Original Research Paper

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Pulmonary Medicine

STUDY OF SPIROMETRIC EVALUATION IN TYPE 2 DIABETES MELLITUS PATIENTS

Dr. Aakula Priyanka*	Postgraduate Department of Respiratory Medicine Mamata Medical College and Hospital Khammam,507002 Telangana,India*Corresponding Author
Dr.B.Niharika	Postgraduate Department of Respiratory Medicine Mamata Medical College and Hospital Khammam,507002 Telangana,India
Dr.Niaz Farhat	Assistant Professor Department of Respiratory Medicine Mamata Medical College and Hospital Khammam,507002 Telangana,India

KEYWORDS :

1. INTRODUCTION

Diabetes mellitus as we all know is a systemic disorder which affects many organs by causing pathological changes in them. It is considered as a leading cause of increasing morbidity and mortality in todays world. Many theories have been suggested to explain the end organ damage induced by hyperglycemia. These are : 1.Formation of advanced glycosylation end products. 2.Glucose metabolism via sorbitol pathway ,3.Activation of protein kinase C and 4.Increase influx via hexosamine pathway.These processes play the main role in causing impairment of collagen & elastin cross linkage, which therby causes reduced elasticity of connective tissue.As per the epidemiological survey , the prevalence of diabetes mellitus is projected to be highest by 2025 in Asian Indians.

The vascular complications of DM remain the main cause of mortality and morbidity. It includes macrovascular and microvascular retinopathy, neuropathy and nephropathy.

This study is mainly aimed to detect the abnormalities in pulmonary functions in Type 2 DM patients. The presence of abduntant connective tissue and microvascular complications in lung raises the possibility that in diabetes patients, lung could be a "target organ".
Chronic hyperglycemia causes many histological changes in the lungs of diabetics. Thickening of alveolar epithelium and basal lamina of pulmonary capillaries. These changes ultimately result in reduction in elastic recoiling capacity and the lung volume. The reason would probably be non- enzymatic glycosylation induced connective tissue alteration in lung parenchyma.

II. AIM OF THE STUDY

1. To record the Pulmonary function tests in Type 2 DM patient.To observe FVC,FEV1&FEV1/FVC & there relationships with duration of disease.
2. To analyse the pulmonary functions of diabetes and their blood sugar values.

III. MATERIALS AND METHODS

Study design : Cross sectional study.

Place Of Study : The department of Respiratory Medicine, Medical Medical College and General Hospital,Khammam.
Sample Size : Minimum of 50 patients will be studied.

Period of study : 24 Months from November 2020 to November 2022.

Inclusion criteria : Patients of TYPE 2 DM>1 year duration with/without hypertension. No previous history of respiratory diseases.

Exclusion criteria :unstable patients, smokers, chronic respiratory & CVS diseases.

Tools for study : Spiro Tube [ST – 15040020],

It, is simple to operate, precise hand held connected to PC, with the nose clip held in position on the nose and with the handle of the spirometer in the subjects hand, for the FVC manoeuvre the subjects were asked to take a deep, maximal inspiration and he was instructed to insert the disposable mouthpiece into his mouth and to be sure to occulude the mouthpiece and then instructed to blow the air rapidly . Meanwhile throughout the procedure they were encouraged to blow out fully and completely by saying words like "blow" or "blast" thus ensuring complete exhalation through the mouth piece. Then they were allowed to practice the forced expiratory manoeuvre 2-3 times. The acceptability criteria of the tests are a satisfactory start of the test and a satisfactory end of the test which includes.

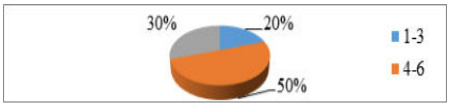
Spirometry was carried out by using the calibrated (ultrasonic device) in a private quite room.Three acceptable manoeuvers were preformed by each of the subjected with a rest of 5-10 minutes between each manoeuvre. Flow,volume/time curve was plotted with the best of the three acceptable manoeuvres being taken as the final reading.The graphs and values obtained were printed from the computer which showed a variety of parameters.Out of various parameters, the following were taken for analysis

1) Forced Vital Capacity : (FVC)
2) Forced Expiratory Volume in 1st Second : (FEV1)
3) Peak Expiratory Flow Rate : (PEFR)

IV. RESULTS In, this study, spirometry was done in 50 Type 2 DM patients to evaluate the effect of diabetes mellitus on lung functions.

Age : In this study, the mean age of the study participants was 55.38 ±9.33 years with a minimum age was 38 years and a maximum age was 77years.

Demographics : In this study, the mean height was 1.54±0.07 meters, weight was 60.68±5.71 Kgs and the BMI was 24.89±2.62 Kg/m2 respective.Duration of diabetes :The mean duration of diabetes among the study participants was 5.56±2.02 years with maximum duration of 10 years and minimum duration of 3 years.



Glycated haemoglobin (HbA1c) : The mean HbA1C level among diabetic patients was found to be 7.11+0.34 within a range between 6.5-8.

Evaluation of spirometry parameters : The mean FVC was 2.00+0.58,the mean FEV1 was 1.76+0.57 and the mean FEV1/FVC was 86.58+8.66.

Spirometry Parameters	Mean	SD	Range
`FVC (%)	83.44	17.15	52- 149
`FEV1 (%)	89.78	17.31	58- 138
FEV1/FVC (%)	109.62	10.63	66- 128

Pulmonary functions assessed by spirometry
The patterns of pulmonary restriction among the diabetic patients . In this study, majority of the patient had normal pulmonary functions 54

(54%), followed by mild restriction in 14 patients (28%) and moderate restriction in 9 (18%) of the patients.

Comparison of forced vital capacity and percentage predicted value among the diabetic patients with pulmonary restrictions In this study F`VC was significantly (p=0.002) reduced in patients with moderate restriction as compared to patients with normal functions (1.46±0.26 vs 2.22 ± 0.59) and mild restrictions (1.46±0.26 vs 1.92±0.48). Similarly the FVC percentage predicted was significantly (p=0.00) reduced in patients with moderate restriction as compared to patients with normal functions (64.56±9.69 vs 94.22 ± 15.40) and mild restrictions (64.56±9.69 vs 74.79±2.83).

Comparison of forced expiratory volume in first one second and percentage predicted value among the diabetic patients with pulmonary restrictions.

In this study FEV1 was significantly (p=0.005) reduced in patients with moderate restrictions.compared to patients with normal functions (1.44±0.73vs1.91±0.56) and mild restriction(1.44±0.73 vs 1.70±0.39). Similarly the FEV1 percentage predicted was significantly (p=0.00) reduced in patients with made.

Comparison of forced expiratory volume in first one second and percentage predicted value among the diabetic patients with pulmonary restrictions.

In this study FEV1 was significantly (p=0.003) reduced in patients with moderate restriction as compared to patients with normal functions (78.21±16.45vs88.97±3.91) and mild restrictions (78.21±16.45vs 87.35±4.94). Similarly the FEV1 percentage predicted was significantly (p=0.004) reduced in patients with moderate restriction as compared to patients with normal functions (99.44±19.32 vs 112.19 ± 6.02) and mild restrictions (99.44±19.32 vs 111.21±5.95).

Comparison of FEV1/FVC ratio and percentage predicted value among the diabetic patients with pulmonary restrictions .

In this study FEV1 was significantly (p=0.003) reduced in patients with moderate restriction as compared to patients with normal functions (78.21±16.45vs88.97±3.91) and mild restrictions (78.21±16.45vs 87.35±4.94). Similarly the FEV1 percentage predicted was significantly (p=0.004) reduced in patients with moderate restriction as compared to patients with normal functions (99.44±19.32 vs 112.19 ± 6.02) and mild restrictions (99.44±19.32 vs 111.21±5.95). One way anova denotes p value <0.05(significant)

DISCUSSION

This study was done to find out the impact of type 2 diabetes on pulmonary functions. Cardio-respiratory clinical features in diabetic patients, such as shortness of breath, dysponea, wheezing and easy fatigability make physicians more alert to coronary artery disease (CAD). lung is also a target organ in diabetic patients, and such clinical features might be due to pulmonary complications than CAD alone. Spirometry is a basic, widely used pulmonary function test (PFT).The pathophysiology for reduced lung functions in diabetics is still not very clear but there have been some reports of histopathological changes in the lungs of diabetic patients, including basal lamina thickening and fibrosis Impairment in lung function of patients with diabetes are believed to be the consequence of biochemical alterations in the connective tissue constituents of the lung, particularly collagen and elastin, as well as microangiopathy due to the nonenzymatic glycosylation of proteins induced by chronic hyperglycemia. The functional abnormalities ensuing from these changes manifest clinically by way of a reduction in elastic recoil of the lung, lung volumes, and pulmonary capacity for the diffusion of carbon monoxide. The concomitant pulmonary structural impact of these biochemical alterations, described to date, consist of a thickening of the alveolar epithelial basal lamina and a specific type of nodular fibrosis of the lung.

Evaluation of spirometry parameters

In this study, the mean FVC was 2.00±0.58, the mean FEVI was 1.76±0.57 and the mean FEV1/FVC was 86.58±8.66. Similary in Kumari et al. study the mean FVC was 2.98 ± 0.59, FEV1 2.45 ± 0.49 and FEV1/FVC was 82%.

In a study done by Roselin et al. among the diabetic patients the mean FVC value was 2.37± 0.75, FEV1 was 2.07 ± 0.64 and FEV1/FVC was 88.39 ±14.43 respectively.

In Irfan et al. study the mean FVC was 2.46±0.83, FEV1 was 2.04±0.75 and FEV1/FVC was 81.94±8.26.

In Mittal et al study the mean was FVC 2.47 ±0 .65, FEV1 was 1.91 ± 0.49 and FEV1/FVC was 81.70+3.17.

In Dash et al study the mean FVC was 2.17 ± 0.59, FEV1 was 1.91 ± 0.54 and FEV1/FVC (%) 88.05 ± 9.26.

In this study, the mean percentage prediction of spirometry parameters among the diabetic patients was % FVC 83.44±17.15, % FEVI was 89.78±17.31 and % FEV1/FVC was 109.62±10.63. Similarly, in Mishra et al. study the % FVC was 83.47 ± 23.03, % FEVI was 87.22 ± 22.4 and % FEV1/FVC was 84.11 ± 9.82.

In another study done by Vanidassane et al the % FVC was 69.36 ± 15.34, % FEVI was 8 80.27 ± 22.5 and % FEV1/FVC was 99.27 ± 12.9. Meo et al. in their studies on Saudi diabetic patients showed significant reduction in FVC, FEV1, and PEF, as compared to their matched controls. They also showed a strong association with a dose–effect response of duration of disease and decreased pulmonary function impairment in their diabetic patients.

Davis et al. conducted a large community-based study in Western Australia in type 2 diabetic patients and demonstrated that VC, FVC, FEV1, and PEF were decreased in type 2 diabetic patients. They also suggested that the reduced lung volumes and airflow limitation are likely to be chronic complications of type 2 diabetes Keerthi et al. reported obstructive lung impairment characterized by reduced FEV1/FVC ratio. Albeit the FEV1/FVC% is a more sensitive indicator of airway obstruction than FVC or FEV1 alone. The decrease in FEV1/FVC% in diabetes mellitus subjects may be related with the poor mechanical properties of the lung, like lung compliance and elastic recoil of lungs.

CONCLUSION

1. The spirometric parameters in general were consistently lower in the diabetic group than non- diabetic group.

2. All the 5 parameters ie.., FVC,FEV1,FEV1/FVC,PEF,FEF 25-75% which were planned for the comparison showed statistically significantly significant difference in form of decrement in diabetic group compared non-diabetics.

3. The pattern of spirometric parameters in diabetic group showed prevalence of restriction pattern in lung function, which can be attributed to non- enzymatic glycolysation of connective tissue resulting in the same.

4. All these points to a conclusion that DIABETES MELLITUS causes decrement in form of restriction more seen in patients with longer duration of DM & patients with uncontrolled glycemic status.

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