

A STUDY OF PULMONARY FUNCTION TESTS IN A PATIENTS WITH TYPE 2 DIABETES MELLITUS AND THEIR ASSOCIATION WITH GLYCAEMIC CONTROL AND DURATION OF DIABETES AT TERTIARY CARE HOSPITAL

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Article Info: Received 03 September 2019; Accepted 15 October. 2019

DOI: <https://doi.org/10.32553/ijmbs.v3i11.754>

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Conflict of interest: No conflict of interest.

Abstract

Background- The pulmonary and other late complications of diabetes share a similar microangiopathy mechanism. Since, they share common mechanisms there may be associations between lung function and markers of microangiopathy. Therefore, we aimed to determine the association of pulmonary function with diabetes and the correlation of pulmonary function abnormalities with microvascular complications.

Methods- This was a cross sectional comparative study carried out in a tertiary care teaching hospital in Jaipur, Rajasthan, India. Eligible participants included 100 adults below 60 years of age with T2DM attending the outpatient clinics or admitted to the wards during the study period, and an equal number of non-diabetic adults matched for age and gender who served as the comparative controls.

Results- The present study clearly showed a highly statistically significant p value when the lung function tests (FVC, FEV1, and PEFR) were compared between type 2 diabetics and age, sex, BMI matched controls. The duration of DM and PFT correlation was found stastically significant and HbA1c and PFT correlation was found stastically Insigificant.

Conclusion- Chronic hyperglycemia in diabetes may lead to diabetes associated systemic inflammation which results in airway and lung damage. Diabetes was more common in the sixth decade of life with slight male preponderance. The most common PFT derangement pattern in diabetic subjects is a restrictive pattern and having a significantly longer duration of a diabetic. The short-term indicators of glycemic controls were not significantly associated with a restrictive pattern of PFT.

Keywords: Diabetes, Pulmonary function test, HbA1c, Duration of diabetes.

Introduction

About 7% of Indian adults suffer from type 2 diabetes (T2DM), making India a country with more diabetic patients than any other on the globe. It is well established that poor glycaemic control leads to microvascular and macrovascular complications. Although the functional disturbances that ensue from pathophysiologic alterations in the microvasculature has been extensively studied in the kidneys, retina and nerves, the effect of diabetes on the lung, another organ with a rich microvascular network has not been investigated with much interest.¹

Chronic hyperglycemia in diabetes may lead to systemic inflammation which results in airway and lung damage.² As a proinflammatory stimulus, chronic hyperglycemia leads to increased intrapulmonary inflammation and tissue fibrosis. Structural modifications of the lung parenchyma that result

from these changes include the narrowing of the alveolar space, flattening of the alveolar epithelium and expansion of the interstitial. The result is a reduction of lung volumes and pulmonary diffusion capacity.³ T2DM individuals are known to have reduced exercise capacity and the level of reduction is associated with diabetes control. The pulmonary and other late complications of diabetes share a similar microangiopathy mechanism. Since, they share common mechanisms, there may be associations between lung function and markers of microangiopathy

Therefore, we aimed to determine the association of pulmonary function with diabetes and the correlation of pulmonary function abnormalities with microvascular complications.

Material and methods

This was a cross sectional comparative study carried out in a tertiary care teaching hospital in Jaipur, Rajasthan, India. Eligible participants included 100 adults below 60 years of age with T2DM attending the outpatient clinics or admitted to the wards during the study period, and an equal number of non-diabetic adults matched for age and gender who served as the comparative controls.

Persons with chronic lung diseases like asthma, chronic bronchitis and bronchiectasis, restrictive airway conditions like scoliosis, pulmonary tumours and respiratory infection (upper and lower respiratory tract infection), active tuberculosis, occupational lung diseases, type 1 diabetes, glomerular filtration rate < 60 ml/minute, pregnant women and smokers were excluded from the study.

Subject's brief history of the condition was sought and detailed clinical examination was performed.

Patients FBS, PPBS were analyzed by glucose oxidase (GOD), peroxidase (POD) methods and HbA1C was analyzed using HPLC. Pulmonary function test was conducted in all the subjects using the spirometer which was the gold standard for accurate and repeatable measurement of lung function.

Data were expressed as a percentage and mean±SD. Student's t-test was used to check the significance of the difference between two parameters in parametric data. Pearson correlation analysis was performed to check the correlation between two categorical variables. Fischer's exact test or Chi-square test was used to analyze the significance of the difference between frequency distribution of the data.

Results

Table 1: Socio-demographic profile

Socio-demographic variable	Diabetic patients	Control	p-value
Mean age	51.25±16.54Yrs	52.32±15.12Yrs	>0.05
Male : female	56:44	59:41	>0.05
Hindu: Muslims	92:8	91:9	>0.05
Rural : urban	33:67	35:65	>0.05
BMI(kg/mt ²)	23.12±2.34	22.8±1.95	>0.05
Duration of diabetes	6.24±2.31Yrs		
FBS(mg/dl)	114.8±17.5mg/dl	75.12±6.32mg/dl	0.001
HbA1c (%)	7.12±1.32	4.6±1.01	0.001

Mean age of diabetic patients was 51.25±16.54years. Majority of the subjects were hindu male from urban

area. The socio-demographic wise both group were comparable. The FBS, HbA1c was significantly higher in diabetic patients.

Table 2: Pulmonary function test

Variable	Diabetic patients	Control	p-value
FVC (liters)	2.15±0.17	3.12±0.10	0.001
FEV1 (liters)	1.78±0.14	2.45±0.06	0.001
FEV1/FVC %	78.23±3.64	69.32±1.12	0.001
PEFR (liters/sec)	4.96±0.32	6.56±0.26	0.001

The present study clearly showed a highly statistically significant p value when the lung function tests (FVC, FEV1, and PEFR) were compared between type 2 diabetics and age, sex, BMI matched controls.

Table 3: Correlation of HbA1c and duration of DM with PFTs

Parameters	R2	p-value	
FVC	Duration of DM	-0.25	0.04(S)
	HbA1c	0.11	0.38(NS)
FEV1	Duration of DM	-0.37	0.01(S)
	HbA1c	0.34	0.64(NS)

In present study duration of DM and PFT correlation was found stastically significant and HbA1c and PFT correlation was found stastically Insignificant.

Discussion

Diabetes mellitus is a chronic disease associated with various micro and macrovascular complications. Present study finding showed that majority of the subjects were male, belonged to the sixth decade of life, having normal BMI and pulmonary function was normal. Pulmonary function was found to be restrictive subjects. Study findings show that diabetes mellitus was more common in old age group (>50years of age) and in male population.^{3,4}

The present study clearly showed a highly statistically significant p value when the lung function tests (FVC, FEV1, and PEFR) were compared between type 2 diabetics and age, sex, BMI matched controls.

Asanuma⁵ and Lange et al.,⁶ reported that FVC and FEV1 were reduced in type 2 diabetic subjects as compared to those in control subjects. The results of present study were similar to the results which were observed by Asanuma and Lange et al., On contrary, Benbassat⁷ showed that FVC and FEV1, were within the predicted values in type 2 diabetics. The most probable reason for this contradiction was that Benbassat had studied pulmonary functions in a

group of patients with type 2 diabetes, but they had not compared their results with a matched control group.

Recent studies which were conducted by Lange et al.,⁶ indicated that the type 2 diabetic patients are associated with a slight reduction in FVC and that it was because of impaired defenses against environmental challenges such as smoking and airway infections in diabetes. In a study which was done by Davis. A Wendy et al., it was found that there was a decrease in mean FVC values in type 2 diabetics.⁸

Conclusion

Chronic hyperglycemia in diabetes may lead to diabetes associated systemic inflammation which results in airway and lung damage. Diabetes was more common in the sixth decade of life with slight male preponderance. The most common PFT derangement pattern in diabetic subjects is a restrictive pattern and having a significantly longer duration of a diabetic. The short-term indicators of glycemic controls were not significantly associated with a restrictive pattern of PFT.

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