International Journal of Medical and Health Research
ISSN: 2454-9142
www.medicalsciencejournal.com
Volume 4; Issue 5; May 2018; Page No. 01-03

To study the association of obstructive airway disease in diabetic and non-diabetic subjects using spirometry

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Abstract
Background: Diabetes mellitus is a chronic illness requiring long term medical attention so as to prevent the development of its devastating complications. Poorly controlled diabetes affects almost every organ of the body. Its effect on lung function has been poorly studied. So our study aims to detect the presence of obstructive airway disease in diabetic and non diabetic subjects by spirometry.
Objective: To study the association of Obstructive Airway Disease in diabetics and non diabetic subjects using spirometry.
Material and Method: This study was conducted on 80 subjects, out of which 40 were diabetic and 40 were non diabetic. Each subject underwent full scale clinical examination, all necessary investigations done specially spirometry with reversibility.
Results: out of 80 subjects studied maximum no of subjects (41.3%) observed were in the age group of 55-64 years, followed by age group 65-74 years (31.3%). Ratio of male and female subjects was M:F ≈ 3.21:1. Significant association was found between OAD and DM. 37.5% (15 subjects) of diabetics were found to have OAD, whereas only 15% (6 subjects) of non diabetics had OAD (p value 0.023).
Conclusion: Our study highlights the significant burden of OAD among diabetics**.** Patients with DM should routinely undergo inexpensive investigations like spirometry to detect the presence of OAD. Spirometry is a very sensitive tool to detect OAD.

Keywords: type 2 diabetes mellitus, obstructive airway disease, spirometry

Introduction
Type 2 diabetes mellitus consists of an array of dysfunctions characterized by hyperglycemia and resulting from the combination of resistance to insulin action, inadequate insulin secretion, and excessive or inappropriate glucagon secretion. Poorly controlled type 2 diabetes is associated with an array of microvasular, macrovascular, and neuropathic complications.
Diabetes mellitus is a chronic disease that requires long term medical attention to limit the development of its devastating complications and to manage them when they do occur [1, 2].
Chronic inflammation has emerged as a new risk factor for the development of type 2 diabetes [3, 4, 5]. Due to upregulation of pro inflammatory cytokines in OAD (Asthma and COPD) [6, 7]. one might hypothesize that these chronic inflammatory diseases would increase risk for type 2 diabetes.
OAD primarily includes COPD and Asthma, which are the major contributors to morbidity and mortality in India. Smoking, occupational exposures and exposure to air pollutants are the major risk factors for the development of OAD's [8].
COPD is a debilitating disease. It is a chronic respiratory disorder that progresses slowly and is characterized by an obstructive ventilatory pattern, which is not fully reversible, very often related to tobacco smoking and which can lead to chronic respiratory failure [9].
Measurement of lung function by spirometry is one of the underutilized tools in the medicine. Reduced lung function is known to be associated with increased all-cause mortality. Regular measurement of lung function can provide an important early clue to find out the people at high risk to a variety of diseases [10, 11].
This study is done to evaluate the prevalence of OAD in non-smoker subjects, based on the spirometric indices.

Objective
- To study the association of Obstructive Airway Disease in diabetics and non diabetic subjects using spirometry.

Materials and Methods
The study was carried out in Department of Pulmonary Medicine, Lilavati Hospital & Research Centre, a tertiary health care centre located in Bandra West, Mumbai, Maharashtra. This is a cross sectional observational study, conducted over a period of 1 year from 2014 to 2015. Sample size included 40 known cases of type 2 diabetes mellitus and 40 age matched non diabetics.

Inclusion Criteria
1. Known cases of type 2 diabetes mellitus.
2. Healthy age matched subjects.
3. Age >30years and ≤70 years.

Exclusion Criteria
1. Age ≤30 years and > 70 years.
2. Subjects with type 1 diabetes mellitus.
3. Patients who are current smokers or have a history of

smoking/chulha smoke exposure.
4. Patients who are known cases of obstructive lung disease and/or restrictive lung disease.
5. Patients who are already on steroids or bronchodilators.
6. Subject with contraindication for performing spirometry.

Methodology

Patients attending the Lilavati Hospital and found to have type 2 diabetes mellitus, satisfying the inclusion and exclusion criteria are included in the study after taking written informed consent on a prescribed format. The diagnosis of diabetes was based on the criteria given by the National Diabetes Data Group and WHO.

Patients were interviewed in detail and general and physical examination was done. Basic measurements like age, sex, BMI (body mass index) were noted. Detailed enquiry was made regarding the presence of comorbidities and their current ongoing medication. Smoking history was also taken in detail and those with a positive history were excluded from the study.

All the patients were subjected to spirometry with a MIR spirolab-III spirometer (a turbine based spirometer) in accordance with the American Thoracic Society (ATS)/European Respiratory Society (ERS) guidelines. FEV1/FVC ≤ 70% was used to make a diagnosis of OAD.

Statistical analysis

- Chi square test is the statistical method used in our study.
- Suggestive significance (P value <0.05)
- The statistical software namely SPSS version 17.0 was used.

Results

Out of 80 subjects studied maximum no. of subjects (41.3%) observed were in the age group of 55-64 years, followed by age group 65-74 years (31.3%). Mean age was 59.29 with a standard deviation of 7.95. Minimum age was 38 and maximum was 70 years. Most of the subjects were male [61(76.25%)], ratio of male and female subjects was M:F ≈ 3.21:1.

Table 1: Association of OAD in diabetic and non diabetic subjects

Subjects	OAD			
	Yes		No	
	No.	%	No.	%
Type 2 diabetics (n=40)	15	37.50%	25	62.50%
Non diabetics (n=40)	06	15%	34	85%
Total (n=80)	21		59	

The chi square statistic is 5.65. The p-value is 0.023. The result is significant as p <0.05.

Above table shows 37.5% (15 subjects) of diabetics had OAD, whereas only 15% (6 subjects) of nondiabetics had OAD (p value 0.023).

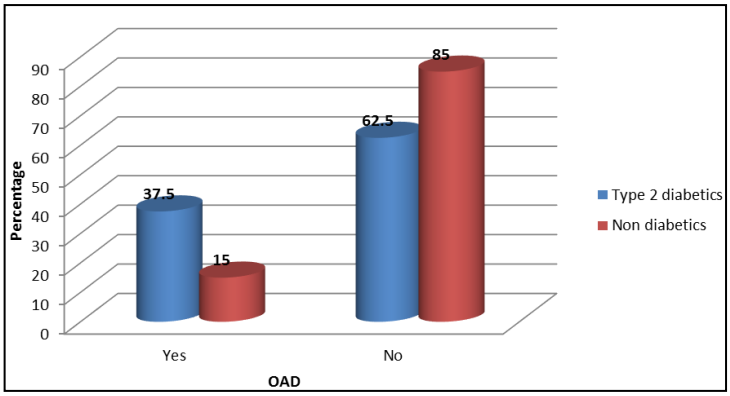

Fig 1: Association of OAD in diabetic and non diabetic subjects

Discussion

Review of the current literature has revealed a definite relationship between OAD and diabetes mellitus, interacting with each other in a complex manner. Diabetes mellitus may have direct consequences on the progression and prognosis of OAD, hyperglycemia on lung physiology, inflammation and susceptibility to infections. On the other hand, OAD, due to the ongoing inflammatory processes and/or therapeutic side effects related to the use of corticosteroids may increase the risk of developing type 2 diabetes mellitus.

In our study, we had performed spirometry in 80 subjects, 40 of which were diabetic and 40 were non diabetics, and there was a male preponderance. Similar findings were noted in the study done by *Sinha S. et al.* [12].

Katsura *et al.* [13]. in their study showed that the prevalence of DM and dyslipidemia are significantly higher in COPD patients than in the general population. Similarly in our study, there was a significant association between OAD and type 2 diabetes mellitus.

Kaminsky DA *et al.* [14]. speculated that abnormal lung function may precede the diagnosis of diabetes, suggesting that lung may contribute to or at least be commonly affected by factors involved in the pathogenesis of diabetes.

Our study was unique in the fact that all the subjects were non-smokers, removing the confounding effect of cigarette smoke on lung function and systemic inflammation.

Conclusion

Our study highlights the significant burden of OAD amongst patients with Type 2 Diabetes Mellitus. Subjects included in our study did not have any respiratory symptoms. Patients with Type 2 Diabetes Mellitus should routinely undergo inexpensive investigations like spirometry to detect the presence of hidden OAD.

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