

Study of chronic hyperglycemia and pulmonary function test at tertiary care center in rural Maharashtra

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Abstract

Background: Global burden of diabetes has increased from 108 million to around 420 million in last 40 years. Diabetes mellitus prevalence is rising in urban and rural areas. One of the less known complications of diabetes mellitus is impaired pulmonary function. There are very few studies in this rural area to address magnitude of problem and assess its adverse outcomes. **Aim and objective:** To study chronic hyperglycemia and its correlation with impaired pulmonary function in patients coming to tertiary care center in rural Maharashtra. **Materials and methods:** 60 type 2 diabetes mellitus patients were randomly selected coming to tertiary care center satisfying inclusion criteria, written and informed consent was taken. For estimating Glycosylated hemoglobin modified method of Fluckiger and Winterhalter was used. Spirometry was done using computerized spirometer HELIOS 702 of recorders and medicare systems private limited (RMS). Data obtained was analyzed using SPSS. **Results:** In spirometry FVC and FEV1 means were decreased. 42% of patients had restrictive type of lung disease. FEV1 and FEV1/FVC showed strong negative correlation with HbA1c and differences in the means were statistically significant ($p=0.01$ and $p=0.03$ respectively). FVC also showed strong negative correlation with HbA1C value ($r=-0.313$) and difference in the mean was highly significant ($p<0.001$). there is negative correlation between BMI and pulmonary function and it is statistically significant. **Conclusion:** chronic hyperglycemia leads to restrictive type of lung disease. With rise in HbA1c there is more impairment of pulmonary function. Diabetics are at greater risk of development of restrictive type of lung disease, they must be screened routinely for pulmonary function test along with screening for macro and microvascular complication.

Key Word: chronic hyperglycemia, pulmonary function test.

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Received Date: 20/08/2020 Revised Date: 15/09/2020 Accepted Date: 27/10/2020

DOI: <https://doi.org/10.26611/1031633>

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INTRODUCTION

Global burden of diabetes has increased from 108 million to around 420 million in last 40 years⁽¹⁾. Diabetes mellitus prevalence is rising in urban and rural areas. Currently India has total 77 million diabetic patients. it constitute 17 % of total diabetics in world. According to International diabetes federation idea will have 134 million diabetics by 2045. Diabetes mellitus leads to macrovascular and microvascular complications like stroke, myocardial infarction, peripheral vascular disease, diabetic nephropathy, diabetic retinopathy and diabetic neuropathy. But one of the less known complications of diabetes mellitus is impaired pulmonary function. Pulmonary

function is assessed by estimating forced vital capacity, FEV1 and FEV1/FVC ratio with the help of spirometer. While treating diabetes usually focus is on screening of microvascular and macrovascular complications. Impairment of pulmonary function is usually missed. Studies in past suggest obstructive, restrictive and mixed type of lung disease in diabetic patients^{3,4} Impaired pulmonary function decreases overall quality of life of affected individual and also decreases his productivity. These complications come with a great economic burden. There are very few studies in this rural area to address magnitude of problem and assess its adverse outcomes.

Aim and objective: To study chronic hyperglycemia and its correlation with impaired pulmonary function in patients coming to tertiary care center in rural Maharashtra.

MATERIALS AND METHODS

The present study was carried out in accordance with the Helsinki declaration all participants participated voluntarily after being given a detailed explanation of the purpose of the study. Written and Informed consent were obtained from each participant. Detailed clinical history and thorough clinical examination were performed. 60 type 2 diabetes mellitus patients were randomly selected coming to tertiary care center satisfying inclusion criteria, All diabetic patients visiting OPD and those hospitalized in wards were included in study.

Table 1: Criteria for the diagnosis of diabetes

HbA1c \geq 6.5%. The test should be performed in a laboratory using a method that is NGSP certified and standardized to the diabetes control and complication trial assay.*
OR
Fasting plasma glucose \geq 126 mg/dl (7.0 mmol/l). Fasting is defined as no caloric intake for at least 8 h.*
OR
2 h plasma glucose \geq 200 mg/dl (11.1 mmol/l) during an oral glucose tolerance test. The test should be performed using a glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water.*
OR
In a patient with classic symptoms of hyperglycemia or hyperglycemic crisis, a random plasma glucose \geq 200 mg/dl (11.1 mmol/l)
*In the absence of unambiguous hyperglycemia, result should be confirmed by repeat testing ⁽⁴⁾

Patients with present or past history of smoking, those suffering from cardiovascular disease and all patients suffering from any known pulmonary diseases were excluded from study. For estimating Glycosylated hemoglobin modified method of Fluckiger and Winterhalter was used. Spirometry was done using computerized spirometer HELIOS 702 of recorders and medicare systems private limited (RMS). Data obtained was analyzed using SPSS.

RESULTS

In spirometry FVC and FEV1 means were decreased. 42% of patients had restrictive type of lung disease. FEV1 and FEV1/FVC showed strong negative correlation with HbA1c and correlation is statistically significant (p=0.01 and p= 0.03 respectively).

Table 2: correlation and statistical significance

	FEV1 TEST	FEV1/FVC test	FVC Test
BMI	r=-0.0148 p=0.9104	r= -0.1882 P=0.1276	r=-0.3139 P=0.009
Hab1c	r=-0.2864 P=0.0189	r=-0.2515 P=0.0396	r=-0.7976 p=0.0000

FVC also showed strong negative correlation with HbA1C value (r=-0.313) and correlation is highly significant (p<0.001). Though there is negative correlation between

BMI and FEV1 but correlation is not statistically significant. There is negative correlation between BMI and Forced vital capacity and it's statistically significant. With rise in BMI there is fall in FVC value.

DISCUSSION

Glycosylated hemoglobin reflects glycemic control over preceding three months. According to stamler J *et al.* lower Glycosylated hemoglobin values are associated with less incidence of microvascular complications in type 1 and type II diabetes mellitus.⁵ Present study revealed restrictive type of lung disease in diabetic patients. these findings are in accordance to studies done by² On the contrary study by Simran Kaur and Nandni Agearwal³ showed mixed type of lung disease in diabetic. Study of pulmonary function in diabetics by Swati H Shah *et al.* showed no correlation between HbA1c and impaired pulmonary function⁶. BMI showed statistically significant negative correlation with forced vital capacity (FVC) values. This is in contrast to study done by Santosh V Chidr *et al.*⁷ Chronic hyperglycemia leads to generation of advanced glycation end products (AGE). Their interaction with corresponding receptors (RAGE) leads to inflammation and oxidative stress ultimately leading to fibrosis in lung parenchyma and thickening of respiratory membrane. These changes make lung tissue less compliant during normal tidal

respiration⁸. Present study is unique in analyzing correlation between long term glycemic control and pulmonary function of rural population. As sample of study is small, larger studies are required to further assess gravity of problem and prevent its adverse outcomes.

CONCLUSION

chronic hyperglycemia leads to restrictive type of lung disease. With rise in Hb1c there is more impairment of pulmonary function. Diabetics are at greater risk of development of restrictive type of lung disease, they must be screened routinely for pulmonary function test along with screening for macro and microvascular complication.

Acknowledgment: sincere thanks to Mr Pankaj Gangwal (Statistician, Dept. of PSM IIMSR Medical college Jalna) for his exceptional support in statistical analysis of data.

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Source of Support: None Declared
Conflict of Interest: None Declared