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Research Article

**STUDY TO KNOW THE RELATION BETWEEN HbA1c in  
DIABETICS AND PULMONARY FUNCTIONS**<sup>1</sup>Dr. Saif Ur Rehman Khan, <sup>2</sup>Dr. Sana Zafar, <sup>3</sup>Dr. Zakirullah<sup>1</sup>Allama Iqbal Medical College, Lahore<sup>2</sup>Shalamar Medical and Dental College, Lahore<sup>3</sup>University College of Medicine and Dentistry, Lahore**Abstract:****Objective:** To find the association of HbA1c in diabetes and pulmonary functions.**Study Design:** A prospective study.**Place and Duration of Study:** In the Endocrinology and Pulmonology Department of Services Hospital, Lahore for one year duration from July 2016 to July.**Methods:** For this study, a total of 60 diabetes subjects between the ages of 40 and 60 were selected in both sexes.**Results:** Two main findings of the study were: (1) the results of pulmonary function tests in diabetic patients were significantly changed; (2) pulmonary dysfunction was more prominent in patients with long-term diabetes mellitus.**Conclusion:** The findings are important because they reveal the need to prevent lung failure. Therefore, we recommend periodic spirometry testing to assess the severity of impaired lung function in diabetic patients.**Key words:** pulmonary functions, diabetic patients, hemoglobin A1.**Corresponding author:****Dr. Saif Ur Rehman Khan,**  
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## INTRODUCTION:

Diabetes mellitus is a clinical syndrome characterized by hyperglycemia due to an absolute or relative lack of insulin. Insulin deficiency affects the metabolism of carbohydrates, proteins and fats and causes a significant change in the homeostasis of water and electrolytes<sup>1</sup>. Hemoglobin A1C is a small component of hemoglobin, which is known to be elevated in the diabetic state. Normal values range from 5% to 7%, but increase by 2 to 3 times in uncontrolled diabetes. 2 Glucose binds to the N-terminal amino group of the chain via a keto-amine linkage. HbA1C occurs slowly and continuously over 120 days of red blood cells. The HbA1C measurement produces an index of the mean blood glucose level for an average of 60-90 days over the previous 2-3 months. Therefore, HbA1C has been shown to be useful in the assessment of diabetes mellitus, and perhaps the measurement of human 3. glucohemoglobin has been the standard method to assess long-term glycemic control in detecting diabetes. When plasma glucose is consistently high, there is an increase in non-enzymatic glycosylation of hemoglobin. Since the erythrocytes have an average of 120 days, this change reflects the date of the previous 2-3 months. Other complications are diabetes, retinopathy, ulcers and foot ulcers, besides patients with diabetes type 1 and type 2, have found that there are deteriorations in lung function.

## MATERIALS AND METHODS:

This prospective study was held in the Endocrinology and Pulmonology Department of Services Hospital,

Lahore for one year duration from July 2016 to July. A total of 60 known diabetes subjects were selected for this study, ranging in age from 40 to 60 years. Subjects were subdivided into male and female subgroups and divided into two groups according to Hb A1c content. People with known heart and respiratory diseases, Family history of asthma, Patients with a history of respiratory tract infection in the last month, abdominal or thoracic surgery and patients with severe abnormalities of the thoracic cage, anemia severe smoking and was excluded from the study. Expiratory spirometry was performed with an automated spirometer (compact vitalography). Compulsory vital capacity (FVC), forced expiratory volume in one second (FEV1), forced expiratory rate (FEV1 / FVC) and peak expiratory flow (PEF) to avoid daily changes in fixed time of day (9 - 1 pm).

## RESULTS:

The forced vital capacity (FVC), a second (FEV1), FEV1 expiratory volume: Table 1, shows a comparative analysis of pulmonary function tests. . Mean  $\pm$  S.E.M. FVC high HbA1C was  $3.41 \pm 0.15$  in men with normal HbA1C in men,  $2.14 \pm 0.11$  in women with normal HbA1C,  $2.32 \pm 0.15$  and  $1.71 \pm 0.08$  in women with high HbA1C. The differences were significantly higher in men with HbA1C than in men with HbA1C normal HbA1C. In women, HbA1C values were found to be significantly higher ( $P < 0.05$ ) than those with normal HbA1C values. Mean  $\pm$  S.E.M. High HbA1C in men with high HbA1C was  $3.01 \pm 0.10$  in males and  $1.93 \pm 0.07$ ,  $2.04 \pm 0.17$ ,  $1.50 \pm 0.07$  in normal HbA1C men.

Table 1: Comparison of pulmonary function tests: forced vital capacity (fvc), forced expiratory volume in one second (fev1), fev1/fvc and peak expiratory flow (pef) in diabetics with normal hba<sub>1c</sub> ( $\leq 6$ ) and diabetics with raised hba<sub>1c</sub> ( $\geq 6$ )

Pulmonary Function		HbA <sub>1c</sub> $\leq 6$		HbA <sub>1c</sub> $\geq 6$	
		No.	Mean $\pm$ SEM	No.	Mean $\pm$ SEM
FVC (litres)	Male	15	$3.41 \pm 0.15$	15	$2.32 \pm 0.15^{**}$
	Female	14	$2.14 \pm 0.11$	16	$1.71 \pm 0.08^*$
FEV <sub>1</sub> (litres)	Male	15	$3.01 \pm 0.10$	15	$2.04 \pm 0.17^{**}$
	Female	14	$1.93 \pm 0.07$	16	$1.50 \pm 0.07^{**}$
FEV <sub>1</sub> /FVC (%)	Male	15	$88.7 \pm 2.37$	15	$86.8 \pm 2.27$
	Female	14	$90.6 \pm 1.89$	16	$88.7 \pm 1.76$
PEF (litres/sec)	Male	15	$7.9 \pm 0.15$	15	$6.7 \pm 0.21^*$
	Female	14	$4.9 \pm 0.12$	16	$4.5 \pm 0.09^*$

\* $P < 0.05$  when compared with the normal HbA<sub>1c</sub>

\*\* $P < 0.001$  when compared with the normal HbA<sub>1c</sub>

The differences were significantly higher in diabetic (male and female) ( $P < 0.001$ ) compared to diabetic (male and female) with normal HbA1C. Mean  $\pm$  S.E.M. Men with elevated HbA1C for PEF and women with high HbA1C were  $4.9 \pm 0.12$ , and men with high HbA1C had a normal HbA1C of  $7.9 \pm 0.12$ ,  $6.7 \pm 0.21$  with normal HbA1C. In men and women, HbA1C was significantly higher in patients with normal HbA1C than in those with HbA1C ( $P < 0.05$ ). Normal HbA1C high HbA1C and diabetic (male and female) FVC between diabetes (male and female), but FEV1 difference was not observed.

**DISCUSSION:**

Two main findings were: (1) statistically changed between pulmonary function tests in diabetic patients; (2) pulmonary dysfunction was more prominent in patients with long-term diabetes mellitus. This study shows significantly decreased lung function parameters (FVC, FEV<sub>1</sub> and PEF) in diabetics. FEV<sub>1</sub> to FVC ratio was higher in diabetic patients. Therefore, a general reduction in lung volume and a possible restrictive defect were found, and no evidence of airway obstruction was found. A decrease in lung function was also associated with an increase in disease duration. Lung function was impaired in patients with long-term diabetes (> 10 years).

Parameters	r <sup>2</sup>	P value
FVC with HbA1c	0.019	0.289
FEV <sub>1</sub> with HbA1c	0.007	0.498
FVC with duration	8.809e-0.009	0.9994
FEV <sub>1</sub> with duration	0.007	0.518

**DM: Diabetes mellitus, PFTs: Pulmonary function tests**

Primhak et al. Reported that lung function decreased in diabetes. Our results are related to these results. However, Primhak others found that a relationship functions decreased the duration of diabetes or glycosylated hemoglobin. In some other studies, decreased respiratory functions are observed which are consistent with our results; Schnapf and colleagues Type-limited joint motion 1 as a study of diabetes patients and shows a significant reduction in FVC and FEV<sub>1</sub>. He concluded that this decline in lung function may be due to a decrease in lung compliance or limiting the expansion of the chest wall. Schuyler and colleagues have suggested that collagen and elastin may be responsible for early aging, possibly reduction, lung elasticity, and therefore lower lung volumes in diabetic patients. Schnack et al., Ofulue and -Hsia et al also suggested that there is a decrease in lung volumes in diabetic patients. Our study also agrees with Goldman's opinion that the lung is the target organ of diabetes; Philips Baker, which shows hyperglycemia, affects the lungs by damaging the capillary and collagen non-enzymatic glycosylation. Davis et al. conducted a study and determined the relationship between diabetes mellitus and decreased lung function. They reported a decrease in FVC, FEV<sub>1</sub>, VC and PEF when expressed as a percentage of predicted age, gender and height. They also established a significant relationship between FEV<sub>1</sub> and PEF and disease duration. This study also correlated decreased pulmonary function with exposure to glycemia in a higher mean HbA1C form. Our study was conducted by Davis et al. (15). This study was conducted to clarify the relationship between lung function and diabetes. We concluded that reduction in FVC, FEV<sub>1</sub> and PEF in diabetic patients impair lung function. We also show how long the disease lasts and the deterioration of lung function. We also concluded that glycemic exposure is a determinant of reduced lung function.

**CONCLUSION:**

Our data support is that the lung is a target organ with diabetes. The findings are important because they reveal the need to prevent lung failure. Therefore, we recommend periodic spirometry testing to assess the severity of impaired lung function in diabetic patients. Spirometry will detect the most susceptible diabetic patients and thus take additional preventive measures.

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