

**PULMONARY FUNCTIONS IN PATIENTS WITH TYPE-2 DIABETES MELLITUS AND CORRELATION WITH DURATION AND GLYCEMIC INDEX**Venkatesh S<sup>1</sup>, Girija<sup>2</sup>**HOW TO CITE THIS ARTICLE:**

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**ABSTRACT:** There is an alarming increase in incidence and prevalence of diabetes mellitus in Asian Indians, since diabetes is a multisystem disorder which may affect many organs of the body it becomes important to study long term effect of diabetes mellitus on lung functions and also correlate the glycemic index with lung functions. Hence the present study was undertaken to establish the correlation between duration of diabetic mellitus and glycemic index with pulmonary function test.

**METHODOLOGY:** 40 Type 2 diabetics taken as cases and controls and PFT was performed and documented and statically analyzed. **RESULTS AND CONCLUSION:** there was a decline in pulmonary functions FVC, FEV1, FEF25-75 and PEFR with increasing duration of Type 2 Diabetes Mellitus (P <0.05), however there was no changes seen with respect to Glycemic index and was not significant. In Type 2 Diabetes mellitus there is a mixed pattern of abnormality seen, restrictive and obstructive type of pulmonary pathology with increasing duration of Type 2 Diabetes mellitus.

**KEYWORDS:** PFT, Type 2 DM, Duration, Glycemic index.

**INTRODUCTION:** Diabetes mellitus is a metabolic disorder characterized by hyperglycemia resulting from defects in insulin secretion, action or both. Based on etiopathogenic categories, it is classified as Type-1 and Type-2 diabetes mellitus. In Type 1 there is an absolute deficiency of insulin secretion. Where as in Type-2 Diabetes Mellitus there is a combination of resistance to insulin action and also inadequate compensatory insulin Secretory response.

Diabetes mellitus is accompanied by wide spread biochemical, morphological and functional abnormalities which may precipitate certain complications that affect the renal, cardiovascular, neural systems, liver, skin, collagen and elastic fibers. Thus diabetes is a multi-system disorder that affects many organs of the body. There is an alarming increase in the incidence and prevalence of diabetes mellitus particularly in Asian Indians<sup>1</sup>. The major morbidities in Type 2 diabetes mellitus are due to its microangiopathic and macroangiopathic complications.

Studies conducted on pulmonary functions in patients with Type 2 Diabetes Mellitus, suggested possible associations between pulmonary functions and diabetic control status.<sup>2</sup> However there are several pathological changes which may affect the lungs in patients with Type T2Diabetes mellitus. Collagen and elastin changes, which may occur due to small vessel involvement, can lead to significant structural changes.

Increased non-enzymatic glycalation of proteins and peptides of the extracellular matrix at chronic high circulating glucose levels may also have an important role in the pathological changes of the lungs in T2DM patients.<sup>3</sup> There are studies which show relationship between pulmonary and other chronic complications of diabetes. Since the prevalence of diabetes in Asian Indian population is among the highest in the world,<sup>4</sup> this study is undertaken in the subgroup to investigate pulmonary functions and its correlation with duration and glycemic control

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### OBJECTIVES:

- To record PFT parameters FVC, FEV1, FEV1/FVC%, FEF 25-75 and PEFr in patients of Type 2 – Diabetes mellitus.
- To correlate duration of Diabetes with PFT parameters FVC, FEV1, FEV1/FVC%, FEF 25-75 and PEFr.
- To correlate glycaemic index of Diabetes with PFT parameters FVC, FEV1, FEV1/FVC%, FEF 25-75 and PEFr.

**METHODOLOGY:** 40 known patients of both the genders with history of Type 2 Diabetes mellitus were selected from Victoria hospital OPD from Department of Medicine belonging to age group of 35 - 55 yrs. Detailed medical history was taken. Respiratory, cardiac and neuromuscular systems were clinically examined and patients having any acute or chronic pulmonary disease and smokers were excluded.

Informed written consent was taken from all subjects. Blood samples were drawn for determining the glycemic index. PFT was performed using computerized spirometer KIT micro RS 232 in life style laboratory Department of Physiology and three PFT recordings were done at 15 minutes intervals and the best was considered. Results obtained were statically analyzed.

**STATISTICAL ANALYSIS:** After obtaining the Pulmonary functions parametric data. Analysis of variance was used to find the significance of PFT with Duration of Type 2 Diabetes mellitus and Hb1Ac, The Statistical software namely SPSS 11.0 and Systat 8.0 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

### RESULTS:

PFT parameters	Duration of DM years (Mean ± SD)			
	<5yrs	5-10 yrs	>10 yrs	P value
FVC	3.60±0.45	3.20±0.48	2.97±0.29	P=0.002**
FEV1	2.97±0.36	2.66±0.37	2.49±0.23	P= 0.003**
FEV1/FVC%	0.82±0.01	0.83±0.02	0.84±0.02	P=0.173
FEF25-75	3.95±0.41	3.65±0.41	3.38±0.25	P=0.002**
PEFR	8.35±0.89	7.38±1.29	6.72±0.92	P=0.001**

**Table 1: PFT parameters in subgroups of T2DM with duration**

There is significant and progressive decrease in FVC, FEV1, FEF 25-75 and PEFr with advancing duration of Type 2 diabetes mellitus, with no changes in FEV1 / FVC % with no significance.

PFT Parameters	Hb1Ac in DM group (Mean ± SD)				P value
	5-6	6-7	7-8	>8	
FVC	3.05±0.94	2.92±0.75	2.81±0.68	2.16±0.51	0.198
FEV1	2.40±0.72	2.27±0.56	2.16±0.60	1.74±0.35	0.257
Ratio	0.79±0.05	0.78±0.07	0.77±0.09	0.81±0.08	P>0.05
PEFR	7.35±2.53	7.17±2.50	6.50±2.39	5.14±1.16	0.347
FEF25-75	2.57±0.96	2.41±0.85	2.15±1.16	2.11±0.75	0.738

Table 2: PFT in subgroups of T2DM with glycemic index

However there was no significant correlation of glycemic index with FVC, FEV1, FEV1/FVC%, FEF 25-75 and PEFR.

**DISCUSSION:** There is a progressive decline in PFT parameters as the duration of diabetes increases with significant decline in FVC, FEV1, FEF 25-75 and PEFR. Long standing diabetes causes changes in the interstitium of the lungs as a part of diabetic microangiopathy<sup>3</sup> and non-enzymatic glycation of extracellular matrix<sup>4</sup> there is also acceleration of aging process in the connective tissue of the lungs and modification of alveolar surfactant.<sup>5</sup>

All these changes in the lungs can lead to mixed type of abnormalities both obstructive and restrictive pattern of abnormalities as reflected on PFT parameters.

However there is no significant correlation between HbA1c levels and PFT parameters suggesting hyperglycemia for short duration of time may not cause much structural changes as HbA1c reflects glycemic levels for the last 3 to 4 months.<sup>6</sup>

However adherence to a healthy diet can improve glycemic control, and thereby reduce glycosylated hemoglobin HbA1c levels and when used in combination with other components of diabetic care, can further improve clinical and metabolic outcomes.

**CONCLUSION:** In conclusion the present study showed impairment in pulmonary functions in Type 2 diabetes and suggested that chronic hyperglycemia has a contributory role in its pathogenesis of lungs which can alter the functioning of pulmonary systems.

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