www.jmscr.igmpublication.org
Impact Factor 5.84
Index Copernicus Value: 83.27
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossref DOI: https://dx.doi.org/10.18535/jmscr/v5i8.149

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

A Study of Lung Function Abnormalities in Patients with Diabetes Mellitus

Authors
Dr Sheela Kurian V[1], Dr Saji K Subair[2]
[1]Additional Professor, Dept of Medicine, GMCH Kottayam
[2]Junior Resident in Medicine, GMCH Kottayam

ABSTRACT

Background: *Dyspnoea on exertion in a diabetic patient readily arouses the suspicion of cardiovascular disease and/or physical de conditioning. Diabetic lung involvement did not gain wide recognition until recently. Hence this study was undertaken to know the prevalence of pulmonary dysfunction in diabetic patients.*

Aims

1. *To study the prevalence of lung dysfunction in diabetes mellitus.*
2. *To co-relate the duration of diabetes and pulmonary dysfunction*
3. *To categorise the pattern of pulmonary dysfunction among these patients.*

Materials and Methods: *50 patients with diabetes mellitus who attend the O.P of medicine department, Govt. Medical College, Kottayam underwent pulmonary function test. It was a cross sectional study.*

Results: *Statistical analysis revealed that there was reduction of FEV_1 and FVC without a reduction in FEV_1/ FVC ratio. As the duration of diabetes increased, there was a proportionate reduction in both FEV_1 and FVC. This showed that there is a restrictive pattern of lung function abnormality.*

Conclusion: *Our study showed that diabetes mellitus is associated with a statistically significant impaired pulmonary function in a restrictive pattern. Since our results applied to diabetic sub population free from pulmonary disease It would be worthwhile to investigate the potential pulmonary complications in those patients with diabetes and dyspnoea.*

Keywords: *diabetes mellitus, pulmonary function tests, FEV_1, FVC, FEV/FVC.*

Introduction

Diabetes mellitus is a public health problem in a developing and developed world. According to WHO, India will be the diabetic capital of the world in 2025[1]. DM affects almost all the organ systems in the body producing biochemical, morphological and functional abnormalities mainly of collagen and elastin. The alteration in these scleroprotiens in turn affect the mechanical behaviour of the lungs manifesting in altered lung volumes measured by pulmonary function tests[2]. The underlying mechanism seems to be micro angiopathy brought in by the non enzymatic glycosylation of various scleroprotiens in lungs and elsewhere, since collagen is the most abundant tissue protein in major bronchi, vessels and inter-stitium, the alterations in pulmonary functions occur as a rule[3]. The alterations are reversible to start with amd can be delayed by keeping the blood sugar levels in the normal range. Pulmonary Function Testing (PFT) is a complete evaluation of the respiratory systems

including patient histology, physical examination, chest X-RAY examinations, arterial blood gas analysis and tests of pulmonary functions. The primary purpose of pulmonary function testing is to identify the severity of pulmonary impairment[4]. Spirometry includes tests of pulmonary mechanics – measurements of FVC, FEV, PEF values. Forced inspiratory flow rates and MVV. The measurements taken by the spirometry device are used to generate a pneumotachograph that can help to assess lung conditions such as asthma, pulmonary fibrosis, cystic fibrosis and COPD. Physicians may also use the test results to diagnose bronchial hyperresponsivenesss to exercise, cold air or pharmaceutical agents[5].

Cross sectional spirometric testing of large healthy populations shows a plateau of lung function between the ages of 20 or 30. However, longitudinal observation of individuals shows that some have a lung between peak in the early twenty's while others particularly men may have a peak in their mid thirty's[6]. Healthy non - smokers without exposure to air pollution experience a gradual deadline in lung function throughout adulthood and old age, apparently due to slowly developing , mild, subclinical emphysema.

Materials and Methods

The study was conducted during December – May 2013 among 50 diabetic patients attending the outpatient department of medicine, GMCH Kottayam. Diabetic patients diagnosed as per WHO criteria of at least one year duration and between 35 – 65 years were included in the study. Smokers, patients with established lung diseases, connective tissue diseases, cardiovascular and renal diseases, pregnant patients, persons who had history of thoracic surgery, chest deformities and those with thyroid disorders were excluded from the study.

Method

A written informed consent was obtained from the study subjects prior to their participation in the study. The patients to be enrolled in the study group were examined using a structured pretested questionnaire. All the patients were subjected to undergo pulmonary function tests after initial history and physical examination. Physical examination included anthropometric measure-ments such as weight and height according to the standardised methodology recommended by WHO. PFT was performed with the help of computerized Medspiror. Each subject is provided at least 3 acceptable tracings, from which FVC%, FEV 1%, ratio of FEV1/FVC is measured. The ventilatory patterns were estimated using the above predicted values and classified as normal, obstructive or restrictive pattern. Each patient's HbA 1c was also measured. The correlation with duration of diabetes and pulmonary dysfunction, pattern of pulmonary dysfunction were analysed. The statistical analysis was done using SPSS package.

Results

There were 50 diabetes patients with age ranging from 35 yrs to 65 years with duration of diabetes ranging from 10 – 40 years. 30 patients were having diabetes of 10 – 20 years duration. There was a mean of 41.66% for FEV1 in patients with durations of diabetes between 30 – 40 years, 64.5% for patients between 20 -30 year, 73.73% between 10 – 20 years and 79.9% between 0 – 10 year. This clearly shows a marked reduction in FEV1 in diabetes patients as their duration of diabetes of diabetes increases.

Table1:- Data showing significant Difference between the FEVI and FEVI/FVC.

		Mean	N	Std. Deviation	t	P Value
Pair 2	FEVI	72.680	50	15.4374	4.60	.000
	FEVI/FVC	80.870	50	10.9917		

There exists a significant difference between FEVI and FEVI/FVC with p value=0.00.

Table2:- Data showing Relation between FVC AND FEVI/FVC

		Mean	N	Std. Deviation	t	P Value
Pair3	FVC	73.584	50	11.6615	3.39	.001
	FEVI/FVC	80.870	50	10.9917		

There exists a significant difference between FVC and FEVI/FVC with a p value=0.001

Table 3:- Affection of FEVI in Male and Female.

		Sex		Total	$\chi 2$	P Value
		Male	Female			
FEVI	Affected	12	20	32	.731	.390
	Not affected	9	9	18		
Total		21	29	50		

Showing number of patients categorize in to male and female and affection of FEVI value in each category. Reduction in FEVI affected in 64% of patients. Among male 57.14% are affected and among female 68.96% are affected. Not much significant different between the sexes in the case of affection.

Table 4:- Scheff post Hoch data showing Relation between Duration of Diabetes Mellitus and FEVI.

FEVI			
Duration DM	N	Subset for alpha = 0.05	
		1	2
30- 40	3	41.66	
20- 30	4		64.5
10- 20	30		73.73
10	13		79.92

From the above table it is clear that the mean scores FEVI are 79.72.73, 64.5 and 41.66 for the duration 0-10, 10-20, 20-30, and 30-40. It infers that as duration diabetes increases, FEVI was markedly affected. It inferred that as duration of diabetes increases FEVI was markedly reduced.

Table 5:- Scheff Post Hoch Test for Difference in the FVC on Basis of Duration of DM

FVC			
Duration DM	N	Subset for alpha = 0.05	
		1	2
30- 40	3	58.667	
20- 30	4	67.750	67.750
10- 20	30	73.163	73.163
10	13		79.792

From the table it is clear that the mean scores of FVC are 79.792, 73.163, 67.75 and 58.667 for the duration 0-10, 10-20, 20-30, and 30-40. It inferred that as duration of diabetes increases FEVI was markedly reduced.

Discussion

This study shows that Diabetes is associated with a modest, albeit statistically significant impaired pulmonary function in a restrictive pattern.

In a study by Benbassat ca et.al conducted in 2001 on PFT in patients with diabetes mellitus (27 patients aged 48+/-11yrs) it was found that spirometric values were preserved in patients with diabetes mellitus and there was no defect in diffusing capacity. Cardiovascular factors might account for impaired physical performance. They proposed that there is no need for routine screening of pulmonary function among diabetic patients. In another study conducted in India, Pune by Shah SH[7] it was noticed that PFTs were significantly decreased in diabetic patients compared with the healthy controls except FEV1/FVC There was no correlation found between FVC and FEV1 and duration of illness as well as HbA1C. They concluded that glycaemia levels and duration of disease are probably not the major determinants of lung pathology In a study by asanuma y on pulmonary function in patients with diabetes mellitus, they analyzed pulmonary functions in 50 diabetics (31 males and 19 females) without overt lung disease, compared to 21 healthy male subjects of the same age (around 50 years old). Forced vital capacity and timed vital capacity were lower in diabetics (P less than 0.005). Diffusing capacity was also decreased in male diabetics (P less than 0.05). Among diabetics, a decrease in the diffusing capacity was dominant in patients with diabetic retinopathy, which correlated with an increasing duration of their diabetes with age and gas transfer was also affected by diabetic microangiopathy as the duration of diabetes increased. Sandler et al in their study proposed that Nonenzymatic glycosylation- induced alteration of lung connective tissue is the most likely pathogenic mechanism underlying mechanical pulmonary dysfunction in diabetic subjects. The most tenable explanation for impaired pulmonary function in these patients is the presence of underlying pulmonary microangiopathy. They proposed that the abnormal lung function in some diabetic subjects suggests that the lung should be considered a “target organ” in diabetes mellitus.

But in our study, there was significant association between FEV, FVC, FEV1/ FVC and duration of diabetes mellitus

Limitations of study

Duration of can't be assessed clearly as the time of detection will not give a correct onset of diabetes

Passive smoking cannot be excluded.

If DLCO could have been done, more no of cases could be picked up.

References

1. King H, Aubert RE, Herman WH. Global burden of diabetes 1995-2025 Prevalence, Numerical estimates and projections Diabetes Care 1998; 21(9):1414-31.
2. Benbassat CA, Stern E, Kramer M, et al. Pulmonary function in patients with diabetes mellitus. Am J Med Sci 2001;322(3) : 127-32
3. Swanney MP, Jensen RL, Crichton DA, et al. FEV(6) is an acceptable surrogate for FVC in the spirometric diagnosis of airway obstruction and restriction.Am J Respir Crit Care Med 2000; 162:917.
4. Pulmonary terms and symbols : a report of the ACCP-ATS Joint Committee on Pulmonary Nomenclature, Chest 67:583, 1975.
5. Dr.Marina Gafanovich,MD .Pulmonary Function Test in New York NY 10028 – (212)249-6218 June 2010.
6. Robbins DR, Enright PL, Sherrill DL. Lung function development in young adults: is there a plateau phase ? Eur Respir J 1995; 8:768
7. Pulmonary function tests in type 2 diabetes mellitus and their association with glycemic control and duration of the disease. Shah Sh, et. Al, Lung India. 2013 Apr;30(2):108-12.doi: 10.4103/0970-2113.110417.