**ORIGINAL ARTICLE**

# Assessment of Glucose Tolerance Test to Evaluate Diabetes In First Degree Relatives of Diabetics

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## ABSTRACT

Diabetes is the most often associated disease with older age, obesity, family history of diabetes, physical inactivity etc. Genetic factors are complex and interact with environmental factors in a poorly understood fashion. Impaired glucose tolerance is also reported as a risk factor.

**Conclusion:** GTT was increased in first degree relatives of diabetes with age group (14-25) as compared to controls but significant difference (P<0.01) was only seen in fasting and 1-½hr condition in GTT and BMI in age ranged 26-35 years showed a significant change after ½ hr of blood sugar sample . In age group 35-50 years, there is a significant change in BMI, fasting blood sugar.

**Keywords**: Glucose tolerance test, First degree relatives, Diabetes, BMI

## INTRODUCTION

Diabetes presents itself as a metabolic syndrome with a spectrum of hyperglycemia, obesity, insulin resistance, hypertension, complex dyslipidemia, atherosclerosis, and endothelial dysfunction[1]. According to WHO experts, there is a worldwide increase in the number of adult patients with diabetes, from 135 million in 1995 to 300 million in the year 2005. The highest increase in the prevalence of diabetes is estimated to occur in China (68%) and India (59%)[2]. Pakistani descent screened 1,318 people (25-79 year of age) and reported that 60% of diabetic prevalance[3].

Type 2 diabetes mellitus: results from insulin resistance[4]. About 80 percent of people with type 2 diabetes are overweight. Genetic factors are complex and interact with environmental factors in a poorly understood fashion[5]. Impaired glucose tolerance is also reported as risk factors[6].

## MATERIALS AND METHODS

The study included 50 first degree relatives of diabetics of both sexes considered as experimental subjects. Subjects were divided into 3 groups on the basis of their age i.e. a group with age range 14-25years, group with age range 26-35 years and group with age range 36-50 years. To perform glucose tolerance test, fasting blood sample was taken and the patient was orally given the 50-60 gm of glucose solution. Timings were noted and further blood samples taken at intervals of 30, 60, 120 and 180 min. Urine samples (for urine sugar) with each blood sample was also be collected. The subjects included were the attendants of diabetic patients admitted in medical wards of Sir Ganga Ram Hospital, Lahore. 20 subjects with no history of diabetes were considered as controls. Duration of study was 4-8 weeks.

## RESULTS

The detail of results are given in tables 1 and 2

Table 1: Glucose Tolerance Test in Males of First Degree Relatives Of Diabetics and Controls

| | 14-25 | | 26-35 | | 36-50 | |
|---|---|---|---|---|---|---|
| | **Subjects(n=8)** | **Controls(n=10)** | **Subjects (n=8)** | **Controls (n=10)** | **Subjects (n=9)** | **Controls (n=10)** |
| Age (yrs) | 19.0±2.2 | 21.4±4.7 | 30.2±2.8 | 34.4±7.8 | 41.8±5.7 | 34.4±7.8 |
| BMI | 30.5±5.3** | 23.2±1.3 | 30.4±5.3 | 26.1±2.6 | 34.4±3.6** | 26.1±2.6 |
| Fasting (mg/dl) | 112.4±18.1** | 70.0±10.0 | 112.2±28. 8** | 73.2±8.5 | 123.0±3.3** | 73.2±8.5 |
| 1/2 hour (mg/dl) | 143.8±7.4** | 100.0±28.3 | 144.2±22.7 | 116.90±16.2 | 171.0±14.1** | 116.9±16.2 |
| 1hour (mg/dl) | 123.0±15.9 | 107.0±14.8 | 139.20±19.3 | 127.7±14.5 | 151.8±7.9** | 127.7±14.5 |
| 1:30min (mg/dl) | 109.0±16.7 | 104.0±29.6 | 122.8±18.8 | 116.9±16.2 | 124.0±8.2 | 116.9±16.2 |
| 2hour (mg/dl) | 100.8±14.6 | 89.0±15.97 | 108.2±29.1 | 101.5±8.8 | 103.4±7.1** | 101.5±8.8 |

**P<0.01; *P<0.05

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Table 2: Glucose tolerance test in females of first degree relatives of diabetics and controls

| Parameters | Age (yrs) | | | | | |
|---|---|---|---|---|---|---|
| | 14-25 | | 26-35 | | 36-50 | |
| | Subjects (n=8) | Controls (n=10) | Subjects (n=8) | Controls (n=10) | Subjects (n=9) | Controls (n=10) |
| Age (yrs) | 20.25±4.6 | 22.00±2.1 | 29.67±3.9 | 34.40±7.8 | 45.11±4.2 | 34.40±7.7 |
| BMI | 27.02±4.98 | 25.0±1.5 | 25.78±6.1 | 26.10±2.6 | 40.11±11.6** | 26.10±2.6 |
| Fasting (mg/dL) | 90.75±22.1 | 79.0±15.9 | 102.0±16.7 | 73.20±8.5 | 122.67±31.5** | 73.20±8.5 |
| 1/2 hour (mg/dL) | 117.0±28.3 | 116.40±23.6 | 164.33±40.6** | 111.20±11.9 | 173.44±36.5** | 111.20±11.9 |
| 1hour (mg/dL) | 131.75±19.1 | 114.0±4.9 | 126.0±25.9 | 127.70±14.5 | 173.56±30.5* | 127.70±14.5 |
| 1:30min (mg/dL) | 112.53±23.2 | 106.0±5.5 | 116.67±23.1 | 116.90±16.1 | 163.67±75.6 | 116.90±16.1 |
| 2hour (mg/dL) | 94.25±21.7 | 88.0±8.4 | 104.33±22.4 | 101.50±8.8 | 151.22±73.9 | 101.50±8.8 |

**P<0.01; *P<0.05

Glucose tolerance test in males of first degree relatives' with age ranged 14-25 years compared to their controls was tabulated (Table 1). It was observed that the BMI of first degree relatives of male was significantly increased (P<0.01) as compared to controls. Level of fasting sugar and sugar after ½ hour is significantly increased (P<0.01) as compared to their controls. On the other hand, level of blood glucose after 1, 1:30min and 2hr was also raised in first degree relatives but showed non significant difference.

Glucose tolerance in first degree relatives of males with age ranged 26-35 years compared to controls was tabulated (Table 1). It was observed that the BMI of first degree relatives of male was non-significantly raised (P>0.05) as compared to control. Level of the fasting blood sugar was more as compared to control and it showed a highly significant difference (P<0.01). Level of blood sugar after ½hr, 1hr, 1:30min, 2hr was although raised in first degree relatives but this was non-significant.

Glucose tolerance in first degree relatives of males with age ranged 36-50 years compared to their controls was tabulated (Table 1). It was observed that the BMI of first degree relatives of male was more as compared to control and it showed a highly significant difference (P<0.01). Level of the fasting blood sugar and sugar after ½, and 1 hour was elevated as compared to control and it showed a highly significant difference (P<0.01). Level of blood sugar after 1 and 2 hrs was significantly greater (P<0.01) as compared to control. On the other hand level of blood sugar after 1:30min was although increased but it showed non significant difference.

Glucose tolerance in first degree relatives of females with age ranged 14-25 years compared to their controls was tabulated (Table 2). It was observed that the BMI of subjects was more than their controls but this showed non significant difference. Levels of blood sugar including fasting after ½ hr, 1hr 1:30min, and 2 hrs was although raised in first degree relatives but there was non significant difference.

Glucose tolerance in first degree relatives of females with age ranged 26-50 years compared to their controls was tabulated (Table 2). BMI of first degree relatives of female was non-significantly decreased as compared to control. Level of fasting blood sugar was non significantly raised in subjects as compared to their controls. Level of blood sugar after 1/2 hour was more as compared to control and it showed a highly significant difference (P<0.01). On the other hand, level of sugar after1hr and1:30min and 2 hour showed non significant difference as compared to their controls.

Glucose tolerance in first degree relatives of females with age ranged 36-50 years compared to their controls was tabulated (Table 2). BMI and fasting sugar and level of sugar after ½ hr of first degree relatives of male was more as compared to control and it showed a highly significant difference (P<0.01) . Level of blood sugar after 1 hr shows significant difference (P<0.05). Level of sugar after1:30min and 2 hrs were raised but this showed non significant difference.

## DISCUSSION

Diabetes exerts a significant burden worldwide and this is expected to increase. Many diabetic patients face significant challenges accessing diagnosis and treatment, which contributes to high mortality and prevalence of complications. First degree relatives of subjects with type 2 diabetes are at risk of developing hyperglycemia. Furthermore, as they also represent an appropriate cohort for examining glucose tolerance test which may be altered in first degree relatives of diabetics[7].

Variation in BMI and glucose tolerance test in male first degree relative, age ranged 14-25 years of diabetics was compared with their controls. It was observed that the BMI and fasting blood sugar of first degree relatives of males significantly greater (P<0.01) as compared to controls. However a study reported that age and BMI, fasting blood sugar did not differ significantly between first degree relative of

diabetes and their controls[8].

Present study observed that GTT, was increased in first degree relatives of diabetes with age group (14-25) as compared to their controls but non-significant difference (P>0.05) was only seen in fasting and 1:30min condition. Our finding is in accordance with a study who observed that first degree relatives with type 2 diabetics are at higher risk of diabetes due to increased GTT. This risk increased with age and BMI[9].

Study was also observed that BMI was significantly increased and impaired altered GTT was observed in first degree relatives of diabetic. According to America diabetic Association[10], first degree relatives of diabetes with impaired glucose tolerance test and increased BMI may be at increased risk of diabetes. Association recommended that the FBS is 126mg/dl and plasma glucose after 2 hr is >200mg/dl may be considered as the first degree relatives at higher risk of diabetics. Another study reported that increase BMI may be increased blood sugar level which may be associated with insulin resistance that in turn increased the risk of diabetics in first degree relatives[11].

GTT and BMI in female first degree relatives with age ranged 14-25 years was increased non significantly as compared to their controls. On the other hand, variation in GTT and BMI in age ranged 26-35 years was also determined. It was observed that in this age group there was a significant change after ½ hr of blood sugar sample taken. A group of worker screened the first degree relatives of diabetics, and recommends that in age >35 years, the BMI, fasting blood glucose level and GTT should be recommended to screen for diagnosis of diabetes[12].

It was observed that impaired GTT was more marked in age group 26-35 as compared to 14-25. This showed that with an increased age, the risk of diabetics is more prevalent. A number of studies are in accordance to our studies. These studies interpreted that insulin resistance is present in individuals who are at high risk of developing diabetics. Their studies concluded that the beta cell function is relatively low in some groups and they are at high risk of developing hyperglycemia[13]. Our study is in accordance with a study that the impaired GTT test in first degree relatives of diabetes may be due to diminished beta cell function and this reduction effect on insulin[8].

## CONCLUSION

It is concluded that body mass index and impaired oral glucose tolerance test may be an indicator of early detection of diabetes in first degree relatives of both male and female.

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