Impaired Glucose Tolerance – A cross Sectional Study among Middle Aged Individuals

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Abstract

Background and Objectives: Diabetes mellitus represents a spectrum of metabolic disorders which has become a major health challenge worldwide. Impaired glucose tolerance (IGT) forms a grey area between diabetes mellitus and normal individuals. IGT has a greater risk of developing future diabetes. To explore the prevalence of IGT in normal healthy individuals, to find correlation between IGT and BMI and family history.

Materials and Methods: About 100 randomly selected subjects of middle aged group 25-45 years of both sexes were selected. Exclusion criteria include hypertension, diabetes oral contraceptives pill users, thyroid disorders, smokers and alcoholics. Oral glucose tolerance test (GTT) was done in all subjects. If 2-hour post glucose concentration was between 140- 199mg%, then the person was labelled as IGT. Variables such as Height, Weight, body mass index and family history were also taken. All the data were analyzed using chi-square, Fischer's exact and two tailed Pearson correlation.

Results: The prevalence of IGT was 16%. Age specific prevalence in subjects below 35 years was 7% and above 35 years was 9%.

Interpretation and Conclusion: The prevalence of IGT was 16%. Subjects with positive family history and BMI had positive correlation with IGT. But there was no age specific prevalence between two selected groups.

Key words: Diabetes mellitus, Body mass index, Impaired glucose tolerance.

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Introduction

Diabetes mellitus represents a spectrum of metabolic disorders which has become a major health problem worldwide. In India, day by day prevalence of type 2 diabetes mellitus is increasing due to rapid industrialization[1]. India is already dubbed as the "Diabetes Capital of the world. It is projected to double between 2000 and 2030[3]. It has been demonstrated that industrialization and modernization lead to sedentary life style, obesity and higher risk of metabolic disorders. 50% of diabetes remains undiagnosed and it is an "iceberg'' disease. Diabetic patients, if undiagnosed or inadequately treated, develop multiple chronic complications leading to irreversible disability and death[2].

Currently the number of cases of diabetes worldwide is estimated to be around 347 million; out of these 90 percent is type 2 diabetes. The global prevalence of diabetes in 2008 was estimated to be 10% in adults aged above 25 years[3]. The magnitude of diabetes and other abnormalities of glucose tolerance are considerably higher than the above estimates if the categories of impaired fasting and impaired glucose tolerance are also included. The population of India has an increased susceptibility to diabetes mellitus[4]. This propensity was demonstrated by multiple surveys of migrant Indians during the year 2004. There was an estimated 37.7 million cases of diabetes in the country. Of these, 21.4 million cases were in urban areas and 16.3 million cases in rural areas. In the same year, 2.2 million cases were affected due to the disease. The International Diabetes Federation (IDF) estimates the total number of people in India with diabetes to be around 50.8 million in 2010, rising to 87.0 million by 2030[5]. Diabetes affects various body systems like cardiovascular, renal, nervous systems and vision. So if diabetes is detected at the stage of impaired glucose tolerance, it may be possible to halt the progression to overt diabetes.

Aims and Objectives

(i) To explore the prevalence of IGT in normal healthy Individuals,
(ii) To find correlation between IGT and BMI and to find correlation between family history and IGT.

Materials and Methods

Prior to initiation of study, informed consent was taken from subjects. This study was approved by

Institutional ethical committee (IEC). 100 subjects in the age group between 25-45 years of both men and women were randomly selected in Tirunelveli district. The study was carried out for a period of 6 months. 100 individuals were divided into 2 groups according to their age. Group I consists of 25 men and 25 women of age between 25-35 years. Group II consists of 25 men and 25 women of age between 36-45 years.

Inclusion Criteria

(a) Both men and women of age between 25-45 years
(b) Non smokers

Exclusion Criteria

(a) Hypertension,
(b) Diabetes
(c) Acute illness
(d) Oral contraceptive Pill users
(e) Steroid users
(f) Thyroid disorders
(g) Smokers
(h) Alcoholics

Blood Glucose Estimation

After instructing the patient to have 3 days of unrestricted carbohydrate diet and overnight fasting of 12 hours, 2ml of venous blood from antecubital vein was collected. Fasting sample was mainly to exclude diabetic patients from the study. Then the subjects consumed 75 grams of glucose dissolved in 250 ml of water. Again venous sample was taken after 2 hours. Plasma glucose concentration was estimated at central clinical laboratory, Tirunelveli using auto analyser. If 2 hour post glucose plasma concentration of glucose was found between 140mg% and 199mg%[7] then it was decided that the person was having impaired glucose tolerance.

Anthropometric Measurements

Height in cm and weight in kg were measured. Body mass index (BMI) was calculated using formula weight (kg)/Height (m^2). As per revised WHO criteria for Indians BMI from 18.5 to 22.9 is normal, BMI from 23 to 24.9 is overweight and above 25 is obese[8].

Family history of diabetes was also taken into account.

Statistical Analysis

All the data were expressed as Mean ± SD. Linear association between blood glucose level, anthropometrical measurements, and family history were assessed using two tailed Pearson's correlation, chi-square, fischer's exact.

Results

Prevalence of IGT in this study was 16%. Age specific prevalence in <35 years was 7%. Age specific prevalence in >35 years was 9%. Statistically there was no significant difference between two age groups. But there was statistically significant difference between groups with positive family history when compared to negative family history group. Majority of Individuals having IGT were obese. Correlation analysis of 2 hour post glucose with BMI and weight was significant.

Table 1: Study Group Selection

AGE(YEARS)	MEN n	WOMEN n	TOTAL n
26-35	25	25	50
36-45	25	25	50

Table 2: Correlation between BMI IGT

Age (years)	BMI		IGT		P VALUE
	Mean	SD	Mean	SD	
Group1 (25-35)	22.17	2.93	120.4	18.8	0.0001*
Group2 (36-45)	24	3.53	123.6	22.9	0.0001*

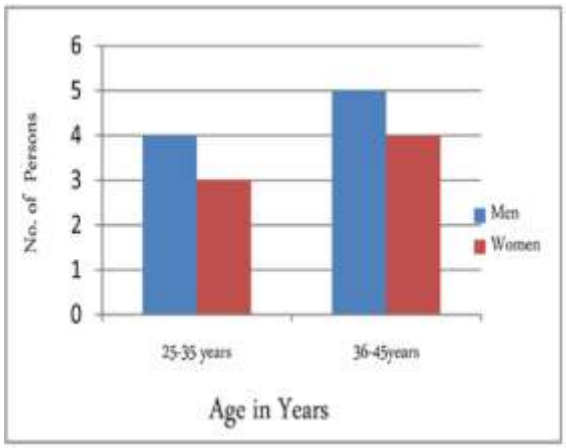
***Significant**

Table 3: Correlation between IGT and Family history

Age in years	FAMILY HISTORY	IGT		FISHER'S EXACT
		Yes	No	
Group1 (25-35)	Yes	5	2	0.0001*
	No	2	41	
Group2 (36-45)	Yes	5	3	0.003*
	No	4	38	

***Significant**

Prevalence of IGT



Discussion

In our study, the prevalence of IGT in randomly selected population was 16%. As per the study of Ramachandran et al and Mohan et al the prevalence of IGT was 14% and 5.9% respectively in Chennai population[9,10]. As compared to their study the prevalence was high in our study. This could be due to variations in socioeconomic status, physical activity and also due to mixed urban and rural population of subjects selected in ourstudy[11]. The prevalence of IGT between men and women was also the same in our study, similar to study done by Snehalatha et al[12].

In our study, age specific prevalence in group I was 9% and in group II was 7% respectively. Statistically there was no significant difference between two age groups. This was similar to the study done by Kapur et al[13]. But there was statistically significant difference between two groups with positive family history when compared with negative family history which is similar to the study done by Robert et al[14]. This could be due to genetic factors, which cause IGT. Genetic studies done in south Indian subjects showed an uncoupling protein 2 gene variant (UCP2) was associated with raised BMI as quoted in the study done by Jai Ganesh et al[15].

Majority of individuals having IGT were obese. Correlation analysis of 2-hour post glucose with BMI significantly correlated[16]. According to Ramachandran et al, healthy BMI for Indians is below 23kg/m². Ele Ferranini et al have reported that conversion of IGT to diabetes is rapid in obese persons[17]. Obesity has been related to insulin resistance and hyperinsulinemia[18].

Conclusion

The prevalence of IGT in our study population was 16%. Subjects with positive family history and BMI had significantly positive correlation with IGT. But there was no Age specific prevalence between two selected groups. This study can be used as preliminary step in the sample size for planning a large scale epidemiological study in this geographical location. Such studies will help in the implementation of preventive measures to reduce the burden of the disease and to reduce the mortality and morbidity associated with Diabetes mellitus.

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