



Respiratory Myopathy in Non-Insulin Dependent Diabetes Mellitus

S. Syed Safina^{1*}

¹*Sree Balaji Medical College & Hospital Affiliated to Bharath Institute of Higher Education and Research, Chennai, Tamil Nadu, India.*

Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

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ABSTRACT

The pulmonary function tests FVC, FEV1, FEV1/FVC, PEF, FEF25-75, and MVV were performed in 45 non-insulin dependent diabetics and 47 controls with RMS HELIOS 401 computerised spirometer. The FBS, PPBS, and HbA1c were estimated. The effect of levels of FBS, PPBS and HbA1c on the pulmonary function variables were analysed. The Spirometric variables values were all decreasing with increasing FBS, PPBS and HbA1c levels. This result underlines that respiratory system including the respiratory muscles are also one of the target organs of non-insulin dependent diabetes mellitus. This study supports and adds on to the literatures suggesting respiratory myopathy in non-insulin dependent diabetes mellitus.

Keywords: Spirometric; HbA1c; diabetes mellitus.

1. INTRODUCTION

The hormone insulin which is secreted by the B cells of Langerhans plays a very important role in regulating the blood sugar level and increasing the generation of ATP. Studies have reported

that biochemical, enzymatic changes in the skeletal muscles of diabetic patients and also the respiratory functioning is also disturbed in diabetic patients. Diabetes is a systemic disease that produces changes in the structure and function of several tissues, particularly

connective tissues with complications that affect various systems [1,2]. The presence of an abundant connective tissue in the lung and an extensive microvascular circulation raises the possibility that lung may be a target organ in diabetic patients [4-9]. Increased non enzymatic glycation of protein and peptides of the extracellular matrix at chronic levels may also have an important role in the pathological changes of the lungs in type2 DM [3].

The point deserved to be discussed is that physicians should know the size of problem of pulmonary complication as a consequence the novel techniques used in the treatment of diabetes mellitus through the respiratory system such as insulin [4]. Hence this study aims to determine the to determine any respiratory muscle weakness in type II diabetic patients through the spirometric variable mvv (maximal voluntary ventilation).

2. METHODOLOGY

2.1 Design of the Study

A cross sectional study of the lung function of type II diabetes mellitus subjects with age and sex matched healthy non-diabetic controls.

2.2 Materials

Spirometer model RMS 401with helios software, stadiometer, weighing scale, Microsoft excel, SPSS version 15.0. Forty five patients (30 females and 15 males) with T2DM included in the study group. Forty seven healthy non-diabetic volunteers were included in the control group.

2.3 Inclusion Criteria

1. Patients with history of type 2 diabetes mellitus.
2. Age group 30 to 60 years.
3. Both male and female.
4. Healthy volunteers with no medical illness.
5. No history of smoking for both diabetics and non-diabetics.
6. No previous history of respiratory disease.
7. No respiratory abnormalities at the time of examination including nasal itching, running nose, nasal congestion, cough, breathlessness, hoarseness of throat, sneezing and sinusitis features.

2.4 Exclusion Criteria

1. Patients/Healthy volunteers with history of smoking.
2. History of Hypertension.
3. History of respiratory or cardiovascular diseases.
4. Subjects with previous history of lung disease.
5. Subjects with signs and symptoms of respiratory infection at the time of test.
6. Subjects who were admitted in hospital during the past 6 months for respiratory symptoms.

A cross sectional study of the lung function of type II diabetes mellitus subjects with age and sex matched healthy non-diabetic controls. All biochemical tests, pulmonary function test and respiratory efficiency test are done. Each subject was instructed to visit Cardio respiratory laboratory with six hours of fasting on a specific date. The blood sample (3 ml volume) was drawn for estimation of Fasting Blood Sugar and Glycosylated Haemoglobin. The performance of pulmonary function test was demonstrated. The subjects and controls were made to undergo pulmonary function test using RMS polyrite (computerised spirometer) for three times at every 15 minute interval. The FVC, PEF, FEV1/FVC%, FEF25-75% and MVV were recorded. And the best of the three was taken for the analysis.

The same subjects were asked to take breakfast and blood sample was drawn two hours later for PPBS estimation. The anthropometric, clinical examination of

3. RESULTS

The mean age of non-diabetic group is 44.04, with the range of 35-55 years of age. The mean age of diabetic group is 47.09 with the range of 31-57 years of age. Subjects were closely comparable in their age distribution within the groups. Overall, the level of control of blood sugar among diabetics appears to be good since all were on oral hypoglycaemic agents. The mean FBS is 128.44 mg/dl, with a SD of 46.67 mg/dl, ranging from 68 mg/dl to 236mg/dl. The mean PPBS is 211.89 mg/dl, with a SD of 68.24 mg/dl, ranging from 98 mg/dl to 359 mg/dl. The mean Spirometric values were assessed as

percentage predicted also to overcome variations due to age, heights and weights of the subjects. In percentage predicted values also comparison also diabetics had lower values compared to non-diabetics in FVC, FEV1, PEFr, FEF25-75 and FEV1/FVC. MVV in percentage predicted values showed a low value for non-diabetics compared to diabetics.

The values are statistically significant in FVC, FEV1, PEFr and FEF25-75. The major effect of diabetes appears to be on FVC, FEV1, PEFr and FEF25-75. On FEV1/FVC, the differences show a variable effect. There is a very rough correlation between the declining Spirometric values and the FBS and PPBS values. Pearson correlation coefficient of the Spirometric values yielded significance only between HbA1C and percentage predicted of FVC and FEV1. Also the Pearson correlation coefficient of the Spirometric values yielded significance between BMI and percentage predicted of FVC. Regression analysis revealed significance between duration of diabetes and percentage predicted of PEFr and FEF25-75.



Fig. 1. spirometer model RMS helios 401

3.1 Discussion

The present study mainly focuses on the assessment of the ventilatory function in type II diabetes mellitus patients and its comparison with age and sex matched healthy non-diabetic controls. The percentage predicted FVC values were consistently lower in diabetics compared to non-diabetics with a significant P value of 0.00. This study is in agreement with Sanjeev et al and Maurizio et al who had demonstrated consistent FVC reduction in their studies on non-insulin dependent diabetic patients. The PEFr values

were again reduced in diabetics with significant P value of 0.01. This study is in agreement with Wendy A. Davis et al and Vinay Agarwal et al. showing a decreased PEFr. There is a rough decrease in the value of FEV1/FVC in diabetics compared to non-diabetics though it didn't reach a statistical significance. This result agrees with the study of Vinay Agarwal et al. [6,7] showing decreased FEV1/FVC in both and females. Suggesting a restrictive pattern of the disease. On comparison of HbA1C with the Spirometric values significant correlation observed with FVC and FEV1. The poor lung function values were associated with poor sugar control. A significant association is observed between HbA1C and declining FVC and FEV1 values. In our study we found a predominant restrictive pattern of the disease with a significant FVC and FEV1/FVC reduction, that is <80% of predicted. And a reduced PEFr indicates the reduced capacity of the expiratory muscles.

4. CONCLUSION

There was consistent reduction in all the Spirometric parameters in type II Diabetes, which reached statistical significance for all the parameters. Poor glyemic control showed poor lung function. In Diabetes mellitus, thickening of basement membrane of various tissues including Phrenic nerve tissue leads to diffuse microangiopathy, demyelination and chromatolysis of Axons and Schwann cells, which would be the reason for reduced respiratory muscle strength. The reduction in respiratory muscle strength in type II Diabetics in this study is indicated by reduced MVV, PEFr and FEF25-75. Thickening of alveolar epithelium and pulmonary capillary basal lamina and also the reduced recoiling of lung could be the reason for reduced Spirometric parameters. Hence early detection of reduced pulmonary function and respiratory myopathy through simple spirometry as a routine test is essential for preventing the respiratory complication outcome due to DM. In future, the same study can be extended by including the parameters like respiratory pressures, diffusion capacity, non-volitional tests to assess respiratory muscle strength in a larger sample group.

CONSENT

As per international standard or university standard, patient's written consent has been collected and preserved by the author.

ETHICAL APPROVAL

The study was approved by the Institutional Ethics Committee

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COMPETING INTERESTS

Author has declared that no competing interests exist.

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