

A Study on the Duration of Diabetes and Changes in Lung Function in Type 1 *Diabetes mellitus*

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Abstract: *Diabetes mellitus* leads to micro vascular damage of all organs. Pulmonary vasculature and connective tissues plays a major role in maintaining the normal respiratory function. So we have decided to investigate the effect of Type 1 Diabetes on lung function. *Aim:* To find out whether the pulmonary function changes in Type I Diabetics are in accordance with duration of disease. *Material:* 30 subjects with Type I Diabetes mellitus of duration 2-3 years as group I and 30 subjects with Type I *Diabetes mellitus* of duration 6-7 years as group II. From Diabetology, Out Patient Department, Stanley Medical College, patients were recruited for this study. *Methods:* SPIROLAB II was employed to measure pulmonary function. *Results:* The FEV₁/FVC ratio showed significant decrease in group II than group I. p value < 0.05 is considered as significant. FEV₁/FVC showed a slight increase in group II. This suggests there is restrictive impairment in pulmonary function in Type I Diabetics of duration 6-7 years compared to type I Diabetics of duration 2-3years. *Conclusion:* Spirometry testing may play an important role in the treatment of Diabetes in the future when newer methods like inhaler Insulin are administered.

Key words: Pulmonary Function % Spirometry % FEV₁/FVC Ratio % Inhaler Insulin

INTRODUCTION

Type I Diabetes mellitus an autoimmune disorder of multifactorial origin is on the rising trend since the last decade. This condition occurs in childhood or adolescence and commonly presents as diabetic Ketoacidosis. These patients are entirely on exogenous source of Insulin due to failure of pancreas. This leads to a chronic condition characterized by micro vascular damage and metabolic imbalance affecting all the organs.

Diabetes mellitus has been inconsistently associated with reduced lung function. In subjects with diabetes mellitus histopathology studies has revealed thickened alveolar epithelia and pulmonary capillary basal lamina, due to pulmonary microangiopathy.

Reduced lung volume and pulmonary elastic recoil along with decrease in diffusion were the abnormalities recorded in lung function [1]. Nonenzymatic glycosylation alters connective tissue of lung parenchyma and impaired pulmonary microangiopathy leads to pulmonary dysfunction in diabetic subjects [2].

Due to genetic predisposition, a genetic factor affecting the collagen structural properties has been put forth as a possible cause of pulmonary function impairment [3]. Changes in elastic and diffusion properties of lung function of respiratory muscle results in respiratory diseases.

This metabolic disorder affects all the organs – eyes, heart, kidneys and vascular system. This results in retinopathy, nephropathy, neuropathy.

AIM: To investigate the relationship of the duration of diabetes and pulmonary function in type 1 diabetics whether the pulmonary changes in Type I Diabetics are in accordance with duration of disease.

MATERIALS AND METHODS

The patients were recruited from Out Patients of the Department of Diabetology, Stanley medical college and hospital and the pulmonary function test was carried out in the Department of Physiology, Stanley medical college.

Ethical committee approval was obtained from the Institutional Ethical Committee, Stanley Medical College, Chennai.

Inclusion Criteria: Sixty Type 1 diabetic subjects of the age group 15-40yrs, Both genders were recruited for this study. A detailed Proforma about their age, gender, personal h/o regarding smoking, alcohol consumption and symptoms was filled by the patients. Anthropometric measurements, General examination and clinical examination of all the system was carried out.

Group 1: Included type 1 diabetics of 2 to 5 years of diagnosis and treatment.

Group II: Were type I diabetics of more than 7 yrs of diagnosis and treatment.

Exclusion Criteria: Subjects with skeletal deformity, neuromuscular disorders, Cardiopulmonary disease, chronic infections, recent surgery and malignancy.

Patients with diabetes, hypertension, tobacco smoking and alcohol addictions were excluded from this study.

Spirometry Recording: Spiro lab II was employed to measure pulmonary function. The recordings were carried out in the Physiology lab between 10:30 to 12:00 at a room temperature of 28 -32 degree. The maneuver was demonstrated to the patients. Written consent was obtained for participation in this study.

Recording started. Patient was asked to take a full maximal inspiration followed by forceful, maximal and complete exhalation without delay. Minimum three recordings were performed. Readings with highest values were recorded [4].

The parameters recorded were FEV₁, FVC and FVC ratio. Employing Independent student's t test the difference between means of the two groups was compared. pValue less than 0.05 were taken as significant. Using SPSS Version 15 software the parameters were analysed.

RESULTS

Pulmonary function data among type I diabetics of group I (duration 2 to 5 yrs) and group II (duration more than 7yrs) were shown in Table 1. Type I diabetics of group II had lower FVC and FEV₁ values compared to group II subjects. On the other hand their means was not significant.

Table 1: Comparison of lung volumes between Group I and Group II of Type I Diabetics

Parameter	Group I	Group II	pValue
FVC	2.175 ±0.33	2.027 ± 0.30	0.077
FEV1	1.835±0.29	1.696 ± 0.26	0.059
FEV1 / FVC	0.842±0.009	0.836±0.01	0.010
FEF 25 -75	3.052±0.19	2.96±0.15	0/049
PEF	5.704±0.47	5.519±0.49	0.144
MVV	87.65±7.60	84.06±6.94	0.061

Mean values of FEV₁ / FVC was found to be significant. This reveals restrictive impairment in pulmonary function in Type I Diabetics of duration 6-7 years compared to type I Diabetics of duration 2-5years. There is a positive correlation between duration of disease and pulmonary function impairment in Type I Diabetes.

DISCUSSION

Diabetes mellitus is the leading non communicable disease in India. It ends up in complications leading to increased morbidity and affecting the quality of life. Insulin pump inhaler is a novel technique employed for lifelong treatment in IDDM subject. Hence, insight into the functional status of the respiratory system is mandatory for lifelong Insulin replacement.

According to Schyuler MR *et al.* [5], lung might be a target organ in diabetes and was the first person to produce scientific evidence. This was confirmed by Sandler M *et al.* [6], in their study that there is loss of lung elasticity in IDDM though the pulmonary dysfunction was subclinical.

Reduced values of Forced vital capacity and Timed vital capacity have been reported in earlier studies [7]. In this study FEV₁/ FVC ratio is increased, which points towards restrictive pattern of respiratory dysfunction. In their study, Innocenti F *et al.* [8] has shown forced expiratory volume in first second and forced vital capacity are decreased in Type 1 Diabetics compared to their counterparts.

Inhaler Insulin during meal time is a new method under trial in the treatment of Type 1 diabetes [14]. Bioavailability of Insulin is maximal when Insulin is administered through pulmonary route. Clinical trials have revealed lower postprandial glycemic changes compared to subcutaneous route [15]. Therefore, assessment of lung function becomes mandatory in the management of IDDM subjects.

To assess lung function patients should undergo Spirometry before starting the treatment [16]. After starting Inhaler Insulin; Spirometry has to be performed every six months in all patients on inhaler Insulin irrespective of respiratory symptoms. Hence, in future Spirometry will become one of the investigations in outpatient department of Diabetology in the long term management of this metabolic disorder.

CONCLUSION

This study shows as duration of Diabetes increases, there is a subclinical change in lung function towards restrictive pattern. This may open a new avenue in the management of Type I Diabetes in the near future when novel method of meal time inhaler insulin takes the role of safe and effective Insulin delivery.

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