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Research Article

**FREQUENCY OF IMPAIRED FASTING BLOOD GLUCOSE  
IN HEALTHY OBESE FIRST DEGREE RELATIVES  
OF TYPE-2 DIABETES MELLITUS PATIENTS**Mujtaba Shah<sup>1\*</sup>, Ghulam Murtaza Shah<sup>2</sup>, Abid Ali<sup>3</sup><sup>1</sup>Liaquat University Hospital, Hyderabad<sup>2,3</sup>Liaquat University of Medical & Health Sciences, Jamshoro**Abstract:**

**Objective:** To determine the frequency of impaired fasting blood glucose in healthy obese first degree relatives of type-2 diabetes mellitus patients.

**Methodology:** This cross sectional study was conducted at Medical department of Liaquat University Hospital, Jamshoro over a period of six months. A total of 152 first degree relatives of type-2 diabetes mellitus patients, who were 18 years or older, having a BMI >25kg/m<sup>2</sup> were included. Known diabetic individuals, having any other endocrine disorders, pregnant women and women with polycystic ovarian disease were excluded. Fasting blood glucose between 100-126 mg/dL was labeled as Impaired Fasting Glucose.

**Results:** 60.5% (n= 92) of the sample comprised of males while 39.5% (n= 60) comprised of females. Female to male ratio was 1:1.53. The mean  $\pm$  SD age was 29.92  $\pm$  8.33 years with a range from 18 to 45 years. The mean  $\pm$  SD BMI was 31.68  $\pm$  3.31 Kg/m<sup>2</sup> while mean  $\pm$  SD FBS was 88.92  $\pm$  16.33mg/dL. FBS ranged from 60 to 162 mg/dL. The frequency of impaired fasting glucose in healthy obese first degree relatives of type-2 diabetic Patients was 13.2% (n = 20) [Odds ratio = 1.61, with 95% confidence interval of 7.82, 18.58].

**Conclusion:** Diabetes mellitus (DM) is emerging as a major health-care challenge for Pakistan. The impaired fasting glucose (IFG) is frequent in healthy obese first degree relatives of type-2 diabetic patients.

**Recommendations:** Proper and regular screening programmes are strongly recommended in this regard using the tests which are highly specific and sensitive.

**Key words:** Diabetes mellitus, Impaired fasting glucose, Obesity, BMI, Healthy.

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**INTRODUCTION:**

Diabetes mellitus is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion and/or insulin action and it is the third most common cause for morbidity and mortality [1]. Modernization has resulted in increased rate of diabetes, primarily because of a decrease in physical activity and an increase prevalence of obesity. Impaired fasting glucose is strongly associated with family history of type II diabetes mellitus and obesity. Most people with IFG and IGT go on to develop type II diabetes within 10 years. Progression of IFG and IGT to type II diabetes can be controlled by life style modification like weight reduction, increasing physical activity and restricting total calories.

We consider familial aggregation of diabetes as a risk factor for the development of type II Diabetes Mellitus (type-2 DM), since family members (first degree relatives) not only share the genetic/hereditary factors involved in the etio-pathogenesis of DM, but also the socio-environmental and other risk factors (obesity, hyperlipidemia, hypertension, race-ethnic group), they constitute a high risk group. Thus, early diagnosis of type-2 DM is important so that diabetes related morbidity and mortality could be reduced. It will be possible to identify these high-risk subjects by screening for IFG and IGT [2].

Pakistan is 7th in the world according to latest estimates of prevalence of diabetes with 7-million peoples suffering from diabetes and by the year 2025, the country is expected to be 4th with 15 million peoples suffering from diabetes, representing a 2 fold increase in case load [3], efforts can be taken to reduce the onset of diabetes by knowing the fasting and glucose tolerance status in healthy obese first degree relatives of diabetes by recommending life style modification like weight reduction, diet intervention and regular exercise.

The objective of this study is thus, to evaluate the prevalence of impaired fasting glucose for type II DM in first-degree relatives of known diabetic patients and highlight the impaired fasting glucose test to find out the incidence of DM [4-6].

**MATERIAL AND METHODS:****Study design:**

Cross sectional study.

**Setting:**

Medical departments of Liaquat University Hospital, Jamshoro.

**Duration:** Six months.

**Sample size:**

Sample size calculated using Open-Epi Software. Confidence level (1- $\alpha$  %) was taken as 95%, with precision (d) of 0.05 and a power of 80%. Prevalence of impaired fasting glucose in anticipated population was taken 11.1 %.10 with an estimated sample size of 152.

**Sample technique:**

Non-probability consecutive.

**Inclusion criteria:** Individuals fulfilling the following inclusion criteria were included

1. Individuals presenting at medical OPD for consultation regarding any health issue with a family history of type-2 diabetes mellitus in first degree relatives (father, mother, grandmother, grandfather, brother, sister, son and daughter).
2. Individuals aged 18 years or above and having a BMI (body mass index) 25kg/m<sup>2</sup> and;
3. A waist circumference >92 cms in males and >82 cms in females.

**Exclusion criteria:** The following individuals were excluded from the sample

1. Known diabetic individuals.
2. Pregnant women.
3. Individuals with any other endocrine disorders or known diagnosis of tumors, polycystic ovarian disease and any other disease with a potential risk of impaired glucose tolerance.

**Data collection procedure:**

Detailed medical history and physical examination was done for all the individuals who meet the inclusion criteria after taking informed consent. After a brief questionnaire based interview all participants were asked to follow for fasting blood sugar test. Blood samples were taken for overnight 8 hours fasting blood glucose, collected in test tube containing no preservative and were transported within half hour to Liaquat University Hospital laboratory to be examined using "PAP" enzymatic calorimetric test. Fasting blood glucose between 100-126 mg/dL was labeled as Impaired Fasting Glucose.

**Data analysis:**

Data were analyzed on SPSS version 19 and Microsoft Excel.

A p value of <0.05 was considered statistically significant.

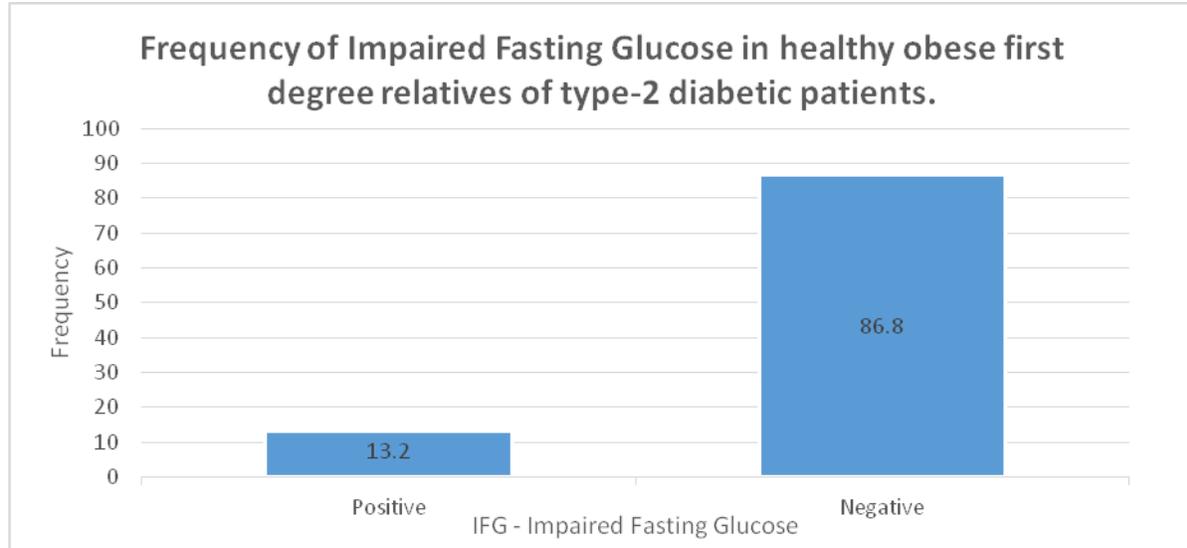
**RESULTS:**

Descriptive statistics (age, height, weight, BMI, waist circumference) are tabulated below. When evaluated for fasting blood sugar it was seen that mean  $\pm$  SD FBS was  $88.92 \pm 16.33$ mg/dL. FBS ranged from 60 to 162 mg/dL.

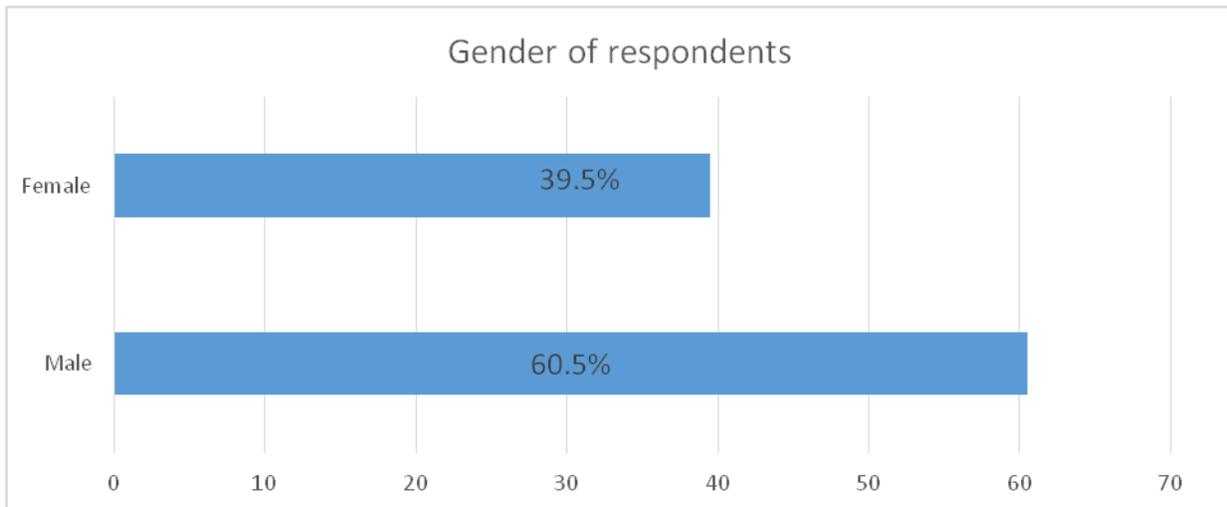
**Table 1: The mean  $\pm$  SD age of all the respondents (who were healthy obese first degree relatives of type-2 diabetes mellitus patients) was  $29.92 \pm 8.33$  years with a range from 18 to 45 years. (Table 1) The mean  $\pm$  SD height was  $144.85 \pm 9.06$  centimeters which ranged from 125 to 168 centimeters. The mean  $\pm$  SD waist was  $38.78 \pm 2.12$  centimeters with a minimum waist of 34 and maximum waist of 45 centimeters. (Table 1) The mean  $\pm$  SD BMI of these healthy but obese individuals at time of inclusion in the study was  $31.68 \pm 3.31$  Kg/m<sup>2</sup>. Minimum BMI was 26.27 Kg/m<sup>2</sup> while maximum BMI was 42.35 Kg/m<sup>2</sup>**

	<i>Minimum</i>	<i>Maximum</i>	<i>Mean</i>	<i>Std. Deviation</i>
<i>Age (Years)</i>	18	45	29.92	8.33
<i>Height (Centimeters)</i>	15	168	144.85	9.06
<i>Height (meter<sup>2</sup>)</i>	1.93	3.46	2.60	0.325
<i>Weight (KGs)</i>	55	104	82.03	10.48
<i>BMI (weight by height in meters<sup>2</sup>)</i>	26.27	42.35	31.68	3.31
<i>Waist (Centimeters)</i>	34	45	38.78	2.12
<i>Fasting Blood Sugar (mg/dL)</i>	60	162	88.92	16.33

The primary outcome variable i-e; frequency of impaired fasting glucose in healthy obese first degree relatives of type-2 diabetic Patients was 13.2% (n = 20)



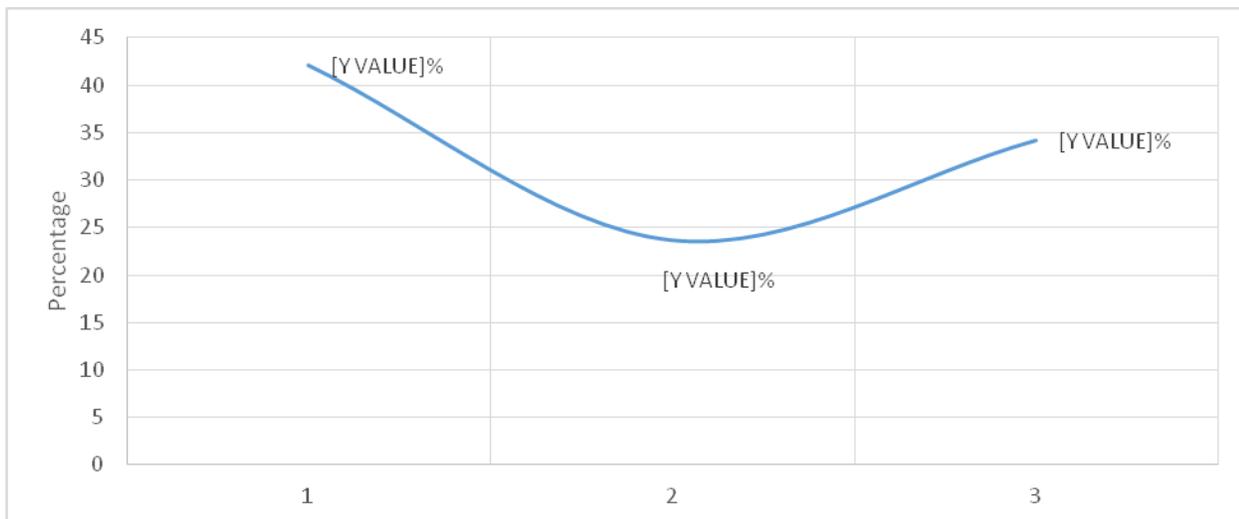
**Fig 1: frequency of impaired fasting glucose in healthy obese first degree relatives of type-2 diabetic Patients**



**Fig 2: Male respondents**

Male respondents were in majority. Males were 60.5% (n= 92) and females were 39.5% (n= 60).

Almost half of respondents were of younger age group i-e; 18-25 years (42.1%; n= 64). Thirty six (23.7%) respondent were of age between 25-35 years while in age category 36 years and above; there were 34.2% (n = 52) respondents.



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**Fig 3: Frequency of impaired fasting glucose in healthy obese first degree relatives of type-2 diabetic patients increased with increasing age. Among youngest group (18-25 years) it was 10.9% which increased to 11.1% in 26-35 years age group and further upto 17.3% in eldest age group (36 years and above). This finding was not significant (P value = 0.551)**

**DISCUSSION:**

Diabetes is the most common endocrine disorder and the third most common cause for morbidity and mortality, following cardiovascular diseases and malignancies. According to International Diabetes Federation, the prevalence of diabetes is expected to increase from 5.9 % to 8.1%, by 2025 affecting more than 300 million people. The First International Congress on pre-diabetes and the Metabolic Syndrome was of the opinion that more than 50% of people with diabetes will come from Asia over the next decade. Such is the magnitude of diabetes [7, 8].

One of few strong risk factors for the development of type II Diabetes Mellitus (type2 DM) is genetics and familial aggregation. The American Diabetes Association recommends screening patients who are overweight or obese (BMI of 25 or higher) and who have additional risk factors for diabetes (Table A), such as family history of one or more first-degree relatives with type II diabetes [8]. Impaired fasting glucose test (IFG-T) has been recommended as an ideal way to screen this high-risk group. By early identification followed by preventive measures like exercise, diet, and good glycemic control the development of DM or its complications can be postponed.

Putting this problem affront the current study was undertaken to evaluate the prevalence of impaired fasting glucose or type-2 DM in first-degree relatives of known type-2 diabetic patients and highlight the impaired fasting glucose test to find out the prevalence of glucose intolerance and DM.

The population included in current study was younger with about half respondents of age between 18 to 25 years. The mean age of all respondents was  $29.92 \pm 8.33$  years with a range from 18 to 45 years. A recent study [9] found that mean age (of obese healthy individuals, first degree relatives diabetes patients) was  $43.1 \pm 6.9$  years. This difference from the current study findings was due to difference in the age limit of the Iranian study i-e; 30-60 years.

In current study it was seen that male respondents were in majority. Female to male ratio was 1:1.53. No established evidence regarding increased susceptibility of any one gender for diabetes is available yet some studies found males while other reported female gender to be more prone to develop diabetes in case of a positive family history[10].

The frequency of impaired fasting blood glucose among obese healthy first degree relatives of type-2 diabetic patients was 13.2% [OR= 1.61; C.I. 7.82, 18.58] in current study. The rate documented by other studies ranges from 9.8% to 35% [9, 11]. The results of current study are thus in concordance with international prevalence.

Strengths of this study includes that it was first study to evaluate the risk of impaired fasting glucose in a high risk population in local context. The results of this study highlight the importance of screening of first degree obese relatives of type-2 diabetic patients who look and think themselves healthy otherwise. This will help in planning and implementing screening programs so as to early identify the potential undiscovered diabetes mellitus patients thus minimizing the morbidity and complications of diabetes mellitus.

**CONCLUSION:**

On basis of the results the study concludes that impaired fasting glucose is frequent in these populations at risk. Proper and regular screening programs are strongly recommended in this regard using the tests which are highly specific and sensitive. The current study warrants further research on the high risk people using continuous glucose monitoring system (CGMS) which is documented to be even better than OGTT in screening for diabetes mellitus type II.

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