Research Article

Frequency of Impaired Glucose Tolerance in Obese Patients

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Abstract | Obesity is a state of excess body adipose tissue. Impaired glucose tolerance is a risk factor for developing diabetes Mellitus & is associated with hyperglycemia and insulin resistance. To determine the frequency of impaired glucose tolerance in obese patients. This Cross Sectional study was carried out in North Medical Ward, King Edward Medical University/ Mayo Hospital Lahore for 6 months i.e. January to June 2014. Total 160 obese patients visiting outpatient department of North Medical Ward, Mayo Hospital Lahore for 6 months were included by non-probability purposive sampling. Patients aged 15-70 years of either gender were included. Oral glucose tolerance (OGTT) was done in each patient with unrestricted carbohydrate diet for three days and avoiding coffee, smoking and heavy exercise six hours before the test. Fasting sample was taken then 75g oral glucose was given. Sample after two hours was sent to KEMU clinical lab. A positive result of the patient was labeled as IGT. The patients mean age was 46.3±13.4 years. Out of 160 patients, 78 (48.8%) were males and 82 (51.2%) females.116 (72.5%) patients were obese grade 1 and 44 (27.5%) patients were obese grade 2. The mean BMI (Normal BMI=18.5-22.9kg/m^2**)** of the patients came out to be 29.1±13.6 kg/m^2.There were 116 (72.5%) patients of obese-1 and 44 (27.5%) patients of obese 2. There were 140 (87.5%) patients normal and 20 (12.5%) patients were impaired OGTT. In obese-1 type patients, 112 (70%) patients had normal OGTT and 4 (2.5%) patients had impaired OGTT. In the obese-2 type patients, 28 (17.5%) patients had normal OGTT and 16 (10%) patients had impaired. Impaired glucose tolerance is commonly found in obese patients.Therefore adequate measures like dietary restrictions, physical exercise & drugs should be taken to control obesity.

Received | May 12, 2017; **Accepted** | January 10, 2018; **Published** | December 20, 2017

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Citation | Ahmad, M.S, S. Iqtadar, S.U. Mumtaz, Z. Niaz, I. Waheed and S. Abaidullah. 2017. Frequency of impaired glucose tolerance in obese patients. *Annals of King Edward Medical University*, 23(4): 546-549.

DOI | http://dx.doi.org/10.17582/journal.akemu/2017/23.546-549.

Keywords | Obesity, Impaired glucose tolerance, Obesity grades

Introduction

Impaired glucose tolerance (IGT) is a transition phase between normal glucose tolerance & diabetes mellitus that includes fasting glucose of less than 126mg/dl (<7.0 mmols/L) & two hours post-parandial glucose of 140-199mg/dl (7.8-11.0 mmols/L). It is characterized by hyperglycemia & insulin resistance and is considered a risk factor in developing diabetes mellitus, Ischemic heart disease, and cerebrovascular accidents.(1)Obesity is a state of excess body adipose tissue. Obesity is considered to be the result of imbalance between intake and energy expenditure. Factor leading to obesity are behavioral changes like (sedentary life style, increase ingestion of high caloric diet) genetic and familial predisposition, steroids and endocrine abnormalities (Cushing syndrome). There are different methods to gauge obesity but most widely accepted method is body mass index (BMI), which is equal to weight/height^2 (kg/m^2). (2),(3) The obesity is leading to increased morbidity & mortality day by day. It has so many cardiovascular complications including impaired glucose tolerance & Diabetes. [4]Thereare at least 300 million people worldwide with impaired glucose tolerance. [5] Approximately 3.6% to 8.7% individuals having IGT go on to develop diabetes mellitus annually. [1]In Pakistan, a study showed overall prevalence of IGT & diabetes mellitus is 9.25% & 11.52%, respectively.[6]A number of risk factors leading to IGT include obesity, hypertension, first degree relatives of diabetics, pregnancy, smoking and drugs as diuretics, steroids. [7]

According to World Health Organization (WHO) guidelines for Asian Pacific, BMI from 18.5 to 22.9 is considered to be normal. The people with BMI 23 to 24.9kg/m^2 are overweight while 25 to 29.9kg/m^2 are obese grade-1 and $\geq$30kg/m^2 are taken obese grade-2. [8] An urban population study showed prevalence of 9.25% impaired glucose tolerance in obese patients. [9]

There was a significant relationship between two-hour plasma glucose level based on body weight-body height and BMI variable using the Pearson correlationtest ($r = 0.32$; $p = 0.005$ and $r = 0.27$; $p = 0.018$). [10]

The relationship between obesity and IGT has not been studied extensively in Pakistani population due to lack of awareness about screening for IGT in obese which leads to undiagnosed diabetes developing in them resulting in morbid obesity. The purposive significance of this study is to identify the people with IGT much earlier especially those who are having risk factors like obesity. This can help the min getting early medical care in order to prevent further complications like Ischemic heart disease, diabetes mellitus & cerebrovascular accidents.

Objective

To determine the frequency of impaired glucose tolerance in obese patients.

Materials and Method

This cross sectional study was carried out in OPD of North Medical Ward, Mayo Hospital Lahore for 6 months from January to June 2014. After the ethical approval, 160 cases were taken by non-probability purposive sampling. The sample size was calculated by 95% confidence level, 4.5% margin of error and having expected prevalence of IGT i.e. 9.25% in obese patients[6]. The purpose of the research was conveyed to each patient and informed written consent was taken. Patients of either sex of age more than 15 years with BMI $\geq$25 were included who visited Mayo Hospital due to a concern regarding obesity. Patients with Diabetics (known) or FBS >126mg/dl, hypertension (known) or BP >140/90 mmHg on two separate occasions, pregnancy, patients taking drugs diuretics and steroids, known chronic illnesses like ischemic heart disease and chronic liver disease were excluded from the study. Oral glucose tolerance was done in each patient with unrestricted carbohydrate diet for three days and avoiding coffee, smoking and heavy exercise six hours before the test. Fasting sample was taken then 75g oral glucose was given. Sample after two hours was sent KEMU Clinical lab. Each patient with positive result was labeled IGT. The collected data was entered and analyzed into SPSS version 21. Descriptive statistics was done and frequency of impaired glucose tolerance was calculated. P-value of <0.05 was taken as significant.

The mean age of the patients found, was 46.3±13.4 years. There were 48 (30%) patients of 20-40 years age, 99 (61.9%) patients with age range 41-60 years and 13 (8.1%) patients withage range 61-70 years. The mean weight of patients in this study was 69.7±12.1 kg. The mean height of patients was 1.6±0.1 meters with the mean BMI of 29.1±13.6 kg/m^2. There were 116 (72.5%) patients of BMI range of 25-30 kg/m^2, 30 (18.8%) patients of BMI range of 31-35 kg/m^{2}and 14 (8.7%) patients of BMI range of 36-40 kg/m^2. There were 116 (72.5%) patients of obese-1 and 44 (27.5%) patients of obese 2 (Table 1). There were 78 (48.8%) males and 82 (51.2%) females (Figure 1). There were 140 (87.5%) patients with normal OGTT while 20 (12.5%) patients were impaired OGTT (Figure 2).

Table 1: *Baseline characteristics of patients (n=160).*

Age (Years)	**46.3±13.4**
20-40	48 (30%)
41-60	99 (61.9%)
61-70	13 (8.1)
Weight (Kg)	69.7±12.1
Height (meter)	1.6±0.1
BMI (kg/m^2)	29.1±13.6
Obese 1 (25-30 kg/m^2)	116 (72.5%)
Obese 2 (>30kg/m^2)	44 (27.5%)

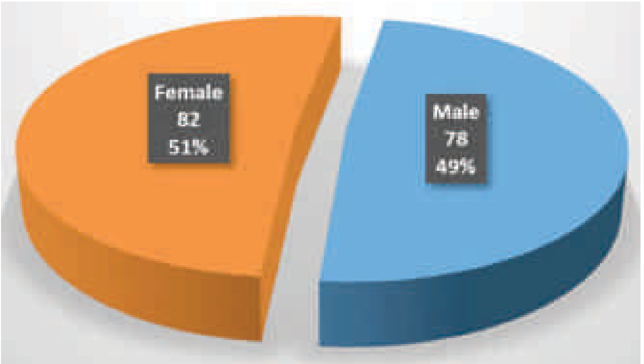

Figure 1: *Gender of patients.*

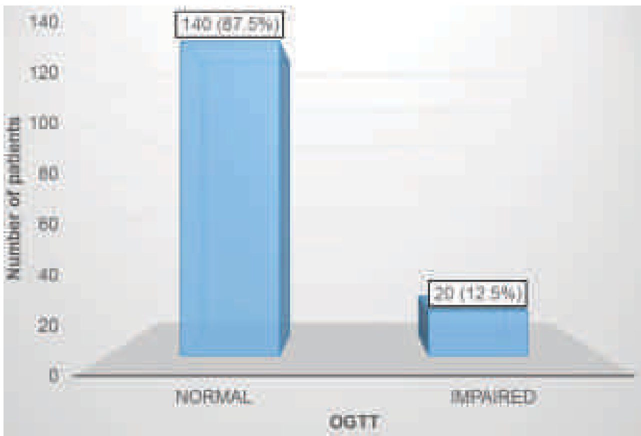

Figure 2: *Frequency of impaired glucose tolerance.*

Table 2: *Comparison impaired OGTT in obesity groups.*

Grades of obesity	OGTT		Total
	Normal	Impaired	
Obese 1	112 (80%)	4 (20%)	116 (72.5%)
Obese 2	28 (20%)	16 (80%)	44 (27.5%)
Total	140 (100%)	20 (100%)	160 (%)

P-value: *0.000 (Fisher exact test).*

Data was stratified for grades of obesity and it was found that in obese-1 type patients, 112 (70%) patients had normal OGTT and 4 (2.5%) patients had impaired OGTT of which only 1 was female. In the obese-2 type patients, 28 (17.5%) patients had normal OGTT and 16 (10%) patients' had impaired of which only 4 were females. P-value was significant ($p<0.0001$) (Table 2).

Results and Discussion

The mean age of the patients in this study was 46.3±13.4 years that is consistent with the study of Viswanathan et al[11] withthe mean age of 41.3±0.2 years. Similarly Ramachandran et al[12] study mean age of 40±12 years is also consistent with our study.

The male(48.8%) & female (51.2%) percentage of our study patients is also comparable with percentage of Invittiet al[13] study with 39% male and 61% female patients.

Reduction in obesity can be achieved by diet control, physical exercise, and drugs[14]. A randomized clinical trial conducted on overweight cases with IGT shows that low diet; weekly 150 minute brisk walk decreases the risk of developing diabetes mellitus by 58% as compared to matched controls. [10]The well-known strong association between BMI and IFG was observed mainly among persons with elevation of serum GGT to certain physiological levels, suggesting a critical role of serum GGT in the pathogenesis of IFG. This finding has an important clinical implication because serum GGT can be used to detect high-risk obese persons. [8] In previous literature, higher percentages of overweight and obese candidates were identified as having IGT compared with their normal-weight counterparts. [9]

Mean BMI of the patients in our researchwas 29.1±13.6 kg/m^2 which is almost equal of Ramachandran et al[15] BMI of 28.7±4.2 kg/m^2.Frequency of impaired glucose tolerance test was 12.5% patients. While comparison with the study of Mohan et a conducted on urban population showed prevalence of IGT in obese grade-1 and obese grade-2 are 11.7% & 9.5% respectively[15] which is comparable with the above study.

In a Pakistani study conducted by Iqbal & Naz showed overall prevalence of IGT & diabetes mellitus are 9.25% & 11.52% respectively. [3]While in above study IGT was 12.5% which is comparable with their study. Dietary habits of low to middle socioeconomic status patients showed more fat, sugar & caloric intake in middleas compared to low socioeconomic status[16].

Conclusion

Frequency of impaired glucose tolerance is common in obese patients. Therefore adequate measures like diet restriction, physical exercise & drug therapy should be taken to control obesity.

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