



PEFR AND FEF 25-75 PERCENTAGE IN TYPE-2 DIABETES MELLITUS GAYATRI

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Abstract : Diabetes mellitus is a major public health problem with increasing incidence worldwide and long term complications of various organs including lungs. These complications are mainly a consequence of macro vascular and micro vascular damages of the target organs. The magnitude of the complications of this disease is related to its duration. The aim of this study is to compare PEFR and FEF 25-75 in diabetics and control group, and its relation with duration of the disease. This case control study was carried out in the Department of Physiology, Kilpauk Medical College, from June 2012 to October 2012 on 30 type 2 diabetic patients. For comparison, 30 age and sex matched apparently healthy non diabetic subjects were also studied. Based on the duration of disease, diabetic patients were divided into A (5-10 years) and B (10-20 years). PEFR and FEF 25-75 of all the subjects were measured by an computerized spirometer (Super spiro). Data were analyzed by Student t-test, Ancova test and Mann-Whitney test. The mean percentage of predicted values of PEFR and FEF 25-75 values were significantly lower in patients with type 2 diabetes when compared to controls. PEFR decreases as duration of diabetes increases, so it is inversely related to the duration of the disease. FEF 25-75 is not affected by the duration of diabetes.

Keyword : Diabetes Mellitus, Chronic hyperglycemia, PEFR, FEF 25-75 percentage.

INTRODUCTION

DEFINITION

Diabetes mellitus comprises a heterogeneous group of metabolic diseases that are characterized by chronic hyperglycemia and disturbances in carbohydrate, lipid, and protein metabolism resulting from defects in insulin secretion, insulin action, or both. The incidences of diabetes is rising; it is estimated that, in the year 2000, 171 million people had diabetes, and this is expected to double by 2030. This global pandemic principally involves type 2 diabetes and is associated with greater longevity, obesity, unsatisfactory diet, sedentary lifestyle and increasing urbanisation. Prevalence of both types of diabetes varies considerably around the world, and is related to differences in genetic and environmental factors. Diabetes is a major burden upon health-care facilities in all countries.

DM is accompanied by widespread biochemical, morphological and functional abnormalities which may precipitate certain complications that may affect neural, cardiovascular,

renal systems and also organs and tissues like skin, liver, collagen and elastic fibers. Thus diabetes is a multisystem disorder that affect many organs of the body. These complications are mainly a consequence of macro vascular and micro vascular damages of the target organs. Lung is a target organ in diabetes and that glycemic exposure is a strong determinant of reduced pulmonary function in type 2 diabetes. Hyperglycemia causes micro vascular changes such as thickening of basal lamina in the smaller vessels of the lungs, which causes reduction of vascular diffusing capacity. It has also been suggested that this chronic debilitating disease may increase the susceptibility and severity of systemic inflammation of lungs and ultimately cause peripheral airway obstruction as well as fibrosis of lung tissue.

Hyperglycemia affects the lung by non enzymatic glycation of chest wall and bronchial tree protein which prevents easy expansion. The micro vascular complications appear early within 5 to 10 years and macro vascular complications appear within 15 to 20 years from the onset of diabetes. The presence of an extensive micro vascular circulation and abundant connective tissue in the lungs, raises the possibility that lung tissue may be affected by microangiopathy process and non-enzymatic glycosylation of tissue. The duration of DM is an important factor affecting the lungs. Chronic hyperglycemia is strongly associated with progressive neurogenic damage.

Measurement of expiratory flow rates is an important clinical tool for evaluating and monitoring respiratory diseases. Results from individuals with suspected lung diseases are compared with results predicted from normal healthy volunteers. Predicted or normal value vary with age, gender, ethnicity, height, and to a lesser extent, weight. Abnormalities in values indicate abnormal pulmonary function and can be used to predict abnormalities in gas exchange. These values can detect the presence of abnormal lung function long before respiratory symptoms develop, and they can be used to determine disease severity and the response to therapy. Peak expiratory flow rate is the maximum rate of airflow achieved during expiration. FEF 25-75% is the average flow rate during middle 50% of FVC. MATERIALS AND METHODS

The study was conducted in 30 cases of type-2 diabetic patients and 30 control group. Patients above 45 years were chosen for the study from the outpatients Department of Diabetology, with due permission of the Head of the Department.

The subjects were briefed about the study and detailed clinical examination was done. Ethical clearance was obtained.

Inclusion criteria · Patients in the age group 45-65 years with type-2 diabetes mellitus. · Non –smokers. Exclusion criteria · Smokers. · Patients with history of respiratory diseases such as Asthma, COPD, tuberculosis, bronchiectasis, interstitial lung diseases. · Individual with current or recent upper or lower respiratory infection. · Patients with cardiac diseases. Method

PFT was performed with the help of computerized Spirometer with patients in sitting posture. After recording age, sex, height and weight, Subjects were asked to close the nostrils with thumb and finger and exhale through the mouthpiece with full force after forceful inspiration.

RESULTS Results derived by statistical analysis of data are presented in tables. In our study there are 30 diabetic patients with mean age of $58.2 \pm SD 8.2$. There are 30 control subjects with mean age of $55.3 \pm SD 7.5$ years.

COMPARISON OF BMI OF DIABETIC AND CONTROLS

The BMI for the diabetics has been slightly higher than the

BMI	Diabetics		Controls		Student t-test value	P-value
	Mean	Standard deviation	Mean	Standard deviation		
	25.1	4.4	22.7	3.5	2.412	0.018

controls. The significant p-value confirms that the BMI values for the two groups are statistically different. Since BMI value is different, Analysis of Covariance test has been applied to compare the PEFR and FEF 25-75% between the two groups after controlling the BMI effect.

	Diabetics		Controls		ANCOVA test result	
	Mean	Standard deviation	Mean	Standard deviation		F-value P-value
PEFR	41.70	15.36	71.27	16.01	BMI	4.639 0.035
					Group	60.995 <0.001
FEF 25-75%	72.20	28.31	85.27	29.66	BMI	2.975 0.090
					Group	5.144 0.027

The significant P-value (p=0.035) of BMI infers that the PEFR has been influenced by BMI. PEFR is lower in diabetes than control group after controlling the BMI effect as shown by significant p-value (<0.001)

The non-significant p-value (P=0.090) of BMI infers that BMI has no influence on FEF 25-75%. FEF 25-75% level has been comparably lower in diabetes than control group after controlling the BMI effect as shown by significant p-value (0.027)

COMPARISON OF PEFR AND FEF 25-75% WITH DURATION OF THE DIABETES.

	<= 10 years (16)		>10 years (14)		Mann-Whitney test value	P-value
	Mean	Standard deviation	Mean	Standard deviation		
PEFR	47.31	18.23	35.29	7.72	59.5	0.021
FEF 25-75%	77.63	33.70	66.00	20.00	91.0	0.382

The significant p-value for PEFR (P=0.021) infers that, as the duration of the disease increases, the performance of PEFR decreases. FEF 25-75% is not affected by the duration of the disease (P=0.382).

DISCUSSION

Diabetes is a multisystem disorder that affects many organs of the body. Western influence has led to loss of physical activity and changes in food pattern from traditional unprocessed natural ingredients to highly refined energy dense fatty and sugary fast foods. These two core factors will be responsible for the high incidence of Diabetes in the years to come. Pulmonary functions are reduced in type 2 DM and duration of diabetes has more influence on pulmonary functions than glycemic control. The complications of diabetes on different organs are well known. Of late even the involvement of respiratory system has also been proved by many researchers, with changes in pulmonary volume, diffusion and elastic properties of lungs as well as the performances of the respiratory muscles leading to restrictive pattern in pulmonary functions. Non enzymatic glycosylation induced alteration of lung connective tissue is the most likely underlying mechanism. Md Omar Ali et al. reported that the mean of percentage of predicted values of PEFR and FEF 25-75% in type 2 diabetic male patients of different durations were significantly (p<0.001) lower than those of non diabetic subjects. Again, these parameters in diabetic patients of 10-20 years duration was lower than those of 5-10 years duration but the difference was not statistically significant. Gauher Banu Shaikh et al reported that PEFR & MEP were reduced in type 2 diabetic patients compared to controls. Sultan A Meo et al reported that diabetic patients showed a significant reduction in the forced vital capacity (FVC), forced expiratory volume in one second (FEV1) and peak expiratory flow (PEF)

relative to their matched controls. However, there were no significant difference in the forced expiratory ratio (FEV1/FVC%) and middle half of the FVC (FEF 25-75%) between the groups. Qazi Rais Ahmed et al reported diabetic patients showed a significant decrement in the FVC% and PEFR relative to their matched controls. Shravya Keerthi et al reported PEFR and FEF 25-75% values are low in diabetics compared to controls and the parameters showed significant negative correlation with duration of diabetes. All these studies are in accordance with my observations which also showed significant reduction in PEFR and FEF 25-75% in diabetes.

Conclusion

Thus from the above study, it is evident that 1. PEFR and FEF 25-75% is significantly decreased in diabetic patients when compared to controls. 2. PEFR decreases when duration of diabetes increases.

3. FEF 25-75% is not influenced by duration of diabetes. As pulmonary dysfunction may be one of the earliest and easily measurable non-metabolic alteration in diabetes, the patients with diabetes are suggested to undergo pulmonary function testing along with other investigations. If diabetes is detected early and adequate steps are taken, it may be possible to significantly delay the occurrence of complications and there after their progression.

Spirometry remains a cost effective, a simple non-invasive diagnostic tool and its judicious use can give warning signal for patients to take early preventive measures.

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