

# Correlation between Fasting Blood Glucose and HbA1c in First Degree Relatives of Sudanese Diabetic Patients as a Predictor of Type 2 Diabetes Mellitus

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**Abstract:** *Background:* About 415 million people has diabetes worldwide, with type 2 diabetes mellitus (DM) making up about 90% of the cases. Glycated hemoglobin is a measure of the risk for the development of complication of diabetes. This study is aim to compare between levels of fasting blood glucose with HbA1c in first degree relatives (FDR) of patients with type 2 diabetes mellitus and healthy non diabetic subjects as predictor to have diabetes type 2 in future. **Material and method:** This case control study contain 35 patients with type 2 DM, 35 FDR and 35 apparently healthy non diabetic control subjects. Fasting blood glucose were assayed using glucose oxidase method, HbA1c were assayed using immunoassay technique. **Results:** The mean age was 29 years for relatives and 25 years for controls, the mean and standard deviation of fasting blood glucose in FDR and control was (84.89 mg/dl  $\pm$  17.01, and 84.51 mg/dl  $\pm$  13.04 respectively) and for HbA1c was (6.14%  $\pm$  1.06, 5.86%  $\pm$  0.699 respectively), this study show no significant difference in fasting blood glucose and HbA1c between FDR and control subjects (p value 0.919, 0.189 respectively). **Conclusion:** Fasting blood glucose and HbA1c may not be used as a predictor of diabetes in first degree relatives of diabetic patients.

**Keywords:** Fasting blood glucose, HbA1c, Diabetes mellitus, Relatives

## 1. Introduction

Offspring's of diabetic parents are taken as higher risk as it is well known that diabetes mellitus (DM) is more common among family members of diabetic parents <sup>(1)</sup>. A strong family history of diabetes mellitus may suggest that an individual is at risk of developing diabetes mellitus (particularly type 2) <sup>(7)</sup>.

Testing of fasting blood glucose should be carried out at an earlier age or more frequently in individuals who display overweight tendencies and have additional risk factors as family history of diabetes as a first-degree relative <sup>(3)</sup>.

Unless people with prediabetes change their life style, most will have type 2 diabetes within the next 10 years <sup>(8)</sup>.life style changes such as weight loss (7% of body weight) and moderate physical activity (150 min per week) can reduce the risk of diabetes by as much as 58% <sup>(9)</sup>.

Some recent studies recommended that to develop a low-cost, easily accessible life style management program that would potentially be available for the hundreds of thousands of people with prediabetes <sup>(10)</sup>.

Recent studies revealed that first degree relatives of T2DM with isolated impaired fasting glucose should probably be included in the primary preventive program for diabetes <sup>(2)</sup>.

## 2. Objectives

The purpose of this study to compare between levels of HbA1c and fasting blood glucose in FDR and normal control subjects.

## 3. Materials and Methods

In this case control study, 35 of first degree relatives of type 2 DM and 35 apparently healthy nondiabetic subjects were analyzed for fasting blood glucose and glycated hemoglobin (HbA1c) this study carried out in Khartoum state, Sudan, during the period between January to April 2017. The mean age for FDR was 29 and for controls was 25 years. The exclusion criteria for FDR were patients with diseases that may affect HbA1c result (e.g. anemia and renal problems, cardiovascular disease or hepatic disorders or currently taken nutritional supplements). In addition, apparently healthy control as well as relative who has acute or chronic disease was excluded. The study protocol was followed after obtaining voluntary consent of the participants. A full explanation of research protocol was given to all subjects before the consent is taken. Data were collected from all participants regarding their age, sex and other conditions and were analyzed using SPSS software.

### Blood sampling and analysis

From each participant 5ml of venous blood sample was taken after overnight fasting and divided into two aliquots as 2.5 ml on fluoride oxalate tube for fasting blood glucose and 2.5 ml on EDTA for HbA1c, the fluoride oxalate

sample was centrifuged at 3000 rpm for 5min then the plasma was stored in -4 c° and was assayed by glucose oxidase method using biosystem standard kits (M11503i-16) and samples for HbA1c was assayed by immunofluorescent techniques using ichroma standard kits (GE02-15).

All the samples were analyzed when internal quality control met the accepted criteria.

#### 4. Results

This study revealed that, the mean age of FDR and control were (29±11.0,25±2.4 years respectively).

The fasting blood glucose of FDR was insignificantly when compared to control group with a mean value of (84.89±17.013 and 84.51±13.041 mg/dl respectively), and p value = 0.919

The mean of HbA1c in FDR was insignificantly different when compared to control with a mean value of (6.1457% ±1.065, 5.86%± 0.699 respectively), and p value = 0.189.

The fasting blood glucose was positively correlated with HbA1c in FDR when compared to control group with r = 0.221, p value = 0.203.

#### 5. Discussion

In this study FDR and control group had been analyzed for fasting blood glucose and HbA1c. FDR and control show insignificant difference in mean of fasting blood glucose and HbA1c.

This study shows insignificant in the level of HbA1c and fasting blood glucose between first degree relatives and control (p value = .189, p value = .919) which mean that the HbA1c test is not valid to predict diabetes mellitus type 2 in this study.

Our study agrees with study performed by BijanIraj, Nader Taheri, Massoud Amini. Payvand Amini and Ashraf Aminorroaya who found that no significant difference in HbA1c between FDR with impaired fasting glucose and who with impaired glucose tolerance (p value = 0.7) <sup>(2)</sup> and agrees with Ogedengbe S, 2Ezeani IU, 1Aihanuwa E <sup>(6)</sup> on their study at Nigeria who found that no significant differences at levels of HbA1c and fasting blood glucose in FDR and control subjects with (p value 0.42 and 0.74) respectively.

**Table 1:** Show the mean and significance of fasting blood glucose and HbA1c between FDR and control

		Mean ± SD	P value
HbA1c %	FDR	6.1 ± 1.06	0.189
	control	5.9 ± 0.699	
Glucose in mg/dl	FDR	85 ± 17.0	0.919
	control	84 ± 13.0	

Mumtaz Ali Shaikh, Raj Kumar and Rafi Ahmed disagrees with our study, they found that fasting blood glucose mean in first degree relatives of patient with diabetes type 2 was 87.4 mg/dl and in control group was 77.7 mg/dl (p value =

0.001) as FDR of diabetic patient at higher risk for diabetes type 2 than those with no parent history of type 2 diabetes.

Dr. Poornima Ajay Manjrekar, Dr. Anupama Hegde, Dr. Shrilaxmi, Dr. Fiona D'souza , Mr. Vishwas Kaveeshwar , Ms. Anupama Jose, Ms. Sana Tasneem found that fasting blood glucose correlated significantly and positively with HbA1c in all groups<sup>(5)</sup>.

#### 6. Conclusion

It is more convenient to do fasting blood glucose - 2 hours post prandial test and/or glucose tolerance test (GTT) beside HbA1c to predict for risk of diabetes type 2 in FDR in future.

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