

Original research article

Prevalence of COPD among diabetic patients – A prospective study

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ABSTRACT

Aim: To study the prevalence of diabetes in patients with chronic obstructive pulmonary disease

Materials & Methods: A prospective study was performed on 110 consecutive patients with proven copd with diabetes this study is conducted in various tertiary care Medical College hospitals in Tamil Nadu. The patients were studied on the basis of a specific questionnaire.

Results: Of 110 enrolled patients male65(60%), female45(40%) , smokers34,(31%), alcoholic36(33%), steroid users45(40%) ,COPD more than 5 yrs male33(30%) DM more than 5 years male 22(20%) female18,(16%) diabetic first male18(16%) ,female11(10%) ,COPD first male 47(43%), female34(31%) Age group31-65 mean age 47

Conclusion: COPD patients are more prone for type 2 diabetes mellitus, and DM is a host factors enhancing risk for infection in COPD and long term complications, .while treating with corticosteroids watching the blood glucose levels frequently and correcting hyperglycemia is a must. In uncontrolled DM worsening of the lung functions and in turn hypoxia of islets worsen DM requires management with insulin.

Keywords : COPD Diabetes Hypoxia Hyper glycaemia

INTRODUCTION

Current research shows that there might be a connection between diabetes and COPD because both conditions involve inflammation. Also, some of the medications used to treat COPD may worsen hyper glycaemia. Diabetes occurs more often in individuals with COPD than in the general population. The exact prevalence of the association between diabetes and COPD varies between studies reported; however it is known that diabetes affects 2–37 % of patients with COPD, underlining the need to better understand the link between these two conditions. Many studies evaluated the epidemiological aspects of the association between diabetes and COPD analyzing potential common issues such as systemic inflammation, oxidative stress, hypoxemia or hyper glycaemia.

Another important aspect is to consider the pharmacological treatment used by COPD predispose to DM and vice versa . Diabetes mellitus (DM) is a common co morbidity of chronic obstructive pulmonary disease (COPD) A series of studies have shown that DM is associated with impaired lung function .The chronic complications of diabetes include a number of pathological changes involving different organs and **lung** represents a target organ for diabetic micro angio pathy in patients with diabetes .

It is not known why patients with COPD are affected by T2D more often than non-T2D subjects. Many conditions, in addition to chronic hyper glycaemia, such as inflammation or disease-related inflammation, oxidative stress, hypoxia, reduced physical activity, and smoking habit may contribute to the higher prevalence of diabetes in COPD. In addition to all these conditions, the treatment with corticosteroids is considered to be another cause of the association between these two diseases

Epidemiology

Diabetes occurs more often in people with COPD than in the general population although the exact prevalence varies between studies. Italian College of General Practitioners study infers Compared to the non-COPD individuals, COPD patients were at increased risk of DM, 10.5 % in the general population vs. 18.7 % in COPD patients. Unexpectedly, in this study COPD patients had an increased prevalence of both cardiovascular diseases and T2DM and a very low prevalence of the metabolic syndrome, suggesting that COPD is a real risk factor for cardiovascular diseases and diabetes .Many studies confirmed that the development of DM was associated with greater rates of decline of pulmonary function suggesting that diabetes may be, in particular at its onset, is associated with a significantly accelerated decline of respiratory function . Lazarus et al within the Normative Aging Study in their perspective analysis reported that FVC was negatively associated with the risk to have higher levels of insulin resistance and a similar associations were found for FEV1 and maximal mid-expiratory flow rate (MMEF), suggesting the possibility that insulin resistance could be the factor correlated with the impairment of pulmonary function

Mechanisms

DM is a common co morbidity of COPD ,the mechanisms underlying the increased prevalence of diabetes in COPD still remains unclear, although a number of potential pathways including inflammation, oxidative stress, hypoxia and chronic hyper glycaemia may provide some explanation .

Systemic inflammation is a common feature to both COPD and to T2DM, which drives insulin resistance, atherosclerosis and many systemic expressions of COPD itself. systemic inflammation might be increased by the coexistence of these two conditions, COPD and diabetes, worsening both in their clinical manifestations.

Smoking induces oxidative stress that can trigger local and systemic inflammation, though cigarette smoking is not a link between DM and COPD . This is especially interesting given that exposure to cigarette smoking is crucial for the development of COPD and, at the same time, an independent and modifiable factor for the development of DM .

There are many evidences that the levels of inflammatory proteins (Table 2), such as cytokines and among these TNF- α , IL-6, or C reactive protein (CRP), are increased in patients with COPD. Systemic inflammation is associated with various complications in COPD, including cardiovascular and metabolic diseases such as diabetes. Intracellular mediators of inflammation could also lead to chronic hyperglycemia and to an increased synthesis of collagen mediated by higher levels of advanced glycation end products that ultimately would affect negatively lung function . Hypoxia causes significant changes in metabolism, studies conducted in healthy subjects at high altitude showed increased insulin resistance and glucose production in the liver with greater insulin sensitivity at peripheral level and increased uptake of glucose in skeletal muscle It seems that pancreatic β cells are sensitive to hypoxia-induced damage, regardless of the conditions intermittent hypoxia that observed in sleep apnoea or chronic hypoxia seen in COPD.

Indeed, chronic hypoxia has been observed in association with impaired glucose tolerance, reduced insulin sensitivity accompanied by greater lipolysis. In COPD patients, in which the normalization of saturation values has been obtained, it can be observed an improvements of glucose tolerance and insulin sensitivity It is possible that both of these diseases, COPD and DM, might share common patho physiological pathways which can be mediated by hypoxia inducible factor (HIF) .

In a study conducted on isolated human bronchi, they found that high glucose concentrations lead to enhanced responsiveness of airway smooth muscle cells to contractile agent. The data suggested that the glucose-induced enhancement of bronchial responsiveness is likely to be due to increased activation of particular intracellular pathways

Treatment in COPD causing DM:

Corticosteroids are considered the main therapeutic approach potentially implicated in the strong association between diabetes and COPD. The use of corticosteroids, in susceptible individuals, may determine states of hyperglycemia. In fact, the use of inhaled corticosteroid (ICS) has been reported to be correlated with an increase in the concentration of plasma glucose in diabetic patients, and this increase seems to be modulated in a dose-response manner Short-term treatment with oral corticosteroids, used in acute exacerbations, is associated with a five-fold increased risk of acute hyper glycemia and also the long-term use of oral corticosteroids in stable COPD is correlated with increased risk of glucose intolerance .

Instead, in a more recent retrospective study, double-blind, placebo-controlled, which used the ICS budesonide alone or in combination budesonide/ formoterol in COPD highlighted that the treatment with ICS in COPD patients was not associated with an increased risk of new-onset DM nor hyperglycemia These studies outline how the association between COPD and T2D might be independent of the use of ICSs . Beyond everything, it should not be precluded the use of ICSs in COPD patients, where clinical evidence suggests that they may be useful, rather it should be aware that there is a risk of unwanted side effects and it should be considered a use of the lowest possible dose to obtain the optimal management of the disease . The patients on phosphodiesterase 4 (PDE4) inhibitor for acute exacerbation in copd with T2D results in a significant reduction in glycated hemoglobin was observed. and concluded that PDE4 inhibitors can lower glucose levels in patients with newly diagnosed T2D without COPD, although the exact mechanism is still unknown

In patients with T2D, metformin is the recommended first-line treatment and this treatment is associated with reduce risk of cardiovascular events and death Metformin has been, although rarely, associated with lactic acidosis which may be fatal, thus its safety in COPD it has been questioned .

The British National Formulary and the US Federal Drug Administration suggested that metformin should be discontinued immediately in any conditions associated with hypoxemia. Hence, the clinical use of metformin in patients with diabetes and coexisting COPD is limited whether it is appropriate or not .

Metformin, has its pleiotropic anti-inflammatory and antioxidants actions, and may have a role in COPD by limiting glucose flux through the epithelium of the airways that is associated also with respiratory infections . A retrospective study, which included patients with COPD and DM, showed that treatment with oral hypo glycaemic agents was independently associated with the improvement of FVC Moreover, a recent open-label study where metformin in patients with COPD has been used, suggested that this drug could improve respiratory muscle strength Safety of metformin in COPD has been evaluated in a recent retrospective cohort. COPD patients treated with metformin showed an association with lower elevation of lactate concentration.

T2D seems to be associated with the reduction of alveolar micro vascular reserves and possibly be evidence of deterioration in lung volume, alveolar perfusion and capillary recruitment. This reduction correlates with glycaemic control and extra pulmonary micro angio: insulin improved DLCO in patients with T2D possibly through a facilitation of the alveolar-capillary interface conductance . Based on possible role of insulin in improving pulmonary gas exchange it was attempted inhaled use. However, the use of inhaled insulin has highlighted potential negative effects and among them the presence of cough, and potential reduction in DLCO and FEV1 More research is needed before inhaled insulin may be recommended in diabetic patients with or without pulmonary disease

DEMOGRAPHIC DETAILS OF PATIENTS

Enrolled patients

Male	65	(60%),
Female	45	(40%)
Total	110	(100%)
Smokers	34	(31%)
Alcoholic	36	(33%)
Steroid users	45	(40%)

COPD due to Occupational

Male	18	(16%)
Female	11	(10%)
Total	29	(26%)

COPD more than 5 yrs

Male	33	(30%)
Female	18	(16%)

DM more than 5 years

Male	22	(20%)
Female	18	(16%)

Diabetic first

Male	18	(16%)
Female	11	(10%)

,COPD first

Male	47	(43%),
Female	34	(31%)

Age group	MALE	FEMALE
31-40	20	12
41-50	23	12
51-65	22	21

Results:

Of 110 enrolled patients male65(60%), female45(40%) , smokers34,(31%), alcoholic36(33%), steroid users45(40%) ,COPD more than 5 yrs male33(30%) Female 18 (16%) DM more than 5 years male 22(20%) female18,(16%) diabetic first male18(16%) ,female11(10%) ,COPD first male 47(43%), female34(31%) Age group31-65 mean age 47

Conclusion:

COPD patients are more prone for type 2 diabetes mellitus, and DM is a host factors enhancing risk for not only infection in copd but the cause of deterioration of lung function itself and result in long term complications.while treating with corticosteroids watching the blood glucose levels frequently and correcting hyperglycemia is a must. In uncontrolled DM worsening of the lung functions and in turn hypoxia of islets worsen DM requires management with insulin. Keeping glucometer and nebulisers in home are must in all patients with copd and diabetes mellitus

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