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# Original Research

## Assessment of pulmonary function test in patients with type 2 diabetes mellitus

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***ABSTRACT:***

**Background:** Diabetes affects numerous organs and is a micro-macrovascular disease. The outcomes of the poor characterization of DM pulmonary complications have been inconsistent. The present study was conducted to assess pulmonary function test in patients with type 2 diabetes mellitus. **Materials & Methods:** 86 patients with type II diabetes mellitus of both genderswere kept in group I and healthy subjects in group II. The following parameters were noted: forced expiratory flow during 25% of FVC (FEF25), forced expiratory flow during 50% of FVC (FEF50), forced expiratory flow during 75% of FVC (FEF75), forced expiratory flow during 25–75% of FVC (FEF25–75), forced expiratory flow during 0.2–1.2 litres of FVC (FEF0.2–1.2), maximum expiratory flow rate (PEFR), and forced vital capacity (FVC) in litres. **Results:** The mean age in group I was 52.2 years and in group II was 54.1 years, weight was 62.8 Kgs in group I and 64.1 Kgs in group II, height was 153.5 cm in group I and 155.3 cm in group II. The mean HbA1C level in group I was 7.9% and duration of DM was 6.2 years. The difference was non- significant (P> 0.05). The mean FVC in group I was 74.1 and in group II was 88.4, FEV1 was 72.2 in group I and 84.7 in group II, FEV1/ FVC was 108.7 in group I and 106.3 in group II, PEFR was 54.2 and 73.4, $FEF_{25}$ was 56.2 and 77.5, $FEF_{50}$ was 57.5, $FEF_{75}$ was70.7 and 81.2, $FEF_{25-75}$ was 61.8 and 70.1, $FEF_{0.2-1.2}$ was 66.3 and 88.5 in group I and II respectively. The difference was significant (P< 0.05). There was no positive correlation between FVC with HbA1C, FEV1 with HbA1C, FVC with duration and FEV1 with duration (P> 0.05). **Conclusion:** The main factors influencing lung pathology are neither glucose levels or the length of the illness.

**Key words:** Diabetes, Pulmonary function test, diabetic micro-angiopathy

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## INTRODUCTION

Diabetes affects numerous organs and is a micro-macrovascular disease. The outcomes of the poor characterization of DM pulmonary complications have been inconsistent. Microangiopathy may have an impact on the lung's alveolar capillary network, a sizable microvascular unit.[1] However, a significant loss of the microvascular bed can be tolerated without causing dyspnea due to its enormous reserve. Consequently, there may be a lack of clinical recognition for pulmonary diabetic micro-angiopathy. Pulmonary functions in diabetes mellitus have been extensively investigated outside of India, but in our nation, there aren't many studies on these anomalies and how they relate to glycosylated hemoglobin (HbA1c) and the length of the disease.[2]

Among the significant alterations that occur in diabetes mellitus are decreased lung volume, decreased respiratory muscle function, decreased pulmonary diffusion capacity for carbon monoxide, chronic low-grade inflammation, decreased elastic recoil, and autonomic neuropathy affecting the respiratory muscles.[3] Because of the possible clinical and epidemiological ramifications, the link between diabetes mellitus (DM) and pulmonary function tests (PFTs) is nevertheless significant despite its ambiguity. Loss of pulmonary reserve could become significant from a clinical standpoint.[4] In contrast to myocardial and skeletal muscle function, pulmonary indices can be measured despite physical fitness limitations and can thus serve as a useful indicator of the progression of diabetic microangiopathy. Ventilator function testing is a non-invasive method of quantifying physiological reserve in a large microvascular bed.[5]The present study was conducted to assess pulmonary function test in patients with type 2 diabetes mellitus.

## MATERIALS & METHODS

The present study consisted of 86 patients with type II diabetes mellitus of both genders. All were informed

regarding the study and their written consent was obtained.

Data such as name, age, gender etc. was recorded. Patients were kept in group I and healthy subjects in group II. Using a turbine flow sensor-based 702 Helios-Spirometer, the pulmonary function test (PFT) was conducted in accordance with the American Thoracic Society/European Respiratory Society (ATS/ERS) recommendations. The following parameters were noted: forced expiratory flow during 25% of FVC (FEF25), forced expiratory flow during 50% of FVC (FEF50), forced expiratory flow during 75% of FVC (FEF75), forced expiratory flow during 25–75% of FVC (FEF25–75), forced expiratory flow during 0.2–1.2 litres of FVC (FEF0.2–1.2), maximum expiratory flow rate (PEFR), and forced vital capacity (FVC) in litres. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

## RESULTS

**Table I Baseline parameters**

| Parameters | Group I | Group II | P value |
|---|---|---|---|
| Age (years) | 52.2 | 54.1 | 0.85 |
| Weight (Kgs) | 62.8 | 64.1 | 0.72 |
| Height (cm) | 153.5 | 155.3 | 0.57 |
| HbA1C | 7.9 | - | - |
| Duration of DM (years) | 6.2 | - | - |

Table I shows that mean age in group I was 52.2 years and in group II was 54.1 years, weight was 62.8 Kgs in group I and 64.1 Kgs in group II, height was 153.5 cm in group I and 155.3 cm in group II. The mean HbA1C level in group I was 7.9% and duration of DM was 6.2 years. The difference was non- significant (P> 0.05).

**Table II Assessment of pulmonary function test**

| Parameters | Group I | Group II | P value |
|---|---|---|---|
| FVC | 74.1 | 88.4 | 0.05 |
| FEV1 | 72.2 | 84.7 | 0.02 |
| FEV1/ FVC | 108.7 | 106.3 | 0.94 |
| PEFR | 54.2 | 73.4 | 0.01 |
| $FEF_{25}$ | 56.2 | 77.5 | 0.02 |
| $FEF_{50}$ | 57.5 | 0 | - |
| $FEF_{75}$ | 70.7 | 81.2 | 0.05 |
| $FEF_{25-75}$ | 61.8 | 70.1 | 0.04 |
| $FEF_{0.2-1.2}$ | 66.3 | 88.5 | 0.01 |

Table II, graph I shows that mean FVC in group I was 74.1 and in group II was 88.4, FEV1 was 72.2 in group I and 84.7 in group II, FEV1/ FVC was 108.7 in group I and 106.3 in group II, PEFR was 54.2 and 73.4, $FEF_{25}$ was 56.2 and 77.5, $FEF_{50}$ was 57.5, $FEF_{75}$ was70.7 and 81.2, $FEF_{25-75}$ was 61.8 and 70.1, $FEF_{0.2-1.2}$ was 66.3 and 88.5 in group I and II respectively. The difference was significant (P< 0.05).

**Graph I Assessment of pulmonary function test**

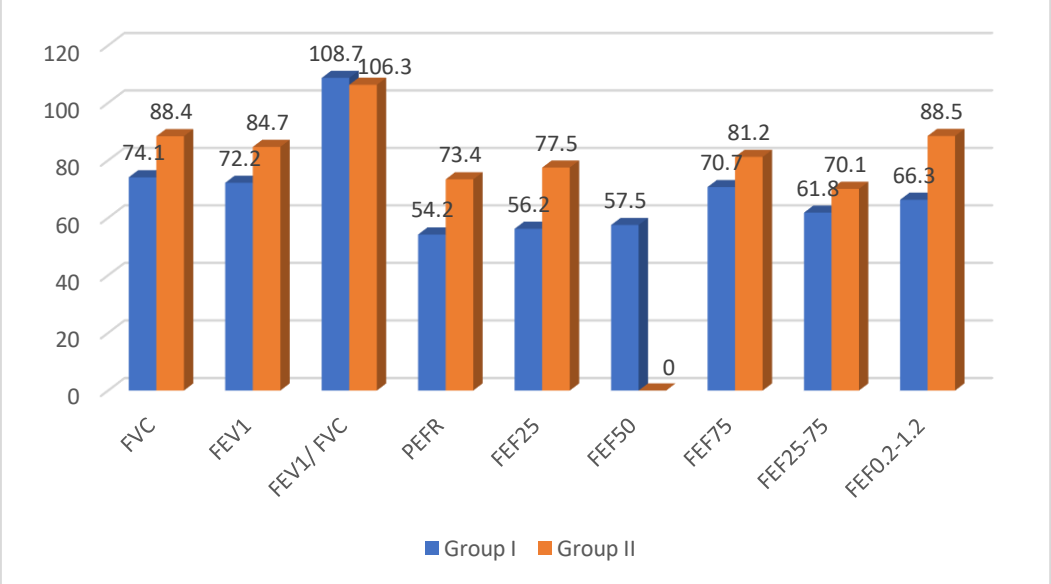

**Table III Correlation of HbA1C and duration of diabetes mellitus with PFT**

| Parameters | $R^2$ | P value |
|---|---|---|
| FVC with HbA1C | 0.015 | 0.12 |
| FEV1 with HbA1C | 0.006 | 0.57 |
| FVC with duration | 8.6-0.003 | 0.42 |
| FEV1 with duration | 0.005 | 0.13 |

Table III shows that there was no positive correlation between FVC with HbA1C, FEV1 with HbA1C, FVC with duration and FEV1 with duration (P> 0.05).

## DISCUSSION

The widespread biochemical, morphological, and functional problems that accompany diabetes mellitus (DM) can lead to consequences that impact the neurological, cardiovascular, and renal systems as well as organs and tissues such the skin, liver, collagen, and elastic fibers. It affects numerous body organs and is in fact a multi-system sickness.[6] Diabetes-related problems impair general quality of life and present a substantial healthcare burden. The metabolic problem is a risk factor that can cause macrovascular pathologies that lead to peripheral vascular illnesses, coronary artery diseases, and cerebrovascular accidents, as well as microvascular pathologies that contribute to autonomic neuropathy, nephropathy, and retinopathy.[7] Within 5 to 10 years following the initiation of diabetes, microvascular problems start to show up, and within 15 to 20 years, macrovascular issues do as well. Of these, pulmonary impairment with a tenable pathophysiological etiology has been documented in diabetic individuals. The necessity of spirometry in diabetic patients is actually up for dispute.[8]The present study was conducted to assess pulmonary function test in patients with type 2 diabetes mellitus.

We found that mean age in group I was 52.2 years and in group II was 54.1 years, weight was 62.8 Kgs in group I and 64.1 Kgs in group II, height was 153.5 cm in group I and 155.3 cm in group II. The mean HbA1C level in group I was 7.9% and duration of DM was 6.2 years. Shah et al[9] examined the pulmonary function metrics of diabetes patients and contrasted them with those of healthy volunteers who were matched for age and gender. In diabetic patients, they connected glycosylated hemoglobin (HbA1c) and the length of the disease with forced vital capacity (FVC) and forced expiratory volume in one second (FEV1). Using a Helios 702 spirometer, pulmonary function tests (PFTs) were recorded in 60 male patients with type 2 diabetes and 60 healthy male controls between the ages of 40 and 60. FVC, FEV1, FEV1/FVC, FEF25, FEF50, FEF75, FEF25–75, FEF0.2–1.2, and peak expiratory flow rate (PEFR) were the PFTs that were recorded. The ion exchange resin method, a highly common estimation technique, was used to assess the HbA1c of each patient. Pearson's coefficient was used to analyze the relationships between FVC, FEV1, HbA1c, and length of illness in diabetic patients. With the exception of FEV1/FVC, the PFTs were considerably lower in diabetes patients than in healthy controls. FEV1 and FVC did not correlate with either HbA1c or the length of the illness.

We found that mean FVC in group I was 74.1 and in group II was 88.4, FEV1 was 72.2 in group I and 84.7 in group II, FEV1/ FVC was 108.7 in group I and 106.3 in group II, PEFR was 54.2 and 73.4, $FEF_{25}$ was 56.2 and 77.5, $FEF_{50}$ was 57.5, $FEF_{75}$ was70.7 and 81.2, $FEF_{25-75}$ was 61.8 and 70.1, $FEF_{0.2-1.2}$ was 66.3 and 88.5 in group I and II respectively. There was no positive correlation between FVC with HbA1C, FEV1 with HbA1C, FVC with duration and FEV1 with duration (P> 0.05). Yeh et al[10]tested the hypothesis that diabetes is independently associated with reduced lung function, both cross-sectionally and longitudinally.At baseline, adults with diabetes had significantly lower predicted FVC (96 vs. 103%, P < 0.001) and predicted FEV(1) (92 vs. 96%, P < 0.001) than those without diabetes. These differences remained significant after adjustment for demographic characteristics, adiposity, smoking, physical activity index, education, and ARIC field center. Graded, inverse associations were observed between hyperglycemia, diabetes severity (i.e., duration of diabetes and types of antidiabetes medications), and FVC and FEV(1) (all P(trend) < 0.001). In prospective analyses, FVC declined faster in diabetic adults than in their nondiabetic counterparts (64 vs. 58 ml/year, P = 0.01). Diabetes severity as indicated by intensity of antidiabetic treatment also showed graded relationships with the rate of FVC decline (P < 0.01).

## CONCLUSION

Authors found that the main factors influencing lung pathology are neither glucose levels or the length of the illness.

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