

A STUDY OF IMPAIRED GLUCOSE TOLERANCE AND IT'S IMPACT ON LUNG FUNCTION IN STABLE COPD PATIENTS

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Abstract

Background: Chronic obstructive pulmonary disease (COPD) is a leading respiratory disease affecting the length and quality of lives of people around the globe. As reported by the World Health Organization (WHO), it affects more than 65 million people around the world, mainly smokers older than 40 years of age¹. A major factor that complicates therapeutic approaches to the management of COPD is that it is frequently associated with comorbidities that need to be emphasized². Impaired glucose tolerance is frequently a precursor to the development of diabetes mellitus. Estimation of glucose tolerance by OGTT can help physicians recognize diabetes early among COPD patients which can delay progression of the disease and exacerbations which accounts for high morbidity and mortality. **Aim:** To study the effect of impaired glucose tolerance on lung function in stable COPD patients. **Materials and Methods:** This is an institutional based cross-sectional study which included 80 COPD patients who regularly visited the outpatient department of Government General and Chest Hospital. Patients were subjected to OGTT, 6-minute walk test, spirometry and BODE index was calculated. **Result:** Out of 80 patients 38.8% of patients had impaired glucose tolerance and 12.5% of patients were reported as diabetics while 48.8% of patients had normal OGTT. IGT had a negative moderate correlation with FEV1 and distance walked in 6-minute walk test and a positive moderate correlation with smoking index, BODE index and number of exacerbations. **Conclusion:** The present study reveals that IGT on OGTT has a significant effect on lung function in COPD. IGT in COPD is associated with a lower FEV1 and higher mMRC score. Patients with IGT has more frequent exacerbations causing more decline in lung function.

INTRODUCTION

Chronic obstructive pulmonary disease is finally gaining the attention it needs. Chronic obstructive pulmonary disease (COPD) is a leading respiratory disease affecting the length and quality of lives of people around the globe. As reported by the World Health Organization (WHO), it affects more than 65 million people around the world, mainly smokers older than 40 years of age.^[1] The Global Initiative

for Chronic Obstructive Lung Disease (GOLD) defines COPD as "A common, preventable and treatable disease that is characterized by persistent respiratory symptoms and airflow limitation that is due to airway and/or alveolar abnormalities usually caused by significant exposure to noxious particles or gases".^[3] It is a heterogeneous disorder and its prevalence varies with age, gender, occupation, ethnicity and most importantly smoking. The prevalence is underestimated since COPD is

frequently under-diagnosed and hence also under-treated. It has an extensive effect on both patients and the healthcare system with high resource utilization, frequent hospitalizations due to acute exacerbations, chronic therapy, reduced quality of life, and death.^[4] Despite worldwide medical research, health care efforts, and health care costs, COPD statistics reveal a continuing upward trend in mortality, in contrast with other major causes of death like cancer and cardiovascular disease.^[5] A major factor that complicates therapeutic approaches to the management of COPD is that it is rarely the only chronic illness a patient has to contend with. The presence of comorbidities is so strongly associated with the management of COPD that the need for thorough attention to them needs to be emphasized.^[4] One such frequent comorbidity is Type 2 diabetes mellitus (DM2) which is common in patients with COPD. According to the available studies the prevalence of DM2 in COPD patients varies between 2-37% 5. Available studies suggest that DM2 may have impact on quality of life and lung function in COPD patients. Impaired glucose tolerance is frequently a precursor to the development of diabetes mellitus. Estimation of glucose tolerance by OGTT can help physicians recognize diabetes early among COPD patients which can prevent deterioration of the disease which accounts for high morbidity and mortality. Although there is emerging data on effect of diabetes in COPD, very little is known about the effect of impaired glucose tolerance/ altered glucose metabolism on lung function in COPD patients. Impaired Glucose tolerance can be easily measured using the oral glucose tolerance test and requires little expertise. It can therefore be a modifiable risk factor for the increased morbidity associated with the disease. The present study is therefore undertaken to elucidate the effect of impaired glucose tolerance on lung function in COPD patients.

Ethical Approval

This study was approved by the institutional ethical committee of Osmania Medical College, Hyderabad.

MATERIALS AND METHODS

This is a cross sectional study which was conducted on 80 patients who were diagnosed with COPD and regularly visited the out-patient department at Government General and Chest hospital, Hyderabad. Patients were enrolled into the study after obtaining their consent. Following a thorough clinical examination, patients were subjected to spirometry, six-minute walk test, OGTT and BODE index was calculated. Patients who were known diabetics, unstable or critically ill patients, patients with history of pulmonary tuberculosis and patients

who denied to participate in the study were excluded.

Data Analysis

Microsoft Excel and SPSS were used for statistical analysis. Discrete variables were presented as frequency and percentages. A p value of less than 0.05 was considered statistically significant.

RESULTS

The present study included 80 patients. There were 72 (90%) males and 8 (10%) females. The majority of patients (45%) were of the age group 69-69 years. The mean age was 62 ± 8 years. 91.2% of patients had smoking history while 8.8% of patients were nonsmokers. These 8.8% of patients constituted all the female patients who had exposure to biomass fuel. All the patients in the study (100%) reported dyspnea with majority of patients (42.5%) having dyspnea of grade II mMRC, followed by cough in 73% of patients. Majority of patients (80%) fall under stage II of GOLD classification of COPD. Out of 80 patients 38.8% of patients had impaired glucose tolerance and 12.5% of patients were reported as diabetics while 48.8% of patients had normal OGTT. In the study the mean FEV1 in patients with IGT was 56.877 whereas the mean FEV1 in the patients with NGT was 63.779. The association is statistically significant with a p value of 0.00. In the study the mean distance covered by patients with impaired glucose tolerance was 303.5 metres whereas the mean distance covered by patients with NGT was 349 metres. There is a statistically significant association between the mean distance covered by the patient and IGT with a p value of 0.03.

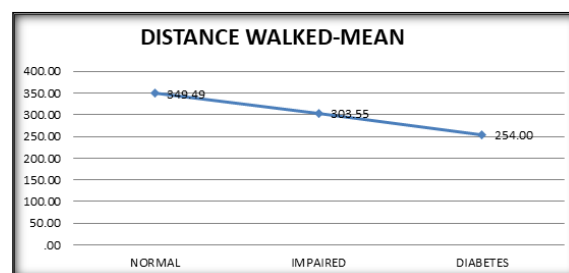


Figure 1: Comparison of the mean distance walked by patients in the six-minute walk test with glucose tolerance

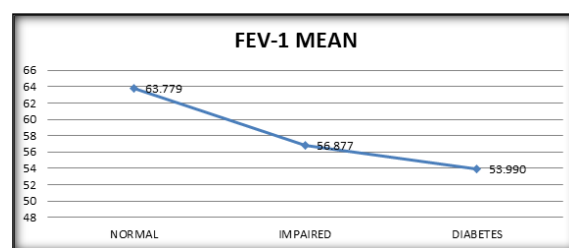


Figure 2: Effect of IGT on FEV1

Table 1: OGTT interpretation in the study population

| OGTT interpretation | N | N % |
|---------------------|---|-----|
|---------------------|---|-----|

| | | |
|----------------------------|----|--------|
| Diabetes | 10 | 12.5% |
| Impaired glucose tolerance | 31 | 38.8% |
| Normal | 39 | 48.8% |
| Total | 80 | 100.0% |

Table 2: The effect of impaired glucose tolerance on the distance walked by patient in the six- minute walk test

| Distance walked | N | Mean | Std. Deviation | 95% Confidence Interval for Mean | | P Value |
|-----------------|----|--------|----------------|----------------------------------|-------------|---------|
| | | | | Lower Bound | Upper Bound | |
| Normal | 39 | 349.49 | 79.271 | 323.79 | 375.18 | 0.03 |
| Impaired | 31 | 303.55 | 76.487 | 275.49 | 331.60 | |
| Diabetes | 10 | 254.00 | 117.398 | 170.02 | 337.98 | |
| Total | 80 | 319.75 | 88.889 | 299.97 | 339.53 | |

DISCUSSION

The present study was undertaken to investigate the effect of impaired glucose tolerance on lung function in stable COPD patients using oral glucose tolerance test. Hyperglycaemia is of interest as it is associated with poor outcomes from acute hospital admission for other conditions. Although there are several studies that show the impact of DM2 on COPD, there is very little convincing data on the effect of impaired glucose tolerance on COPD. Impaired glucose tolerance is a frequent precursor of DM2 and if recognized early can prevent or delay the onset of DM2. In the present study, there was a clear downward trend of FEV1 with rising OGTT values. While the mean FEV1 in patients with NGT was 63.779, the mean FEV1 in patients with IGT was 56.87 and those with DM2 was 53.9. This suggests that patients who were reported having impaired glucose tolerance on OGTT had a lesser FEV1 when compared with patients having normal OGTT. The present study was similar to the study conducted by McKeever et al.^[6] where it was found that the mean FEV1 in patients with IGT was 60.36 when compared with mean FEV1 in patients with NGT which was 73. There was an inverse dose response relation between IGT and FEV1. The present study was also similar to the study conducted by Walter et al.^[7] where the mean FEV1 in those with hyperglycemia was 77 while those patients with normal blood glucose levels was 79 which was statistically significant with a p value < 0.01. Walking is an activity performed by all and therefore measurement of the distance walked is considered an important parameter to grade disability. The six-minute walk test can therefore be used to monitor the progression of disease. In the present study, the mean distance walked by patients with NGT on OGTT was 349.49 meters whereas the mean distance walked by patients with IGT was 303.55 meters and that by diabetic patients was 319.75 meters. These values when plotted on the graph show a clear declining trend. The association between IGT and distance walked in six minutes is statistically significant with a p value of 0.03. In the present study the mean BODE index in those with IGT was 2.61 whereas those with NGT was 1.92 and those with DM2 was 2.90. Patients diagnosed with IGT on OGTT had a relatively higher BODE

index than patients with normal OGTT. The BODE index is a multidimensional scoring system that incorporates BMI, FEV1, six-minute walk test and MMRC grading. The scoring helps to predict the mortality in COPD patients. In the present study statistical significance between IGT and BODE index was not seen. A possible reason for this could be smaller sample size.

CONCLUSION

IGT is a precursor of diabetes and is frequently ignored with respect to its importance. The present study highlights IGT as a parameter that can be used in the future to provide more attention, early intervention and treatment of patients to improve their quality of lives by delaying the decline in lung function. The present study reveals that IGT on OGTT has a significant effect on lung function in COPD. IGT in COPD is associated with a lower FEV1 and higher mMRC score of dyspnoea. Patients with IGT has more frequent exacerbations causing more decline in lung function. Patients with IGT also had a higher score on BODE index which indicates higher mortality. In conclusion, IGT has a negative impact on lung function in COPD with respect to FEV1, BODE index and number of exacerbations.

Limitations

The study was conducted in a tertiary care center in Hyderabad and may not be an actual representation of general population

The sample size was small when compared to the actual prevalence of COPD within the community.

The effect of impaired glucose tolerance on critically ill COPD patients could not be elucidated

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Conflicts of interests Nil.

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