committees. The sample size for the study was 300 (95% confidence level) as calculated from the Open Epi, version 2, Open Source Calculator. The subjects chosen were > 20 yrs, FDR of T2DM patients.

The investigations done for the study were fasting blood sugar (FBS) – after an overnight fasting of 10hrs, venous blood samples were taken & fasting blood sugars were estimated and 2hrs post glucose loading blood sugar (2hrPLBS) – 75 gms of anhydrous glucose was given in 200 ml of water was given to the subject after taking the venous blood samples for FBS. After 2 hrs venous blood samples were drawn again to measure PLBS.

The samples were immediately transferred to the biochemistry lab for analysis on fully automated analyzer Hitachi 917, using Rosch Kit – by enzymatic colorimetric method.

Glucose tolerance was assessed as according to the American Diabetic Association (ADA) & World Health Organization (WHO) criteria ([6]) as follows –

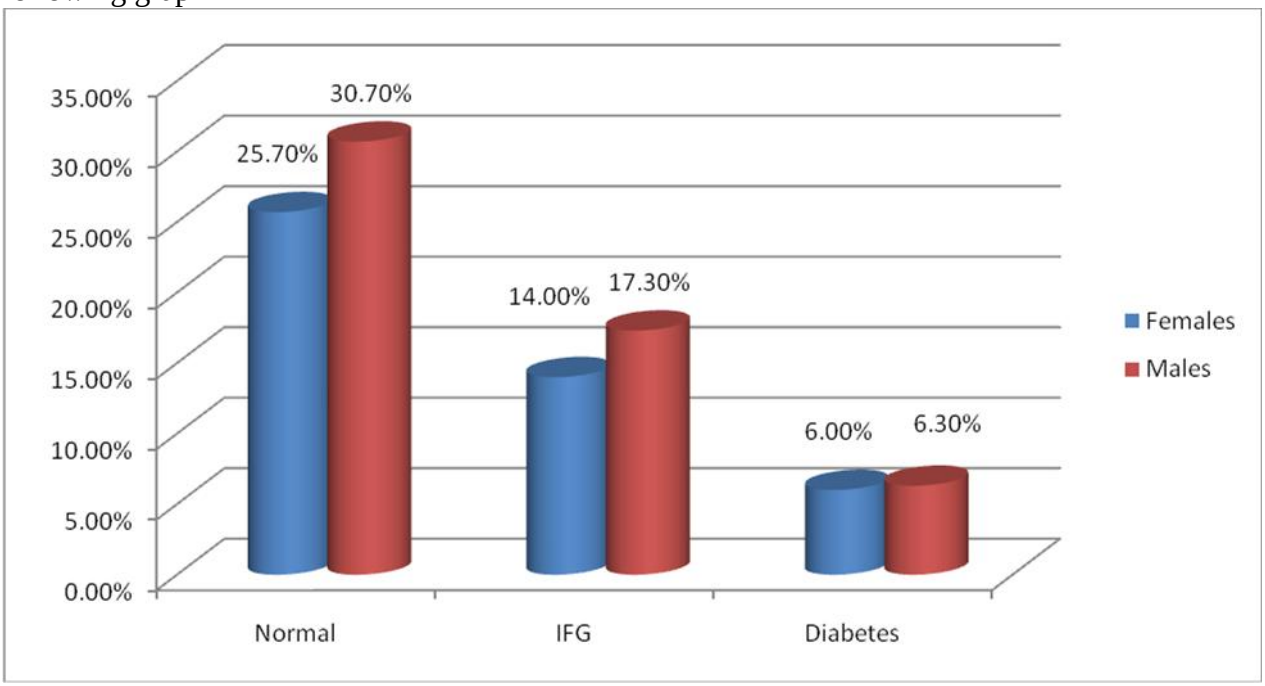
- IFG is defined as fasting venous plasma glucose ≥ 100 mg/dl – < 126 mg/dl, irrespective of 2 hrs value
- IGT is defined as 2 hrs post glucose loading blood sugar ≥ 140 mg/dl - < 200 mg/dl on oral glucose tolerance test (OGTT)
- Criteria for the diagnosis of DM:

- Symptoms of diabetes and random plasma glucose concentration ≥ 200 mg/dl
- FBS ≥ 126 mg/dl (where fasting is defined as no calorie intake for at least 8 hrs)
- 2h PLBS ≥ 200 mg/dl during OGTT

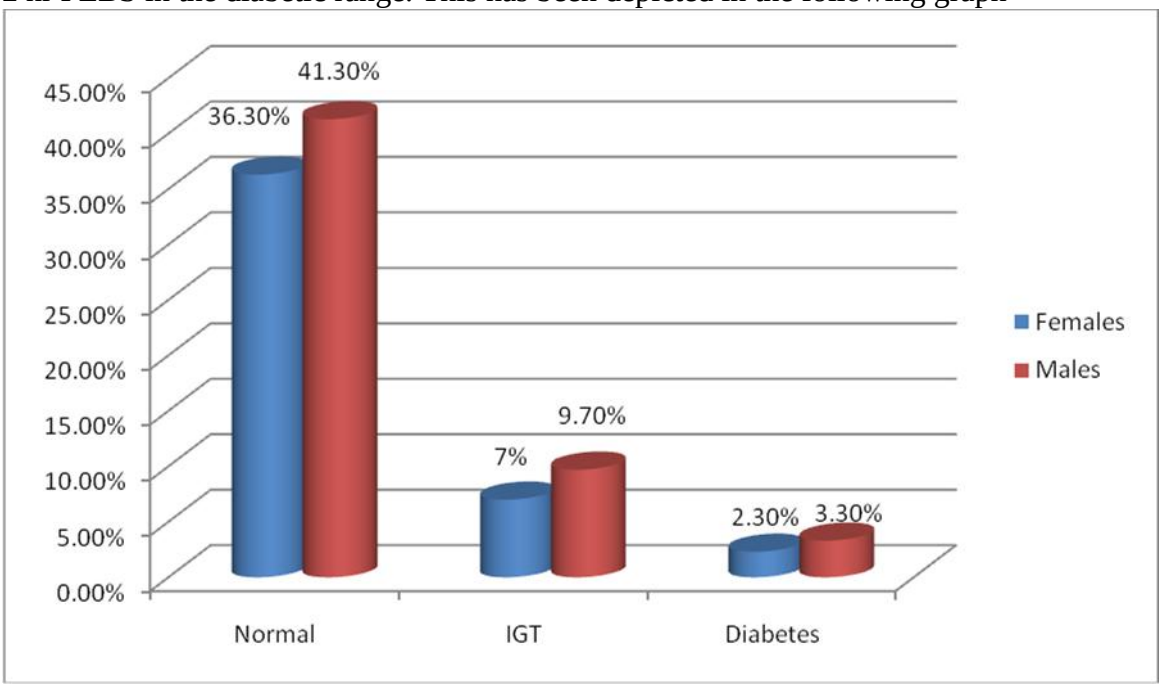
RESULT

The mean FBS in our study was found to be 106 mg/dl (SD 37.3) and mean 2 hr PLBS was 123 mg/dl (SD 50.8).

On investigating the FBS of the subjects there were 169 subjects (77 females and 92 males) were found to have normal blood sugar levels, 94 (42 females and 52 males) had IFG and 37 (18 females and 19 males) had FBS in the diabetic range. This has been depicted in the following graph



On investigating 2 hr PLBS, there were 233 subjects (109 females and 124 males) had normal blood sugars. , 50 (21 females and 29 males) had IGT and 17 (07 females and 10 males) had 2 hr PLBS in the diabetic range. This has been depicted in the following graph



On comparing abnormal FBS (n=131) with 2 hr PLBS values, 73 subjects had normal 2 hr PLBS, 42 had IGT and 16 had DM. On the other hand, on comparing abnormal 2 Hr PLBS (n = 67) with FBS levels, it was observed that only 9 subjects had normal FBS , 28 had IFG and 30 had DM

DISCUSSION

Against the background of DM being the epidemic of the new millennium, our study was conducted to explore the genetic epidemiology of T2DM to help to provide information and rationale for preventing further perpetuation of the disease in India.

The mean FBS & 2hr PLBS in our study is comparable to another study done on FDR of T2DM by Kumar et al in 2005([7]) where a mean FBS of 98.7 $\pm$ 31.2 (53 – 203) & 2 hr PLBS of 143.6 $\pm$ 53.95 (69 – 558) was observed. In an Iranian study on diabetes and impaired glucose regulation in FDR of T2DM by Amini & Janghorbani ([8]) (2007), the prevalence of IFG, IGT, T2DM was 17.3 %, 19.5 % & 10.3 % respectively. Earlier studies by Boer et al ([9]) and Lindhal et al ([10]) report similar findings. A Chinese study done by Li et al([4]) (2006) where phenotypic and genetic clustering in families with T2DM was observed in 913 family members, it was noted that 15 % IFG/ IGT

Amini et al ([11]) (2006) in their study on 1893 FDR of T2DM concluded that the prevalence of IFG & IGT is high in FDR of T2DM patients. In another trial by Najafipour et al ([12]) (2010), it was noted that IFG is more frequent than IGT in FDR of T2DM patients. The conclusion of this study is also in concordance with our study.

Hence, we conclude that the occurrence of IFG & IGT is higher in the FDR of patients with T2DMand it is important that measures be taken for their early detection, diagnosis and treatment to prevent the conditions to progress to T2DM

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