

Comparison of the Impaired Fasting Blood Glucose in Young Healthy Individuals with Diabetic and Non-Diabetic First Degree Relatives

Mumtaz Ali Shaikh, Raj Kumar and Rafi Ahmed Ghori

ABSTRACT

Objective: To compare the fasting blood glucose (FBG) level in the healthy young individuals with diabetic first degree relatives considered as high risk and non-diabetic first degree relative considered as low risk.

Study Design: Cross-sectional, comparative study.

Place and Duration of Study: Department of Medicine, Liaquat University of Medical and Health Sciences Hospital, Hyderabad/Jamshoro, from January to November 2008.

Methodology: Individuals aged between 20-40 years were selected and divided into two groups. Group A was considered as high risk included non-diabetic young offspring's of type-2 diabetic parents. Group B was considered as low risk non-diabetic offsprings of non-diabetic family (control group), of same age and gender. Fasting blood glucose levels were measured in each individual. Exclusion criteria were known diabetes and pregnancy. Mean glucose levels were compared using t-test. Proportions of impaired glucose level versus positive family history were compared using chi-square test. Significance was considered at $p < 0.05$.

Results: There were a total of 500 subjects including 250 in each group with equal gender distribution in each group. The mean age was 27.46 ± 5.71 years. Mean FBG was 87.4 ± 13.82 mg/dl in group A and 77.7 ± 15.18 mg/dl in group B ($p=0.001$). Twenty five (10%) in group A and five (2%) in group B individuals showed impaired fasting blood glucose ($p=0.001$).

Conclusion: Impairment of fasting blood glucose was with family history of type-2 Diabetes mellitus in comparison to those without type-2 Diabetes mellitus.

Key words: Type-2 Diabetes mellitus. Impaired fasting blood glucose. Family history. Parents. Offsprings.

INTRODUCTION

Offsprings of diabetic parents are taken as high risk as it is well known that Diabetes mellitus (DM) is more common among family members of diabetic parents. It has been noticed that individuals with impaired fasting glucose levels have a 20-30% chance of developing Diabetes over the next 5-10 years.¹ Genetic factors are more important in the etiology of type-2 DM than type-1 DM. Thirty nine percent of the patients have at least one parent with type-2 DM. In monozygotic twins, the concordance for type-2 DM is 60-90%. Diabetes mellitus is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both.² Impaired glucose tolerance (IGT) is known to increase vascular risk and the risk of developing Diabetes.³ Long standing Diabetes can lead to permanent and irreversible functional changes in body cells and thus lead to various complications.⁴

Pakistan is estimated to have 7 million people with Diabetes, currently ranked 8th in the world and by the year 2025 expected to be 4th with 15 million people with Diabetes, representing a 2 fold increase in caseload (Global Burden WHO 1998).⁵ Diabetes prevalence in Pakistan is high, 12% of people above 25 years of age suffer from the condition and 10% have impaired glucose tolerance in keeping with the associated risk factors present in Pakistani society.⁶ Type-2 Diabetes is 7 times more common than type-1 and its incidence has increased more than 30 fold over the past 20 years, concomitant with changing food patterns and increasing obesity rates.⁷ Shera *et al.* have shown prevalence of Diabetes in the urban versus rural areas which was 6.0% in men and 3.5% in women against 6.9% in men and 2.5% in women, respectively.⁷ Newly diagnosed Diabetes was 5.1% in men and 6.8% in women in urban areas and 5.0% in men and 4.8% in women in rural areas.⁸ The risk factors for the development of type-2 DM include family history of Diabetes, increased BMI, increased waist circumference, race/ethnicity, previously identified impaired fasting glucose (IFG), or impaired glucose tolerance (IGT), history of gestational Diabetes mellitus (GDM) or delivery of baby over 9 lbs, hypertension, HDL cholesterol level ≤ 0.90 mmol/L (35 mg/dl) and/or triglycerides level ≥ 2.82 mmol/L (250 mg/dl),

Department of Medicine, Liaquat University of Medical and Health Sciences, Jamshoro.

Correspondence: Dr. Mumtaz Ali Shaikh, 205 A, Al-Raheem Heights, Unit No.6, Latifabad, Hyderabad.

E-mail: ali_mumtazali@yahoo.com

Received November 26, 2008; accepted May 30, 2010.

polycystic ovarian syndrome, consumption of nut and a high prevalence of cigarette smoking in some South Asian populations (Bangladeshis and Pakistanis).⁹⁻¹² There is significant and strong association between family history of DM and high body mass index (BMI) with type-2 DM.¹³

People with IGT can reduce the risk of Diabetes mellitus by changing their lifestyle as well as reduce their weight.¹⁴ The prevalence of metabolic syndrome in Pakistan according to different definitions is reported to be from 18% to 46%, comparable to the data from other South Asian countries. Thus, metabolic syndrome should be considered as a prime target for preventive medicine.¹⁵ Impaired blood glucose level in young individuals with diabetics or non-diabetic family, needs to be traced and their lifestyle be rectified, so that the burden of Diabetes mellitus and its complications may be reduced in community.

The objective of this study was to compare the fasting blood glucose (FBG) level in the healthy young individuals with diabetic first degree relative considered as high risk and non-diabetic first degree relative considered as low risk.

METHODOLOGY

This cross-sectional, comparative study was conducted in the Medical Unit-II, Liaquat University of Medical Health Sciences Hospital, Hyderabad/Jamshoro, from January to November 2008. The normal FBG was taken as <110 mg/dl (6.1 mmol/l). Fasting was defined as no caloric intake for at least 8 hours. IFG was considered 6.1-6.9 mmol/l (110-125 mg/dl). High risk non-diabetic young individual was considered as a young healthy individual between the age of 20-40 years with family history of type-2 Diabetes mellitus in first degree relative. Low risk non-diabetic young individual was considered as young healthy individual between the age of 20-40 years without that family history. Age and gender matched subjects on the above basis were selected and divided into two groups; A and B by non-probability convenience sampling. Exclusion criteria were known Diabetics and pregnancy. An informed consent was taken from all the participants after full explanation of the procedure. All participants were ambulatory and preliminary assessment was carried out of each participant to rule any systemic illness.

All individuals were evaluated for family history of type-2 Diabetes mellitus, obesity and relevant general physical examination was done of each participant. A fasting blood glucose level after over-night fasting for 10-12 hours of each participant was done. The data were collected on a pre-designed proforma and evaluated on statistical program SPSS version 10.0. Student t-test was applied to compare the mean values (2 tailed) of the numerical parameters such as age and FBG. The

Fisher's exact test and chi-square test were used for comparing the proportion of categorical variables of family history i.e. obesity and type-2 DM. P value < 0.05 was considered as statistically significant.

RESULTS

Five hundred individuals were included in this study. Two hundred and fifty participants included in each group with 125 (50%) males and 125 (50%) females. The mean age was 27.46 ± 5.71 (20 - 40) years.

Regarding fasting blood glucose (FBG), the overall mean in high risk group (group A) was 87.4 ± 13.82 (67 - 116) mg/dl and 77.7 ± 15.18 (66 - 111) mg/dl in low risk group (group B); $p=0.001$. In high risk group (group A) the mean FBG was 90.2 ± 14.26 mg/dl in males and 81.0 ± 10.58 mg/dl in females; $p=0.03$. In the low risk group (group B) mean FBG was 80.5 ± 14.34 mg/dl in males and 71.4 ± 15.62 mg/dl in females ($p=0.05$, Table I). Overall, 25 (10%) in high risk group and 5 (2%) in low risk group individuals had impaired fasting blood glucose level ($p=0.001$).

Table I: Fasting blood glucose level in young individuals having Diabetic parents and non-diabetic parents (n=500).

High risk group A (n=250)		Low risk group B (n=250)		p-value
FBG mg/dl	Mean \pm SD	FBG mg/dl	Mean \pm SD	
Males (n=125)	90.2 ± 14.26	Males (n=125)	80.5 ± 14.34	0.03
Females (n=125)	81.0 ± 10.58	Females (n=125)	71.4 ± 15.62	0.05
Overall mean	87.4 ± 13.82	Overall mean	77.7 ± 15.18	0.001

DISCUSSION

Diabetes mellitus is a fast expanding global health problem but more so in the developing countries.¹⁶ In an analysis of 6 prospective studies, the risk of developing Diabetes was found to be approximately 3.6-8.7% per year in patients with impaired glucose tolerance.¹⁴ Its incidence is higher in developing countries than developed countries.¹⁸

In this study, 25 individuals with high risk and 05 with low risk had impaired fasting blood glucose level, out of whom 20 were between 21-30 years of age and the remaining 10 were between 31-40 years. In a study by Sudha *et al.* 5.3% individuals of 21-30 years of age group and 7.7% individuals of 31-40 years of age group were identified as having IFG level. The prevalence of Diabetes in the first degree relatives as well as vertical transmission through more than two generations is commonly seen in Asian Indians increasing with positive family history of Diabetes. A study showed prevalence rate of 62% and risk of 73% when both parents had Diabetes.¹⁸ The study was conducted in Bangladesh showing 3.5% individuals of 21-30 years of age and 2.5% individuals of 31-40 years age of group had IFG level.¹⁸

The present study showed that all individuals with IFG had no symptoms of Diabetes mellitus; which is similar

to the study by Khan *et al.*, in which fasting plasma glucose of 859 symptom-free adults was checked and 40% were found to have IFG.¹⁹

In this study, out of 30 individuals with IFG, 20 (66.6%) individuals belonged to urban areas while 10 (33.3%) individuals belonged to rural areas where as in the study by Shera *et al.* showed 20.5% individuals of urban areas and 17.8% individuals of rural areas had IGT.⁷ Most of the individuals with IFG in this study were males; in another study the males were also predominant; i.e. 13.1% were males and 6.2% were females.²⁰

On behalf of this study we can say, that individual with positive family history of type-2 Diabetes mellitus are at high risk to develop impaired fasting blood glucose leading to number of complications. Metabolic syndrome is a collection of health risks that increase the chance of developing heart disease; stroke and Diabetes.²¹ In the United States, 24% men and 23% women had metabolic syndrome whereas a cohort study showed increasing frequency in metabolic syndrome with increasing age.²⁴ Jaber reported 23% prevalence of metabolic syndrome among Arab-Americans. Prevalence increased with age and increasing Body Mass Index in either gender. Impaired fasting glucose is a common glycemic disorder which usually progress to Diabetes mellitus. The relationships between impaired fasting glucose, other risk factors including blood pressure, and mortality have never been clearly investigated.

This study suggests that individual's diabetic relatives may have impaired fasting glucose which may lead to increase to development of type-2 Diabetes mellitus and its complications in future. By highlighting this huge burden the health workers can advise such individuals to adopt a healthy life style which may retard the development of type-2 Diabetes mellitus and reduce the burden of complications.

CONCLUSION

Impairment of fasting blood glucose was strongly associated with family history of type-2 Diabetes mellitus in comparison with individuals having no family history of type-2 Diabetes mellitus.

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