

STUDY OF EFFECT OF CHANGE OF DIET AND EXERCISE ON THE SUBJECT OF IMPAIRED GLUCOSE TOLERANCE

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ABSTRACT

BACKGROUND

Type 2 diabetes mellitus results from body's ineffective use of insulin. Type 2 diabetes comprises the majority of people with diabetes around the world and is largely the result of excess body weight and physical inactivity. It has been found that impaired glucose tolerance is associated with increased risk of type 2 diabetes mellitus. Increase in physical activity and modification of diet can delay the progress of the disease.

MATERIALS AND METHODS

Sixty patients diagnosed to be impaired glucose tolerance test as per WHO criteria were included in this study. They were divided into two group thirty each. Control group were also received advice about diet and exercise, but intervention group were followed regularly and individually.

RESULTS

In the intervention group, there was significant reduction in all the parameter and progress to type 2 diabetes mellitus in intervention was 6.7% as compared to 26.7% in control group.

CONCLUSION

We would like to conclude from the result of our study that type 2 diabetes mellitus can be prevented or delayed in subject with impaired glucose tolerance. In our study, we found that in the intervention group, the progress of impaired glucose tolerance to type 2 diabetes mellitus was decreased in comparison to control group and all the parameter was reduced to near normal value in intervention group.

KEYWORDS

Impaired glucose tolerance, Diet and exercise, Intervention.

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BACKGROUND: Type 2 diabetes mellitus results from body's ineffective use of insulin. Type 2 diabetes comprises the majority of people with diabetes around the world and is largely the result of excess body weight and physical inactivity.⁽¹⁾ The number of people with diabetes has risen from 108 million in 1980 to 422 million in 2014. The diabetes prevalence has been rising more rapidly in middle and low socioeconomic group.⁽²⁾ As diabetes results from excess body weight and physical inactivity and incidence are increasing in low socioeconomic group, we have started our work to study the effect of diet and exercise on impaired glucose tolerance in our population of coastal Andhra Pradesh.

In 1979, the US national diabetes data group recommended the category of Impaired Glucose Tolerance (IGT) to denote a state of increased risk of progressing to diabetes.⁽³⁾ As per 2006, WHO recommendations for the diagnostic criteria for diabetes and intermediate hyperglycaemia, impaired glucose tolerance is diagnosed as fasting plasma glucose >100 mg/dL and <126 mg/dL, 2 hrs. plasma glucose >140 mg/dL and <200 mg/dL and HbA1c between 5.7% to 6.4%.⁽⁴⁾ The subjects with impaired glucose tolerance used to have increased risk to develop type 2 diabetes mellitus in due course of time.⁽⁵⁾

MATERIALS AND METHODS: Patients with impaired glucose tolerance test diagnosed in the clinical biochemistry lab attending General Medicine Department of GEMS Medical College, Srikakulam, Andhra Pradesh, were included in this study during the period of two years between January 2014 to February 2016. The study was approved by the Institutional Ethics Committee and written consent was obtained from the patient before they enrolled for the study. The parameters like body weight, body mass index, fasting plasma glucose, postprandial plasma glucose and HbA1c were measured.

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Fasting plasma glucose was measured every three months. Finally, all parameter was measured at 1 yr. and at the end of second year. Hexokinase method was used for estimation of plasma glucose and glycosylated haemoglobin was measured by spectrophotometer. Paired t-test was used for statistical analysis and p-value ≤ 0.05 was considered statistically significant. A total of 62 patients of both the sex between 40 to 65 years of age were divided into two groups. At the start of the study after one month, two patients developed diabetes and were excluded from the study. One group was control group having thirty patients, another intervention group with thirty patients. Subjects in the control group were given general instruction about the diet and exercise both verbally and written. They were observed and followed regularly to prevent drop out and we were in contact with them and advised to come for measurement of all the parameter every three month. But, no individualised approached was there for them.

All the guideline for healthy diet and exercise as per local food habit designed by our nutrition was given to them. Subject in lifestyle modification group were given detailed advice to reduce weight at least 5% or more. Patient in this group were followed regularly. They were given a diet chart in written form as per the food habit of local people and it was in the range of 1300 to 1500 kcal. Dietary advice was in the written form. Patient has to fill up and we used to collect every fortnight and reinforcement cancelling was done to them every 15 days. Daily physical activity was walking at the speed of 5 km/hr. for 45 mins., which was assured by a one kilometre distance and four and half rounds of that to be covered in 45 minutes, 6 days in a week uniformly for all. This physical activity was also monitored every 15 days by us. All the patients in intervention group were followed regularly and personally by us.

RESULT: Total sixty subjects diagnosed to be impaired glucose tolerance were included into the study and were divided into two groups. Control group were having thirty subjects. At the start of the study, mean body weight was 85.7 kg and was reduced to mean value 82.3 kg with t-value 3.81 and p-value < 0.001 , which is statistically significant. Body mass index was reduced from mean value 29.6 kg/m² to 28.4 kg/m². The mean fasting plasma glucose was 113.3 mg/dL at the start of the study and it was reduced to 110.4 mg/dL. Two-hour postprandial glucose mean value was also reduced from 171.9 to 170.9, which was not significant statistically with value < 0.84 glycosylated haemoglobin was also reduced little from mean value 6.08% to 5.9% with t-value 2.7 and p-value 0.013. From Table-2 in the intervention group, the mean body weight was reduced from 89.25 kg to 82.85 kg that is around 7.17%. The body mass index was having mean value 30.9 kg/m² in the start of the study was reduced to 28.0 kg/m² after two years. Fasting plasma glucose value at the start of the study was 117.2 mg/dL, which was reduced to 98.8 mg/dL with t-value 6.02 and P-value < 0.05 . Two-hour postprandial glucose was also reduced from 171.15 mg/dL to 142.8 mg/dL with t-value 6.810 and P - value < 0.00001 .

Glycosylated haemoglobin was reduced from mean value 6.12% to 5.435 with P value < 0.00001 . At the end of the study, it was found that in control group out of 30 subject, eight (8) developed diabetes mellitus that is around 26.7%, but in the intervention group two patients that 6.7% of the patient developed type 2 diabetes mellitus.

	Basal	After 2 yrs. (Mean)	t-value	p-value
Body weight (Kg)	85.7	82.3	3.81	< 0.00101
BMI (kg/m ²)	29.6	28.4	4.04	< 0.000478
FPG (mg/dL)	113.3	110.4	3.80	< 0.00129
2 hrs. PG (mg/dL)	171.9	170.09	0.19	< 0.84
HbA1C (%)	6.08	5.9	2.70	< 0.013

Table 1: Control Group

	Basal (Mean)	After 2 yrs. (Mean)	t-value	p-value
Body weight (kg)	89.8	82.85	4.23	0.0004
BMI (kg/m ²)	30.9	28.0	2.54	0.019
FPG (mg/dL)	117.2	98.8	6.02	< 0.05
2 hrs. PG (mg/dL)	171.15	142.8	6.810	< 0.000001
HbA1C (%)	6.12	5.435	6.18208	< 0.00001

Table 2: Intervention Group

	Total	After 2 yrs. pt. Developed Diabetes	%
Control Group	30	8	26.7%
Intervention Group	30	2	6.7%

Table 3: Incidence of Diabetes During Follow Up

DISCUSSION: We have started our study with an expectation that diet and exercise will delay the progress of diabetes from impaired glucose tolerance. We have divided the subject into two groups, control group also received the advice and follow up, but the intervention group were followed personally and monitored regularly. Development of diabetes was 26.7% in control group as compared to 6.7% in intervention group. There is 75% reduction in the incidence of progress to diabetes mellitus.

This is similar to the study of XIA-O et al, Eriksson J. et al and Tuomilehto J et al,^(6,7,8) the results of our study demonstrate that there was reduction in body weight, BMI in both control and intervention group, but in intervention group, it was more, which is because of diet control, regular exercise and also because of regular follow up. Fasting and postprandial glucose decreased in both the group, but in control group 2 hrs. PPG was not significantly decreased, but in intervention group, it was decreased significantly, which similar to the study of Mensin et al, Linda Penn and T. Yates et al.^(9,10,11) In our study, we have found that there was reduction in HbA1c level in the both the group, but in intervention group, it was reduced very significantly, which similar to the study of Hague et al and Nathan T et al.^(12,13)

CONCLUSION: We would like to conclude from the result of our study that type 2 diabetes mellitus can be prevented or delayed in subject with impaired glucose tolerance. In our study, we found that in the intervention group, the progress of impaired glucose tolerance to type 2 diabetes mellitus was decreased in comparison to control group and all the parameter was reduced to near normal value in intervention group. Impaired glucose tolerance test progressed to be more in control group than in the intervention group.

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