Original Article

Prevalence of Type 2 Diabetes Mellitus in Chronic Obstructive Pulmonary Disease and Its Impact on the Severity of Chronic Obstructive Pulmonary Disease among Patients Attending Tertiary Care Center in Central Karnataka, Davangere

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Abstract

Introduction: Diabetes mellitus (DM) is an important and common comorbid condition associated with chronic obstructive pulmonary disease (COPD). The exact prevalence of DM in COPD patients among the Indian population is unknown. Coexisting DM is associated with poor outcome in COPD patients and has a significant impact on lung function and severity of the disease. **Aim:** The aim of this study was to determine the prevalence of type 2 DM in COPD patients attending tertiary care hospital and to assess its impact on the severity of the disease and exacerbation. **Patients and Methods:** A cross-sectional study was done at a tertiary care center in Davangere from July to December 2016. Convenience sampling was used to study 412 patients attending the hospital for consultation. An interview schedule consisting of sociodemographic details and GOLD criteria 2015 to diagnose COPD and the World Health Organization criteria for DM was used. **Results:** The prevalence of DM was 23.05% (95) among 412 COPD patients studied. Thirty-five (8.49%) patients were newly diagnosed with DM. The prevalence in mild, moderate, severe, and very severe COPD was 14.73%, 18.94%, 36.84%, and 29.47%, respectively. DM group patients had a significant decline in lung function compared to non-DM group (mean forced expiratory volume 1% – 45.92 ± 4.22 v/s 56.64 ± 3.58, $P = 0.001$), and the majority of patients with DM (29.47%) were in exacerbation when compared to nonDM group (16.71%). **Conclusion:** The prevalence of DM is high in COPD patients, and significant numbers are newly detected. Hence, it is crucial to screen all COPD patients for DM routinely. Further diabetics tend to have more severe COPD when compared to nondiabetics.

Keywords: Chronic obstructive pulmonary disease, diabetes mellitus, prevalence, screening

Introduction

Noncommunicable diseases (NCDs) such as cardiovascular diseases, stroke, and chronic respiratory diseases pose significant burden on global health, chronic obstructive pulmonary disease (COPD) being one the leading causes of mortality among them.[1] The prevalence of COPD continues to increase worldwide and is projected to be the third leading cause of death by 2030. According to the World Health Organization (WHO) estimates, 65 million people have moderate-to-severe COPD worldwide. Mortality due to COPD in 2005 corresponds to 5% of all deaths globally.[2]

Recently, COPD is considered a disease that has multisystem involvement. Comorbid diseases associated with COPD have a significant impact on the clinical profile and functional capabilities of the individual. Common comorbidities associated with COPD are diabetes mellitus (DM), systemic hypertension, ischemic heart disease, and heart failure. Among these, DM is one of the frequent comorbidities encountered in patients with COPD which can significantly alter the course of the disease.

COPD and DM, both being pro-inflammatory conditions, they share relevant features in their etiology and course. COPD

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patients are more prone to develop type 2 DM due to multiple risk factors such as obesity, sedentary lifestyle, smoking, increased inflammation, oxidative stress, and corticosteroid therapy. The prevalence of DM in COPD patients is 2%–37% depending on the patient population studied and is consistently associated with a 1.4–2.0 fold increased risk of developing DM.[3]

Considering the enormously growing incidence of both DM and COPD in India, the convergence of these two chronic NCDs poses a great challenge to the treating physician. Hence, this study has been taken up to know the prevalence of DM in COPD patients attending our tertiary care center and to know its impact on the lung function and severity of the COPD.

Patients and Methods

This was a cross-sectional study done during the period of July–December 2016. Institutional ethics approval was obtained for the study. About 412 patients attending for consultation at pulmonary medicine outpatient department in a tertiary care center at Davanagere in central Karnataka were interviewed. A written informed consent was taken before interview. The questionnaire was adapted from the GOLD criteria – 2015 to diagnose COPD according to which spirometric criterion postbronchodilator value forced expiratory volume 1 (FEV_1)/forced vital capacity (FVC) <0.70 was taken. Those found to be diagnosed to have COPD were screened for DM according to the WHO/International Diabetes Federation consensus statement.

The data were entered in Microsoft Excel and analyzed using SPSS Inc. Released 2007. SPSS for Windows, Version 16.0. (Chicago, SPSS Inc.). Measures of central tendency such as mean and standard deviation were used to describe the sociodemographic variables. Test of association such as the Mann–Whitney test and *t*-test were performed to look for association between various sociodemographic and COPD factors. A value of $P \leq 0.05$ was taken to be level of statistical significance.

Table 1: Patient demographics (*n*=412)

Parameters	Observation
Sex (male/female)	328/84
Age (years), mean±SD	58.4±11.6
BMI (kg/m^2), mean±SD	23.47±3.7
History of smoking (*n*)	
Smokers	274 (among men)
Biomass fuel exposure	51 (among women)
Known DM cases, *n* (%)	60 (14.56)
Newly diagnosed DM cases, *n* (%)	35 (8.49)
Prevalence of DM, *n* (%)	95 (23.05)
Severity of COPD among DM patients, *n* (%)	
Mild	14 (14.73)
Moderate	18 (18.94)
Severe	35 (36.84)
Very severe	28 (29.47)
Number of patients in acute exacerbations, *n* (%)	81 (19.66)

SD: Standard deviation, BMI: Body mass index, DM: Diabetes mellitus, COPD: Chronic obstructive pulmonary disease

Results

Four hundred and twelve patients with COPD were included in the study. Among them, 328 (79.6%) were male and 84 (21.6%) female. The mean age among study participants was 58.4 ± 11.6 years. Mean body mass index of the participants was 23.47 ± 3.7. In the present study, number of smokers among males were 274 (83.5%), and none of the females were smokers. About 51 (60.7%) female participants had a history of exposure to biomass fuel [Table 1].

Among 412 study participants, 95 (23.05%) had DM and among which 35 (8.49%) were newly diagnosed to be diabetic. The mean duration of COPD in diabetics (7.06 ± 2.10 years) was more when compared to nondiabetics (6.42 ± 1.98 years), and this difference was found to be statistically significant ($P = 0.006$). Furthermore, significant difference in smoking was seen among diabetics (mean pack years 12.93 ± 3.11) when compared to nondiabetics (9.57 ± 4.68 years) ($P = 0.001$). Our study showed that there was a severe decline in lung function (mean FEV_1 – 45.92 ± 4.22) in people with diabetes as compared to nondiabetics (56.64 ± 3.58) and it was found to be statistically significant ($P = 0.001$). Acute exacerbations were seen more in diabetics than nondiabetics with a significant difference ($P = 0.008$) [Table 2].

Discussion

COPD represents a significant and growing health-care concern as a leading cause of morbidity and mortality

Table 2: Comparison between diabetics and nondiabetics

	Diabetics (*n*=95)	Nondiabetics (*n*=317)	*P*
Sex (male/female), *n*	72/13	256/71	0.310
Age (years), mean±SD	59.52±12.22	57.64±10.84	0.145
BMI (kg/m^2), mean±SD	23.66±4.20	22.84±3.64	0.064
Smoking (pack years), mean±SD	12.93±3.11	9.57±4.68	0.001
Duration of COPD (years), mean±SD	7.06±2.10	6.42±1.98	0.006
FEV_1 (percentage predicted), mean±SD	45.92±4.22	56.64±3.58	0.001
Number of patients in exacerbation at the time of enrollment, *n* (%)	28 (29.47)	53 (16.71)	0.008
HbA1c levels (mean±SD)	9.1±1.8	5.2±1.3	0.0001

SD: Standard deviation, BMI: Body mass index, COPD: Chronic obstructive pulmonary disease, FEV_1: Forced expiratory volume in 1 s, HbA1c: Hemoglobin A1c

worldwide. India contributes enormously to COPD burden which is estimated to be among the highest in the world. Mortality due to COPD in India is four fold greater than the USA and Europe.[4] This number is expected to expand tremendously due to increasing exposure to tobacco smoking and biomass fuel. COPD is considered as a novel risk factor for new-onset type 2 DM due to chronic inflammation, oxidative stress, insulin resistance, weight gain, and dysfunction of fat metabolism.

On the other hand, the prevalence of DM is increasing rapidly worldwide. India is considered as the diabetes capital of the world with 41 million people having DM, and every fifth diabetic in the world is an Indian.[5] Considering the significant change in the lifestyle, food habits, decreased physical activity, and obesity in the Indian population, there has been escalating epidemic of DM in both rural and urban Indian populations. With India currently experiencing a demographic shift with higher percentage of elderly population, the coexistence of these two chronic disorders in an individual is very high which would worsen the morbidity and mortality of the individual.

The present study showed that DM was found in 23.05% (95/412). Our findings are in line with other studies done previously. A study conducted in Belgaum, India in 2015 by Mahishale *et al*. observed that the prevalence of DM in COPD patients was 25.63%.[6] Few other studies done outside India observed that deranged blood glucose was seen in more than 50% of the patients admitted with acute exacerbation of COPD.[7-9]

Our study showed that a significant number of diabetics 35 (8.49%) was newly detected. They were not aware of their diabetic status. It is proved beyond doubt that COPD is a condition which predisposes to develop new-onset type 2 DM. Rana *et al*. observed that COPD patients had a multivariate relative risk of 1.38 (95% confidence interval [CI]: 1.14–1.67) for new-onset type 2 DM.[10] Feary *et al*. showed an odds ratio of 2.04 (95% CI: 1.97–2.12) for the development of new-onset diabetes in COPD patients.[11]

Furthermore, the present study showed that COPD patients with DM had statistically significant decline in the FEV_1, and duration of COPD was longer and had more exacerbation rates. Our findings are in line with other studies. The third National Health and Nutrition Examination Survey[12] observed declined lung functions in people with diabetes compared to nondiabetics. Another important aspect worth mentioning here is that this impaired pulmonary function is likely to deteriorate rapidly in uncontrolled diabetes. This is in agreement with the Fremantle Diabetes Study[13] which showed that comorbid DM was associated with lower values of FEV_1, FVC, peak expiratory flow (PEF), and VC. Recently, in 2013, El-Habashy *et al*.[14] showed that there was a significant decrease in pulmonary function tests among diabetic patients (FEV1, FEV1/FVC%, forced expiratory flow –25%–75%, maximal voluntary ventilation, and PEF) compared with healthy controls and further proved that decline was exaggerated in poorly controlled DM.

None or very few Indian studies have compared lung function and exacerbations between diabetics and nondiabetic COPD patients. This is one of the strengths of our research. Our study is limited by small sample size and being a single-center study, and the results cannot be generalized. Some of the patients who were newly diagnosed with DM may be actually having acute transient hyperglycemia due to stress reaction and steroids administration. However, we used HbA1C to confirm the diagnosis of DM.

Conclusion

DM is a common comorbidity seen in patients with COPD. A significant proportion of patients with COPD is newly detected DM. These patients are often not aware of their diabetic status. DM significantly affects the clinical course of COPD. Patients with uncontrolled DM have more severe COPD, poor lung function, and more exacerbations.

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Conflicts of interest

There are no conflicts of interest.

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