

# A Study of Prevalence of Thyroid Disorders in Chronic Obstructive Pulmonary Disease Patients at a Tertiary Care Center in U.P.

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## ABSTRACT

**Introduction:** COPD being a systemic disease, is frequently associated with alteration of systemic functions. This study was designed to determine the prevalence of thyroid disorders in COPD patients.

**Material and Methods:** A prospective study was designed at SRMS Institute of Medical Sciences, Bareilly, U.P and 201 patients were assessed to evaluate the prevalence of thyroid disorders in COPD patients using Lung function tests, clinical and thyroid function tests data.

**Results:** A total of 201 cases of COPD were evaluated, of which 130 (64.6%) were observed to be having thyroid disorders. Hypothyroidism was diagnosed in 119 (59.2%) cases and hyperthyroidism in 11 (5.4%) cases. 71 (35.3%) cases were found to be normal on thyroid function tests. P-value of association of COPD and thyroid disorders was 0.213.

**Conclusion:** The results of this study indicate that thyroid disorders are frequent in patients with chronic obstructive pulmonary disease patients. The thyroid functions were at lower normal range in patients with COPD. Hence COPD patients have higher prevalence of hypothyroidism.

**Keywords:** COPD- Chronic obstructive pulmonary disease, Hypothyroidism, Hyperthyroidism, Pulmonary function test, Thyroid function test.

## INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a major cause of chronic morbidity and mortality throughout the world. The Global Burden of Disease Study has projected that COPD which ranked sixth as the cause of death in 1990, will become the third leading cause of death worldwide by 2020.<sup>1</sup>

There is now increasing evidence available to say that COPD is a systemic inflammatory response to identifiable stimuli, affecting predominantly lungs and numerous other organs like thyroid, pituitary etc.

The thyroid hormone regulates the metabolism of proteins, lipids and carbohydrates, and controls the activity of membrane bound enzymes.<sup>2,3</sup> The thyroid hormone enhances mitochondrial oxidation, and thus, augments metabolic rate.<sup>4</sup> This effect on metabolic rate is probably responsible for the association between the thyroid hormone and respiratory drive.<sup>5</sup> Limited data on the prevalence of thyroid diseases among patients with COPD are available<sup>6,7</sup> yet, several characteristics of patients with COPD could potentially increase their likelihood of developing hypothyroidism and hyperthyroidism.

Objective of the research was to study the prevalence of thyroid disorders in chronic obstructive pulmonary disease

patients.

## MATERIAL AND METHODS

The present Descriptive Cross sectional study was conducted on the patients attending pulmonary medicine OPD and admitted to pulmonary medicine ward in Shri Ram Murti Smarak Institute of Medical Sciences (SRMS IMS) at Bareilly, Uttar Pradesh. with respiratory complaints over a period of one and a half year i.e. from 1<sup>st</sup> November 2013 to 30<sup>th</sup> June 2015. All the patients coming to OPD and admitted in the ward of the Department of Pulmonary Medicine, Shri Ram Murti Smarak Institute of Medical Sciences (SRMS IMS) at Bareilly, Uttar Pradesh constituted the study population.

**Study Subjects:** All the patients diagnosed as a case of COPD were included in the study.

**Inclusion Criteria:** All patients 30 years or more of COPD attending SRMSIMS (defined as chest symptoms who show a post bronchodilator FEV1/FVC <0.7) and willing to undergo assessment of associated thyroid disorders.

**Exclusion Criteria:** Patients with other obstructive airway diseases like bronchial asthma and bronchiectasis, inability to undergo the lung function testing and any condition that could unacceptably increase the subject's risk of performing any of the testing.

**Sample size estimation:** All patients of COPD attending SRMSIMS during study period, meeting the inclusion criteria and not falling in the exclusion criteria were included in the study.

**Study Tool:** An instrument for the survey was developed after reviewing the available literature which gathered demographic information (Name, age, sex, ID number), anthropometric measurements (Height and weight), history of cigarette smoking, COPD categorisation as per Gold guidelines, test results to rule out Thyroid disorders (CXR – P/A view, Spirometry, complete blood count, renal function test, liver function test, thyroid Profile).

**Study Protocol:** Eligible subjects were contacted and infor-

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mation about the purpose of study was given, rapport was developed and voluntary consent was taken before filling the pre-designed questionnaire. The methodology comprised of face-to-face interview in the presence of one attendant, preferably care-taker of the patient or closely related. Information was collected on general demographic parameters, COPD, thyroid disorders present and appropriate laboratory investigations. Presence of thyroid disorder was elicited by self-reporting, supplemented by history, clinical examination and scrutiny of relevant medical records and documents.

#### Defining Chronic Obstructive Pulmonary Disease (COPD):

As per GOLD guidelines (2015), Chronic Obstructive Pulmonary Disease (COPD) is defined as a common preventable and treatable disease which is characterized by persistent airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the airways and the lung to noxious particles or gases.<sup>8</sup> Spirometry measurements are evaluated by comparison with reference values based on age, height, sex, and race. For greater accuracy spirometry was performed thrice and the largest values of both FVC and FEV1 were noted from three technically satisfactory curves.<sup>8</sup>

COPD severity was classified based on spirometric assessment according to the Gold classification 2015, as follows: In patients with FEV1/FVC < 0.70:

#### Assessment of Thyroid function

A complete thyroid function test comprising of measuring the levels of TSH, T<sub>3</sub> and T<sub>4</sub> in serum was performed on the blood of all the COPD patients at Central Lab, Department of Biochemistry. The patients were labelled as having hypothyroidism and hyperthyroidism according to the WHO as per the values listed under:

It is clear from table 3 that 15.9% (32) of the patients belonged to the age group up to 50 years and almost 30.3% (61) belonged to the group 51-60 years. Around 33.3% (67) of the patients were in the age group 61-70 years and 20.4% (41) belonged to above 70 years group. The graphical representation of the distribution of patients according to age is given in figure 1.

Table 4 shows the frequency and percentage distribution according to sex. Out of 201 patients studied with spirometry, around 70.1% (141) of the patients were male and 29.9% (60) were female. The graphical representation of the distribution of patients according to sex is given in figure 2.

Table 5 shows the frequency and percentage distribution according to smoking habit. Out of 201 patients studied, majority 94.5% (190) of the patients have the habit of smoking and the rest 5.5% (11) have not. The graphical representation of the distribution of smoker is given in figure 3.

Table 6 shows the frequency and percentage distribution according to COPD severity. It is clear that 24.4% (49) of the patients classified into mild grade and almost 40.8% (82) belonged to moderate grade. Around 31.3% (63) of the patients were severe grade and only 3.5% (7) belonged to very severe grade. The graphical representation of the distribution of COPD severity is given in figure 4.

Table 7 shows the frequency and percentage distribution of thyroid disorders. It is clear that 35.3% (71) of the patients

Gold 1	Mild	FEV1 ≥ 80% predicted
Gold 2	Moderate	50% ≤ FEV1 < 80% predicted
Gold 3	Severe	30% ≤ FEV1 < 50% predicted
Gold 4	Very Severe	FEV1 < 30% predicted

**Table-1:** Classification of COPD severity on spirometric assessment<sup>8</sup>

	TSH (μIU/ml)	T <sub>3</sub> (ng/ml)	T <sub>4</sub> (μg/dl)
Normal	0.4 – 4.5	3.0 – 7.0	0.7 – 1.4
Hyperthyroidism	<0.4	>7.0	>1.4
Hypothyroidism	>4.5	<3.0	<0.7

**Table-2:** Classification of thyroid disorder<sup>9</sup>

	Frequency	Percent
Up to 50 Years	32	15.9%
51 - 60 Years	61	30.3%
61 - 70 Years	67	33.3%
Above 70 Years	41	20.4%
Total	201	100.0%

**Table-3:** Distribution of patients according to age

	Frequency	Percent
Male	141	70.1%
Female	60	29.9%
Total	201	100.0%

**Table-4:** Distribution of patients according to sex

	Frequency	Percent
Yes	190	94.5%
No	11	5.5%
Total	201	100.0%

**Table-5:** Distribution of patients according to smoking habit

	Frequency	Percent
Mild	49	24.4%
Moderate	82	40.8%
Severe	63	31.3%
Very Severe	7	3.5%
Total	201	100.0%

**Table-6:** Distribution of patients according to COPD severity

	Frequency	Percent
Normal	71	35.3%
Hypothyroidism	119	59.2%
Hyperthyroidism	11	5.5%
Total	201	100.0%

**Table-7:** Distribution of patients according to Thyroid disorders

were normal. Around 59.2% (119) of the patients have hypothyroidism and only 5.5% (11) have hyperthyroidism. The graphical representation of the distribution of thyroid disorders is given in figure 5.

## DISCUSSION

The study was carried out in the department of Pulmonary Medicine at Sri Ram Murti Smarak Institute of Medical

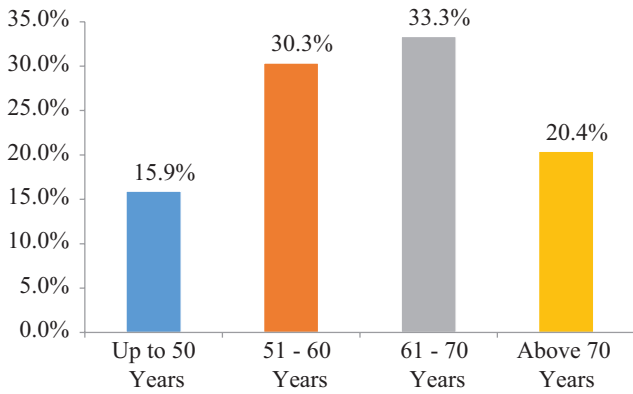


Figure-1: Distribution of patients according to age

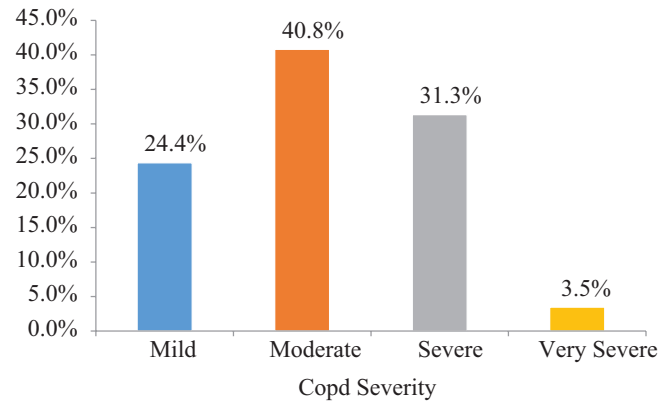


Figure-4: Distribution of patients according to COPD severity

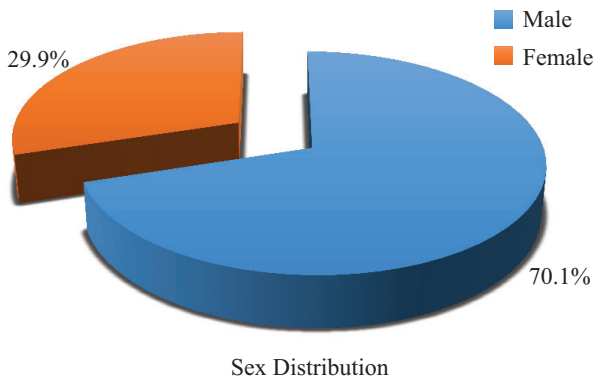


Figure-2: Distribution of patients according to sex

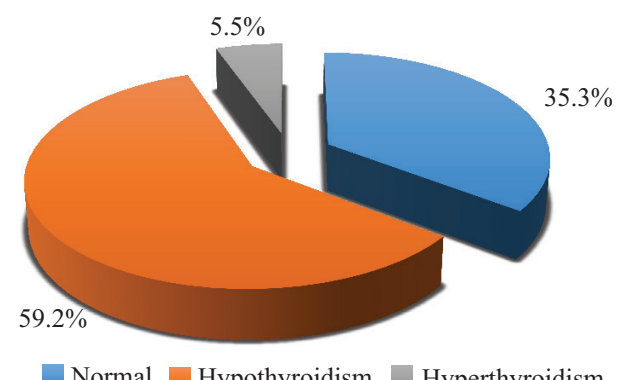


Figure-5: Distribution of patients according to Thyroid disorders

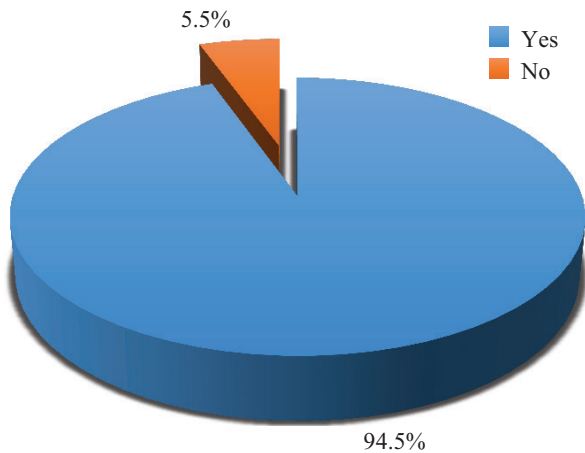


Figure-3: Distribution of patients according to smoking habit

Sciences, Bareilly over a period of 18 months. The study was carried out on 201 subjects who were diagnosed as a case of COPD. Each subject was screened to fulfill the inclusion and exclusion criteria. Various investigations and tests were performed to diagnose comorbidities mentioned as per the GOLD guidelines.

The subjects were selected randomly from the IPD and OPD. No age and sex distribution was made.

The mean age of COPD patients was 62.6 years. Majority of patients were in the age group of 61-70 years. (Table no.3)

Among 201 patients, 60 were females and 141 were males. There was male predominance with the male to female ratio of 2.3:1. (Table no.4)

Majority 190 (94.5%) of the patients had the habit of smoking or had history of long term chullah smoke exposure and

the rest 11 (5.5%) had no such history. (Table no.5)

Out of all the patients studied, about 49 (24.4%) of the patients were classified as having mild COPD and 82 (40.8%) belonged to moderate grade and 63(31.3%) of the patients had severe grade and only 7 (3.5%) belonged to very severe COPD. (Table no. 6)

**COPD and thyroid disorders**

In our study prevalence of thyroid disorders was 64.7% (n=130) and out of which around 119 (59.2%) of the patients had hypothyroidism and only 11 (5.5%) had hyperthyroidism.

R. Prakash et al<sup>10</sup> in 2014 conducted a study and 96 cases of acute exacerbation of COPD were analysed and he found that 62 (64.58%) patients had lower levels of T3, T4, and TSH and even lower during the exacerbation stage and more significantly in above 60 years of age group.

Gulfidan Aras et al<sup>11</sup> in 2014 conducted a study and 21 patients within the exacerbation period of COPD were evaluated and found that 7 (33.33%) patients had free T3 levels below the normal values, and 3 (14.28%) patients had TSH levels below the normal values.

Gupta Madhuri et al<sup>12</sup> in 2013 reported a study and 60 COPD patients and 30 age matched healthy controls were studied and he found that there was a significant difference with respect to BMI, mean serum FT3. Mean serum TSH was within normal limits but had lower values than controls. FT4 was within normal limits. Mean serum FT3 was negatively correlated with bicarbonate levels whereas FT4 was negatively correlated to haemoglobin levels.

Sevinc Sarinc Ulasli et al<sup>13</sup> in 2013 did a study in which 128

patients were included and showed that TSH values and exacerbation frequency had positive correlation ( $p < 0.0001$ ;  $r = 0.82$ ).

## CONCLUSION

The results of this study indicate that thyroid disorders are frequent in patients with chronic obstructive pulmonary disease. In majority of patients with COPD, diagnosed to be suffering from thyroid disorders, were having their TSH values at higher normal range. Hence COPD patients have higher prevalence of hypothyroidism.

The mechanism accounting for the association of thyroid disorders with COPD are not yet fully defined but the systemic effects of inflammation have been suggested as the link.

Data on the prevalence of thyroid disorders among patients with COPD are highly variable. This may partly be due to differences in the methods of data acquisition, which range from self-reported survey data to administrative database analysis.

It can be concluded from this study that there is an increased likelihood of association of COPD with thyroid disorders. A physician dealing with COPD patients should always keep this in mind and use clinical assessment and diagnostic tests, so that the patient can be managed better.

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