REDUCTION OF LUNG FUNCTIONS IN PATIENTS WITH DIABETES MELLITUS

ABSTRACT:

Background and Objectives: The purpose of this study is to evaluate the pulmonary functions in patients with diabetes. Many studies also suggest that the lung as a target organ in diabetes and glycemic exposure may be a causation factor for reduced lung function. Systemic inflammation, hypoxemia, oxidative stress, altered gas exchange, and changes in lung tissues were the major impacts on the respiratory system which were induced by hypoglycemia.

Methods: Forty individual patients of both sexes were considered into the study and divided into two groups depending on their conditions. Group A consists of individuals without any complications or any disease conditions and group B consists of diabetic patients excluding smokers and divided into twenty to each group.

Results: The glycemic status of the individuals was determined by FBS and PPBS. SPSS software was used for the analysis and spirometry was the device used to determine the pulmonary function. Values of FEV1, FVC, FEF, FEV% were only considered in the study and the study results conclude that diabetes shows its effect on the lungs in long term and leads to a decrease in lung function.

Conclusion: Hence we suggest that monitoring the PFT of the diabetic patients helps the individuals to avoid any complications further ahead and also it helps to ease the flow of the recovery and also prevent further more co morbidity that might arise in the future.

Key words: Diabetes, FBS, PPBS, FVC, FEV1, Pulmonary function.

INTRODUCTION

To assess the level of pulmonary function in diabetes patients by performing pulmonary function tests. Diabetes is a metabolic disorder that was affected by multiple factors. It was characterized by insulin deficiency either a defect in insulin secretion or insulin working mechanism deficit which results in disturbance in protein, fat, and carbohydrate metabolism [1]. Microangiopathy and macroangiopathy were the major complications in diabetes which affects the eyes, kidneys, nerves, and lungs. Many studies state that the lung is the target organ in diabetes. Reduced lung functions have been observed in patients suffering from both type 1 diabetes mellitus and type 2 diabetesmellitus. Vander borst et al. conducted a systematic review on pulmonary functions investigation in diabetes which shows that reduction in diffusing capacity of carbon monoxide of the lung, FEV1, and FVC associated with type 1 and 2 diabetes mellitus [2, 3]. The four primary sources which lead to decreased pulmonary functions in diabetes patients were. Lung elasticity reduction was caused by disrupted glycemic control which also causes non-enzymatic glycosylation end products. Reduced diffusion capacity and pulmonary capillary blood volume due to thickening of the basal lamina of the alveolar epithelium and micro vascular changes in the pulmonary capillary beds [4, 5]. The diaphragmatic nerves were affected by an autonomic neuropathy that resulted in decreased muscle tone and control of the diaphragm [6]. Hyperglycemia increases glucose in the airway surface fluid, which serves as fuel for bacteria, and then increases the frequency of isolated bacterial pathogens in sputum, and also increases inflammation, causing scarring of the lung walls, which causes them to lose elasticity, increasing the Decrease the ability to breathe and exhale, which limits the amount of oxygen released into the bloodstream [7, 8].

MATERIALS AND METHOD

A total no. of 40 patients was included in the study from patients of pinnamaneni Siddhartha institute of medical sciences and research foundation. Patients with type2 diabetes and population of normal glycemic control confirmed by normal fasting and postprandial blood sugar and urine for sugar [9].

INCLUSION CRITERIA

Previously diagnosed diabetic patients who are poorly controlled and uncontrolled more than 5 years duration of illness and patients of no history of any lung complications [10].

EXCLUSION CRITERIA

Patients with a history of smoking, acute or chronic respiratory disease, history of occupational exposure and cardiovascular disease, and physical disability that may affect lung functioning and also obese patients were also excluded from the study [11].

ETHICS

Request to conduct the study was applied to the ethical committee of PSIMS&RF and was kindly accepted to perform the study. Participants provided informed consent before being included in the study and were notified that they could quit the study at any time [12].

STATISTICAL ANALYSIS

The data obtained were analyzed by unpaired T-test and ANOVA using the statistical software SPSS [13].

RESULTS

The study included 40 volunteered patients categorized into 2 groups.

1. Group A – controlled group (20)
2. Group B – diabetes group (20)

All the values of FVC – forced vital capacity, FEV1 – forced vital capacity in the first second, FEV1%, FEF – forced expiratory flow are reduced in the diabetic group compared to the control group. There is a high significance of decline is observed statistically.

Table 1: Glycemic Results In 2 Groups

Test	Controlled (mean±SD)	Diabetic group (mean±SD)	P-value
RBS (mg/dl)	176±67.11	234.87±76.998	0.014
FBS (mg/dl)	118±11.6652	123.6744±7.00987	0.037
HbA1C	5.2±0.34	7.64±1.33	0.001

Table 2: Spirometric Values Comparison in 2 Groups

TEST	CONTROL (mean±SD)	MALE	FEMALE	P-value
		DIABETIC (mean±SD)	DIABETIC (mean±SD)	
FVC pre	3.28±0.16	2.78±0.44	1.89±0.77	0.001
FVC post	3.45±0.77	2.96±0.78	1.89±0.55	0.001
FEV1 pre	3.02±0.89	2.22±0.34	1.57±0.27	0.001
FEV1 post	2.98±0.14	2.18±0.11	1.54±0.84	0.001
FEV1/FVC pre	1.23±0.007	0.76±0.002	0.76±0.007	0.001
FEV1/FVC post	1.27±0.66	0.76±0.87	0.78±0.033	0.001
FEF 25-75 pre(L/S)	4.46±0.45	2.99±0.87	2.01±0.38	0.001
FEF 25-75post(L/S)	4.88±0.04	3.01±0.78	2.12±0.04	0.001

DISCUSSION

To demonstrated a decline in less than 10% of FEV1 and FVC in their study. Measures were decreased at an annual rate of 68 and 71 ml/year for FEV1 and FVC. According to them decreased spirometric tests cannot assure its detailed pathology, but there have been reports that show histopathological changes in the lungs of diabetic patients. This includes basal lamina thickening and fibrosis. Many studies also suggest that the lung as a target organ in diabetes and glycemic exposure may be a causation factor for reduced lung function. Systemic inflammation, hypoxemia, oxidative stress, altered gas exchange, and changes in lung tissues were the major impacts on the respiratory system which were induced by hypoglycemia. Demonstrated that diabetes condition can alter lung function. Where an average of less than 9% of FVC, FEV1, and PEFR values was recorded than predicted, also diabetes was independently predictive of reduced lung functions where HBA1C is not. They explained it by suggesting that HBA1C is a short-term marker of glycemic control, a relationship between impaired lung function and glycemia could still be present in diabetes.

In this based on the results we obtained and assessed group A (control group) without any complications in their health condition have shown the normal lung function apart from some slight variations in some individuals but not considered as a complication which was only normal values and coming to group B (Diabetic group) shown a large variation in a decline of the lung function which shows that lung was majorly affected in diabetes irrespective of the smoking this suggests us to monitor the lung functions in long term diabetic condition patients.

CONCLUSION

We found that FEV1 and FVC are significantly decreased in diabetic patients compared to the control group. We cannot confirm specific reasons for the decline due to a huge number of parameters that are too considered. Hence we suggest that monitoring the PFT of the diabetic patients helps the individuals to avoid any complications further ahead and also it helps to ease the flow of the recovery and also prevent further more co morbidities that might arise in the future. A strict diet and glycemic control and regular exercise that improve the strength of respiratory muscles help in increasing lung functions in diabetes patients.

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CONFLICT OF INTEREST

The authors attest that they have no conflict of interest in this study.

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