

A COMPARATIVE STUDY OF LUNG FUNCTIONS IN TYPE-2 DIABETES AND NON DIABETIC SUBJECTS

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Abstract

Objective: The purpose of this study was to evaluate the effect of dynamic lung functions in patients with type 2 diabetes mellitus.

Material & methods: 40 type2 diabetic patients, aged 30-60years, with diabetic duration of 1-20 years, were included in the study. PEFR & MEP are recorded & the results were compared with age and sex matched control (non diabetic) subjects. Results were analyzed by calculating Mean \pm SD, using Student's t test, and Pearson correlation.

Results: PEFR & MEP were reduced in type2 diabetic patients compared to control of which MEP show highly significant reduction.

Conclusion: The present study shows reduced lung functions in type2 diabetic subjects. As MEP is significantly reduced in study group we attribute this reduction in lung function tests to respiratory muscle weakness. Breathing exercises to strengthen the respiratory muscle may improve the lung function tests.

Keywords: Type2 diabetes, PEFR, Lung functions, MEP

1. Introduction

The lung function tests are age old parameters for assessing respiratory health of a person and are important for diagnostic and prognostic values. The prevalence of diabetes for all age groups worldwide was 2.8% in 2000 and is estimated to reach 4.4% by 2030. The total number of diabetics is projected to rise from 171 million in 2000 to 366 million in 2030¹. In Type1 Diabetes lung function has been investigated in several clinical studies & evidenced reduced elastic recoil^{2,3} reduced lung volumes², diminished respiratory muscle performance⁴, decreased in pulmonary diffusion capacity for carbon monoxide^{5,6,7,8}. But there are very few data concerning pulmonary function abnormalities in patients with type 2 diabetes mellitus⁹. The purpose of this study was to evaluate pulmonary functions in patients with type 2 diabetes mellitus and to compare with control (non diabetic) subjects.

1.1 Aims and Objectives: To determine the pulmonary function tests in type 2 Diabetes Mellitus patients & compare with that of healthy age & sex matched individuals.

2. Material and Methods

The study group include 40 type2 diabetic patients (males n=25, Females n=15), aged 30-60 years (mean 52.3 \pm 7.7years), with diabetic duration of 1-20years (mean=6.4 \pm 5.2 years), taken from Diabetic clinic of B.L.D.E.A.'s Shri

B. M Patil Medical College, Hospital and Research centre, Bijapur using simple random sampling.. The study group was compared with 40 Non diabetic age & sex matched subjects taken from teaching and non teaching employees of B.L.D.E'S Shri B.M.Patil Medical College Bijapur. The ethical clearance was obtained from the institution.

2.1 Inclusion criteria: Apparently healthy individuals with type 2 diabetes mellitus are included in study. The apparent health status of the subjects was determined by thorough clinical examination and history taking.

2.2 Exclusion criteria: Subjects with a history of smoking and alcohol, recent / remote history of cardio respiratory diseases, history of respiratory allergy & with acute respiratory infection in the previous three months are excluded from the study.

2.3 Anthropometric Parameters: Height (cm), Weight (Kg) was recorded. BMI (Kg/sqm) calculated.

2.4 Physiological Parameters: Pulse Rate (Beats/min), Respiratory Rate (Cycles/min), Systolic and Diastolic Blood Pressure (mm Hg), were recorded.

2.5 Pulmonary function parameters: The subject was informed about the procedure, and consent has been taken before recording. The highest reading of 3 trials in a sitting posture at room temperature, in morning hours was

recorded. The following Pulmonary function parameters are recorded in the subjects:

a. PEFR (Peak Expiratory Flow Rate): By using mini Wright's Peak flow Meter.

b. MEP (Maximum Expiratory Pressure): By using Modified Black's Apparatus.

2.6 Statistical analysis: All values are presented as Mean \pm SD. Comparison of mean values of parameters of Diabetic & Control subjects was done by using Student's t test.

3. Results

Table 1. Age and Anthropometric parameters of subjects of Control and Diabetic groups

Parameters	Control group (n=40)	Diabetic group (n=40)	P value
Age (years)	52.32 \pm 7.66	52.3 \pm 7.6	0.9
Height (cms)	159.57 \pm 7.75	161.05 \pm 9.13	0.44
Body Weight (kg)	58.70 \pm 11.68	58.71 \pm 10.12	1
BMI (kg / m ²)	23.18 \pm 3.87	22.69 \pm 3.41	0.55

(Values are Mean \pm SD) *p<0.05 Significant, **p<0.01 Highly significant, *** p <0.001 very highly significant.

Table 2: Physiological parameters of Diabetic subjects Vs Control subjects

Parameters	Diabetic (n=40)	Control (n=40)	P value
Pulse rate Beats/min	77.85 \pm 4.8	74.55 \pm 8.52	0.036*
Respiratory rate Cycles/min	21.66 \pm 5.06	19.75 \pm 4.66	0.236
Systolic BP mmHg	124.3 \pm 11	116.3 \pm 11.33	0.001**
Diastolic BP mmHg	74.95 \pm 9.97	75.1 \pm 8.16	0.94

(Values are Mean \pm SD) *p<0.05: Significant **p<0.01: Highly significant, ***p <0.001: Very highly significant
BP- Blood pressure

There is significant (p=0.036) increase of pulse rate (3beats/min) in Diabetics.

And there is significant (p=0.001) increase of systolic BP(8mmHg) in Diabetics.

Table3: Respiratory parameters of Diabetic subjects Vs control subjects.

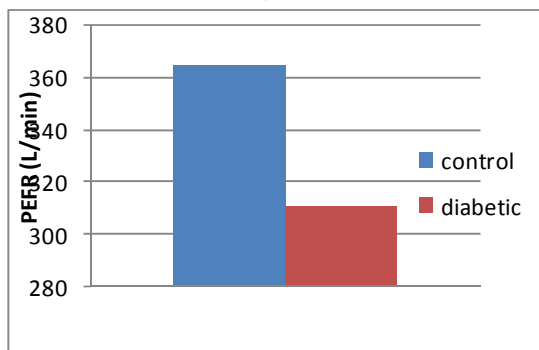
Parameters	Diabetic (n=40)	Control (n=40)	Level of significant
PEFR in L/min	310 \pm 96.66	364 \pm 150.4	0.059
MEP in mm Hg	31.75 \pm 15.34	64.25 \pm 34.33	0.000***

(Values are Mean \pm SD) *p<0.05 Significant, **p<0.01 Highly significant, *** p <0.001 very highly significant.

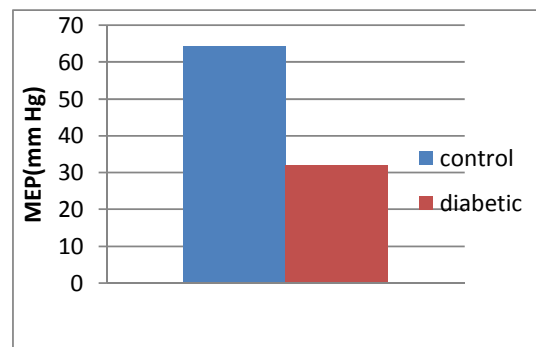
The values of Peak expiratory flow rate (L/min), Maximum expiratory pressure (mm Hg) are reduced in study (diabetics) group compared to control group. Statistically very highly significant (p=0.000) reduction is seen in MEP.

In diabetics the decrease in PEFR is 54 lt/min (14.83%), & MEP is 32.50 mm Hg (50.58%), compared to control subject.

Graph1. PEFR in control and diabetic subjects



Graph2. MEP in control and diabetic subjects



4. Discussion

In our study pulse rate & systolic blood pressure is significantly more in Diabetic group compared to non Diabetic control subjects, (p=0.003, & p=0.001). We attribute this increase in pulse rate & increase Systolic blood pressure to the parasympathetic dysfunction in diabetic patients. This observation is in accordance with the following studies.

In a study Melo E, Foss MC (2003) *et al*, demonstrated that Patients with Type 2 diabetes mellitus have evidence of depression of the parasympathetic autonomic control of the heart¹⁰. Santos e Fonseca C M, Manco JC (1992) *et al*, showed intense depression of the parasympathetic autonomic control of the heart¹¹.

In our study PEFr, MEP was reduced in Diabetics compared to control subjects. In a study Davis Timothy M E (2000) *et al*, demonstrated that diabetes is associated with 9.5% reduced PEFr compared to age, gender, height matched non diabetic controls¹². In the Fremantle study (2004), PEFr is reduced in 125 prospectively studied patients¹³. The very highly significant reduction in MEP (50.58%) is in accordance with the following studies. Sanjeev sinha *et al*, demonstrated statistically comparable decrease in MEP in Type2 diabetes patients. Hyperglycemia and dyslipidaemia might have a contributory role in its pathogenesis¹⁴. Marco Mancini *et al*, demonstrated mild to moderate reduction in transdiaphragmatic pressure and a normal phrenic nerve conduction time in five patients, which suggest that a myopathic disorder is involved¹⁵. The mechanism of impairment of respiratory muscle function may be related to neuropathy, myopathy or both¹⁶.

Conclusion

We found that MEP is significantly reduced; PEFr is insignificantly reduced in type2 diabetics. The possible mechanism for highly significant reduction MEP in study group may be due to respiratory muscle weakness. Hence, we propose repeated recording of simple, non invasive, dynamic lung function tests like (PEFr, MEP) may help to assess the prognosis of type2 diabetes in clinical practice.

Future Prospective:

Regular breathing exercises to strengthen the respiratory muscles may improve the pulmonary function tests in Type 2 diabetic patients & requires further study.

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