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Original Research Article

# Age Related Decline in Lung Function in Type-2 Diabetics

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**Abstract:**

**Background:** Diabetic individuals have several complications, such as diabetic retinopathy and nephropathy as well as an increased mortality risk and impairment in health-related quality of life. Despite some authors have suggested that pulmonary function reduction might be a chronic complication of Diabetes mellitus (DM), there are doubts whether the pulmonary function decrease is really caused by DM itself or if it represents a deleterious impact of ageing process. With the looming expansion of the elderly population of the US, a thorough understanding of "normal" aging-related changes on the respiratory system is paramount. The respiratory system undergoes various anatomical, physiological changes with age. The present study has focused on the impact of age on respiratory system in type -2 diabetics as well as on pulmonary function tests like FVC, FEV1 and FEV1/FVC ratio.

**Keywords:** Elderly; Diabetes; Pulmonary function tests



## Introduction

Diabetic individuals have several complications, such as diabetic retinopathy and nephropathy as well as an increased mortality risk and impairment in health-related quality of life. Despite some authors have suggested that pulmonary function reduction might be a chronic complication of Diabetes mellitus (DM), there are doubts whether the pulmonary function decrease is really caused by DM itself or if it represents a deleterious impact of ageing process. The type-2 Diabetes mellitus (DM) is a prevalent disease worldwide, affecting approximately 25% of the elderly population [1], with a projection of about 300 million adults by 2030 [2].

DM patients have several complications, such as obesity, retinopathy and nephropathy [3] as well as an increased mortality risk and impairment in health-related quality of life, representing high costs to health system [4]. Thus, creating effective policies towards the disease treatment is considered a challenge for public health system.

Diabetic individuals also have higher muscle mass loss [5] and reduced muscle strength as well as less tolerance to exercise when compared with non-diabetic patients [6-9].

Regarding respiratory muscle strength, clinical observation indicates that DM is associated with a higher risk of developing respiratory muscle weakness [7-9]. Recent studies with animal models showed that diabetes evokes severe damage to the diaphragmatic function, leading to a substantially reduced respiratory muscle capacity [10]. With the looming expansion of the elderly population of the US, a thorough understanding of "normal" aging-related changes on the respiratory system is paramount. The respiratory system undergoes various anatomical, physiological changes with age. The structural changes include chest wall and thoracic spine deformities which impairs the total respiratory system compliance leading to increase work of breathing. The lung parenchyma loses its supporting structure causing dilation of air spaces: "senile emphysema". Respiratory muscle strength decreases with age and can impair effective cough, which is important for airway clearance. The lung matures by age 20–25 years, and thereafter aging is associated with progressive decline in lung function. The alveolar dead space increases with age, affecting arterial oxygen without impairing the carbon dioxide elimination. The airways receptors undergo functional changes with age and are less likely to respond to drugs used in younger counterparts to treat the same disorders. Additionally, Ljubic et al. [11] showed that diabetes presence could lead to pulmonary complications, due to collagen and elastin changes [12]. Therefore, despite some authors have suggested that pulmonary function reduction might be a chronic complication of DM, there are doubts whether the pulmonary function decrease is really caused by DM or if this

represents a deleterious impact of ageing process. Thus, this study aimed to compare and pulmonary function in diabetic and non-diabetic elderly patients and the effect of aging on pulmonary function in type -2 diabetics.

**Aims**: This study aimed to compare pulmonary function in diabetic and non-diabetic in elderly patients and the effect of aging on pulmonary function in type -2 diabetics.

**Methods:** This study was approved by the University Research Ethics Committee. Individuals were informed about the aims of the study and signed the informed consent prior to any methodological procedure. Over a period of 2 years, patients with type 2 diabetes mellitus who were attending medical OPD of Dr. D. Y. Patil Medical College Hospital were included in the study. They were requested to attend a medical interview, and underwent physical examination including fundoscopy.

For this case-control study, older adults (age over 60 years old) were randomly selected from an age-ing study (EELO project) and they were separated in Diabetic (DG) and non-diabetic group (referred as control group, CG). while pulmonary function was evaluated by spirometry (considering the following variables: FVC, FEV1, FEV1/FVC), using RMS Helios 702 Spirometer..

**Inclusion criteria**

Type 2 Diabetes mellitus of at least 6months duration, able to give informed consent. Diabetics who have never smoked, without any past history of lower respiratory illness and who did not show at the time of the examination, symptoms related to respiratory illness. These included nasal itching, nasal congestion, running nose, dry throat, hoarseness, epistaxis, sneezing and pain suggestive of sinusitis, cough, expectoration and dyspnea.

**Exclusion Criteria**

Smokers , Present or past history of respiratory diseases that might affect lung function such as asthma, COPD, tuberculosis, bronchiectasis, interstitial lung disease.

History of occupational exposure to any substances that could affect lung function.

Individuals with current or recent upper respiratory or lower respiratory infection, that could pre-dispose to heightened airway reactivity.

Individuals with unacceptable spirometric technique. An unacceptable spirometry was that in which FEV1 or FVC could not be correctly measured due to Cough,

Obstruction of teeth or tongue

Sub-maximal effort

Air escape

Lack of understanding of the procedures

Recent surgery.

RMS Helios spirometer calibrated daily, was used for all pulmonary function measurements according to ATS performance criteria.

**Observation and Results**

A total number of 130 cases were suitable for analysis. There were 74 diabetics (STUDY GROUP) and 56 non-diabetics (CONTROL GROUP). The results were entered on a Microsoft Excel spreadsheet and were analysed using SPSS version 10.0 software

| **[Table/Fig-1]: Anthropometric and spirometric lung function test data for male type 2 Diabetics compared with their matched controls. Parameters** | **Type-2 diabet-ics (Mean± SD)** | **Controls (Mean± SD)** | **P value** |
|---|---|---|---|
| Age (years) | 99.46± 4.12 | 97.72± 3.8 | 1.52 |
| FVC (liters) | 4.77±0.3718 | 6.7382± 0.2252 | 0.0002 |
| FEV1 (liters) | 3.991± 0.3248 | 5.2172± 0.1496 | 0.0028 |
| FEV1/FVC % | 165.0936±7.826 | 144.6418±2.5146 | 0.0008 |

Spirometric values were consistently lower in diabetic than non-diabetic (Table/fig-1).

**Discussion**

In our study diabetes showed reduced lung function. Mean values in diabetics were less when compared with non-diabetics for FVC, FEV1. Both in the Co-penhagen city heart study (Lange et al., 1989) [13] and in the Fremantle diabetes study, lung function among diabetic subjects were diminished when compared among controls. FEV1/FVC% is the vol-ume of air expired in the first second, expressed as percentage of FVC. It is a more sensitive indicator of airway obstruction than FVC or FEV1 alone. Our study showed statistically significant increase FEV1/FVC%. The FEV1/FVC% was increased sug-gested that the impairment of pulmonary functions in type 2 diabetics was primarily restrictive. The as-sociation between PFT and diabetes is also affected by age, sex and BMI. In this study also it is seen.

Diabetics showed reduction in PFT when compared with matched control. Age was a significant determinant in the FDS. The age of the diabetics subject with ventilatory defects was also significantly higher than the age of diabetic subjects with normal ventilatory function, its all reflecting the age –related decline in the lung function.

Considering that DM is an important public health problem, with high prevalence and morbidity, it can be suggested that pulmonary function evaluation could be recommended at the evaluation of diabetes chronic complications.

**Conclusion**: According to these results, it can be concluded that diabetic patients show decline of pulmonary function in comparison to non-diabetic individuals. Therefore, it can be suggested that pulmonary function evaluation should be recommended at the evaluation of diabetes' chronic complications.

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