Original Article

# FREQUENCY OF IMPAIRED GLUCOSE TOLERANCE IN DIFFERENT GRADES OF OBESITY

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## ABSTRACT

**Introduction**
Impaired glucose tolerance (IGT) is a pre-diabetic condition. It is defined as fasting glucose less than 7.0 mmol/l (<126mg/dl) with a two hours glucose tolerance value of 7.8-11.0 mmol/l (140-199mg/dl). Impaired glucose tolerance is characterized by hyperglycemia and insulin resistance and considered to be a risk factor in development of diabetes mellitus.

**Objective**
The objective of this study is to determine the frequency of impaired glucose tolerance in different grades of obesity.

**Study design**
Cross sectional study.

**Setting**
This study was conducted in the Medical Unit-IV outpatient department (OPD), DHQ Hospital, Faisalabad.

**Duration with dates**
Six months from 1st May 2010 to 31st October 2010.

**Subjects and methods**
A total of 150 patients with body mass index ≥25 were selected for this study. Oral glucose tolerance was done to see the relation of impaired glucose tolerance with respect to different grades of obesity which are obese-1 if body mass index is ≥25 but <30 and obese-2 if ≥ 30. 75g oral glucose was given after overnight fasting and blood sample taken before and after two hours.

**Results:**
The mean age of the patients was 37.8±7.8 years. There were 47 (31.3%) male patients and 103 (68.7%) female patients. The mean height of the patients was 1.6±0.1 meters. The mean weight of the patients was 80.4±14.2 kg. The mean body mass index of the patients was 31.7±3.1 kg/m$^2$. There were 55 (36.7%) patients of grade I obesity and 95 (63.3%) patients of grade II obesity. There were 14 (9.3%) patients who had positive impaired glucose tolerance test and 136 (91.7%) patients had negative impaired glucose tolerance test.

**Conclusion:**
It is concluded from this study that frequency of impaired glucose tolerance is common in patients with different grades of obesity occurred in 9.3% of all cases.

**Keywords:** Impaired glucose tolerance, frequency, obesity, body mass index

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## INTRODUCTION

Impaired glucose tolerance (IGT) is a pre-diabetic condition. It is defined as fasting glucose less than 7.0 mmol/l (<126mg/dl) with a two hours glucose tolerance value of 7.8-11.0 mmol/l (140-199 mg/dl). Impaired

glucose tolerance is characterized by hyperglycemia and insulin resistance and considered to be a risk factor in development of diabetes mellitus, coronary artery disease, stroke and peripheral vascular disease.[1]

There are at least 300 million people world wide with impaired glucose tolerance.[2] Approximately 3.6% to 8.7% individuals with impaired glucose tolerance go on to develop type 2 diabetes mellitus each year.[3]

In Pakistan, a study showed over all prevalence of diabetes mellitus and impaired glucose tolerance is 11.52% and 9.25% respectively.[4] A number of risk factors leading to IGT include obesity, hypertension, first degree relatives of diabetics, pregnancy, smoking and drugs as diuretics, steroids.[5]

Obesity is a state of excess body adipose tissue. Obesity is considered to be the result of imbalance between intake and energy expenditure.[6,7]

Body mass index (BMI) between 18.5 to 22.9 is considered to be normal according to guideline of World Health Organization (WHO) for Asia pacific.[9] Those between 23 to 24.9 are overweight while between 25 to 29.9 are obese-1 and greater than or equal to 30 are obese 2. An urban population study showed prevalence of impaired glucose tolerance in obese 1 and obese 2 are 11.7% and 9.5% respectively. Prevalence of impaired glucose tolerance in subjects with abdominal obesity (15%) was significantly higher compared to subjects without abdominal obesity. The prevalence of impaired glucose tolerance is higher among subjects with moderate (7.8%) and light grade of physical activity (6.2%) compared to heavy grade activity (2.5%).[10]

Reduction in obesity can be achieved by diet control, physical exercise, and drugs.[11]

Similarly, a randomized clinical trial in overweight with impaired glucose tolerance shows that low diet, 150 minute brisk walk per week reduces the risk of progression to type 2 diabetes mellitus by 58% as compared to matched control group.[12]

## MATERIAL AND METHODS

### Setting:

This study was conducted in the Medical Unit-IV, (OPD) DHQ Hospital Faisalabad. DHQ hospital is a tertiary care teaching hospital having 800 beds with all necessary facilities.

### Study design:

Cross section study

### Data collection procedure:

A total of 150 patients of either sex of age more than 15 years with BMI ≥25 are included. The approval was obtained from hospital ethical committee. The purpose of the research was explained to each patients and informed consent was obtained from the patients. The history was obtained like pregnancy, hypertension, drugs, diabetes and other chronic diseases like ischemic heart disease and chronic liver disease to rule out. Detailed clinical examination was done by measuring body mass index and checking blood pressure. Oral glucose tolerance was done to see the relation of impaired glucose tolerance with respect to different grades of obesity which are obese-1 if body mass index is ≥25 but <30 and obese-2 if ≥30. Before the test unrestricted carbohydrate diet for three days and the patients should avoid coffee, smoking and heavy exercise six hours before the test. 75g oral glucose was given after overnight fasting and sample before and after two hours. Proforma was developed to record physical and biochemical findings of all patients.

### Statistical analysis:

The collected data was entered into SPSS version 12 and analyzed accordingly. Descriptive statistics was calculated. The quantitative variables were age, height, weight, body mass index and blood pressure. These variables were presented by calculating mean and standard deviation. The qualitative variables included were obesity grades, gender and frequency of impaired glucose tolerance in obese patients. These variables were presented in frequency and percentages. As this was a cross sectional study, therefore no test of significance was applied.

## RESULTS

A total of 150 patients with body mass index equal to or more than 25 kg/m$^2$, and who fulfilled the inclusion criteria were selected from Medical outpatients department, DHQ Hospital Faisalabad.

The mean age of the patients was 37.8±7.8 years.

In the distribution of sex, there were 47 (31.3%) male patients and 103 (68.3%) female patients. The mean height of the patients was 1.6±0.1 meters.

The mean weight of the patients was 80.4±14.2 kg. There were 2 (1.3%) patients in the weight range of 51-60 kg, 47 (31.3%) patients in the weight range of 61-70 kg, 33 (22.0%) patients in the weight range of 71-80 kg, 37 (24.7%) patients in the weight range of 81-90 kg, 11 (7.3%) patients in the weight range of 91-100 kg and 20 (13.3%) patients in the weight range of 101-110 kg (Table 1).

**Table 1. Distribution of patients by weight (n=150)**

| Weight (Kg) | No. | Percentage |
|---|---|---|
| 51-60 | 2 | 1.3 |
| 61-70 | 47 | 31.3 |
| 71-80 | 33 | 22.0 |
| 81-90 | 37 | 24.7 |
| 91-100 | 11 | 7.3 |
| 101-110 | 20 | 13.3 |
| Mean ±SD | 80.4±14.2 | |

Key: SD Standard deviation

The mean body mass index of the patients was 31.7±3.1 kg/m$^2$. There were 66 (44.0%) patients in the body mass index range of 25-30 kg/m$^2$, 62 (41.3%) patients in the body mass index range of 31-35 kg/m$^2$, and 22 (14.7%) patients in the body mass index range of 36-40 kg/m$^2$ (Table 2).

**Table 2. Distribution of patients by body mass index (n=150)**

| Body mass index | No. | Percentage |
|---|---|---|
| 25-30 | 66 | 44.0 |
| 31-35 | 62 | 41.3 |
| 36-40 | 22 | 14.7 |
| Mean ±SD | 31.7±3.1 | |

Key: SD Standard deviation

In the distribution of patients by grades of obesity, there were 55 (36.7%) patients of grade I obesity and 95 (63.3%) patients of grade II obesity (Table 3).

**Table 3. Distribution of patients by grades of obesity (n=150)**

| Grades | No. | Percentage |
|---|---|---|
| Grade I | 55 | 36.7 |
| Grade II | 95 | 63.3 |
| Total | 150 | 100.0 |

In the distribution of patients by frequency of impaired glucose tolerance test, there were 14 (9.3%) patients had positive impaired glucose tolerance test and 136 (91.7%) patients had negative impaired glucose tolerance test (Table 4).

**Table 4. Distribution of patients by impaired glucose tolerance test (n=150)**

| IGTT | No. | Percentage |
|---|---|---|
| Positive | 14 | 9.3 |
| Negative | 136 | 90.7 |
| Total | 150 | 100.0 |

Key: IGTT Impaired glucose tolerance test

## DISCUSSION

In our study the mean age of the patients was 37.8±7.8 years. As compared with the study of Viswanathan *et al.*[13] the mean age of the patients was 41.3±0.2 years, which is comparable with our study. In another study conducted by Ramachandran *et al.*[14] the mean age of the patients was 40±12 years, which is also comparable with our study.

In our study there were 31.3% male patients and 68.3% female patients. As compared with the study of Invitti *et al.*[15] there were 39% male patients and 61% female patients, which is comparable with our study.

In our study the mean body mass index of the patients was 31.7±3.1 kg/m$^2$. As compared with the study of Ramachandran *et al.*[16] the mean body mass index of the patients was 28.7±4.2 kg/m$^2$ which is comparable with our study.

In our study the frequency of impaired glucose tolerance test was 9.3% patients. While compared with the study of Mohan *et al.*[10] conducted on urban population showed prevalence of impaired glucose tolerance in obese 1 and obese 2 are 11.7% and 9.5% respectively, which is comparable with our study.

The overall prevalence of diabetes in the study population was 12.0%, which included 7.2% of known diabetic subjects and 4.8% undiagnosed diabetic subjects, while the prevalence of impaired glucose tolerance was 5.9%. The prevalence of glucose intolerance is high in this selected urban south Indian population. Lifestyle factors and family history

have a synergistic effect on increasing the risk for diabetes in this population.[10]
In a Pakistani study conducted by Iqbal and Naz[4] showed over all prevalence of diabetes mellitus and impaired glucose tolerance is 11.52% and 9.25% respectively. While in our study the frequency of impaired glucose tolerance test was 9.3% patients, which is comparable with the above study.

## CONCLUSION

It is concluded from this study that frequency of impaired glucose tolerance is common in patients in different grades of obesity, as in the present study the frequency of impaired glucose tolerance occurred in 9.3% cases.

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