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Thyroid dysfunction in chronic obstructive pulmonary disease

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Abstract

Introduction: Chronic obstructive pulmonary disease (COPD) is one of the major causes of morbidity and mortality in the world, leading to worsening of quality of life. Other comorbidities have significant impact on the disease course. Thyroid dysfunctions might be associated with frequent COPD exacerbations. Identifying such an underestimated comorbidity is important for its early addressing and delaying progression of COPD complications.

Method: This was a cross-sectional descriptive study done among COPD patients attending at Bir hospital from March 2021 to April 2022. A total of 75 patients fulfilling inclusion criteria were interviewed and underwent clinical as well as laboratory investigations. Data were entered and analyzed using the statistical software IBM-SPSS version 22.

Result: The prevalence of thyroid dysfunction ranged from 2(2.7%) in stage A to 22(29.3%) in stage D. On further analysis, prevalence of hypothyroidism 2(2.7%) in stage A to 14(18.7%) in stage D. Hypothyroidism was found more common in COPD than hyperthyroidism 0(0%) hyperthyroidism in stage A to 8(10.7%) in stage D). The prevalence of thyroid dysfunction with no exacerbations was found to be 0(0%) whereas those with exacerbations but not requiring hospitalization accounted for 7(9.3%). Similarly, 10(13.3%) required hospitalization and 18(24%) had 2 or more exacerbations.

Conclusion: Our study has shown that prevalence of thyroid dysfunction is common among COPD patients. Moreover, COPD patients with thyroid dysfunction suffer more from exacerbation states. Early identification and treatment of thyroid dysfunction seems quite beneficial to reduce the frequency of exacerbations and enhance the quality of life of COPD patient.

Keywords: COPD, Hyperthyroidism, Hypothyroidism, Thyroid Dysfunction

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is one of the major causes of morbidity and mortality in the world, leading to a worsening of quality of life and to premature death. COPD is projected to rank fifth worldwide in terms of burden of disease and third in terms of mortality in 2020.[1] In Nepal, the hospital based non communicable diseases (NCD) prevalence is found 31% in which COPD (43%) is found the most common NCD followed by cardiovascular disease (40%) & diabetes mellitus (12%).[2] Significant comorbidities may have an additional impact on morbidity and mortality related to COPD.[1] Among comorbidities, thyroid dysfunctions are underestimated comorbidity.[3] Several characteristics of COPD patients could potentially increase their likelihood of developing hypothyroidism or hyperthyroidism.[4] Thyroid dysfunction was associated with more frequent exacerbation.[5]

This study was conducted to find out whether there is significant association of thyroid dysfunction with the severity of COPD or not and its role in COPD exacerbations. If we could establish the significant relationship between thyroid dysfunction and COPD state, thyroid screening test can be justified as cost effective measure in its treatment regimen. Early detection and prompt management could improve the quality of life in these patients. The purpose of our study is to assess the impact of thyroid dysfunction in patients with COPD.

METHOD

This descriptive cross sectional study was conducted in National Academy of Medical Science, Bir Hospital, Kathmandu. The study population consisted of COPD patients diagnosed with spirometry and severity was determined according to GOLD criteria 2020.[1] Only those patients with no any other illness and/or on any medication affecting thyroid function were enrolled in the study. The study excluded individuals without consent, pregnant women, those with known diseases such as pituitary adenoma, hashimoto thyroiditis and grave's disease and on regular medications that may affect thyroid functions. COPD patients were enrolled in this study from medicine department OPD/IPD from March 2021 to April 2022

OPD cases were screened for thyroid dysfunction during the OPD visit whereas inpatient cases were screened at discharge time and all of them were followed up. Ethical approval was obtained from the Institutional Review Committee of the same institution (Reference number: 1036/2077/78).

Non probability, purposive sampling technique was chosen for the study. Sample size was calculated by using the following calculation formula:

$$n = \frac{z^2 pq}{d^2}$$

where, n = required sample size
Z = 1.96 for 95% confidence interval
p = proportion in the population (prevalence of thyroid dysfunction among COPD patient is 25%)[5]= 0.25
q = 1-p = 0.75
d^2 = 0.1 margin of error expressed as decimal (i.e 0.1) with allowable error of 10%.
Substituting these values in the above equation, the sample size is estimated as 72.

Semi-structured interview schedule & record analysis along with Modified British Medical Research Council (mMRC) Dyspnea scale and COPD Assessment Test (CAT) were assessed. Both of these assessment scales are proposed by Global Initiative for Chronic Obstructive Lung Disease (GOLD) for COPD cases assessment. Besides, exacerbation and admission history were also asked; on the basis of which COPD staging was done according to GOLD 2020.

Data was collected after obtaining informed consent from the patients (from first degree relatives if critically ill). Descriptive statistics and inferential statistics frequency, percentage, mean, standard deviation were used using SPSS software (22 versions) for analysis. The strength of association between the two categorical variables were measured using non-parametric chi-square test. A p-value was calculated under the predetermined level of significance (0.05) and confidence interval of 95% was constructed. A p-value <0.05 were considered statistically significant.

RESULT

The mean age of the patients in the study was 64.67±8.94 years with the maximum age 85 years and minimum age 40 years. Most of the patients enrolled in the study were female, 57(76%). Majority of the respondents were housewife 48(64%) and then 21(28%) were farmer. Most of the respondents 49(65.3%) were current smoker. Only 8(10.7%) respondents never smoked and 18(24%) were ex-smoker. Regarding smoke pack per year, the mean of smoke pack/ year was found to be 25.28±10.26 with maximum 50 and minimum 10 packs per year.

In CAT™ Assessment Score, majority 56(74.7%) was in moderate to severe COPD stage (CAT score ≥10) and only 19(25.3%) were found to have mild COPD stage (CAT score < 10). Half of the patient in the study 40(53.3%) had normal thyroid function test and around 35(46.6%) were found to have thyroid dysfunction, among which the majority of 25(33.3%) had hypothyroidism and only 10 (13.3%) were of hyperthyroidism. About 22(29%) of patients having COPD stage D were found having thyroid dysfunction status. On

Table 1. COPD stage and thyroid function state, N=75

COPD Stage	TFT State			χ^2	p- value
	Hypothyroidism N(%)	Hyperthyroidism N(%)	Normal N(%)		
Stage A	2(2.7%)	0	12(16%)	12.7	0.048
Stage B	3(4%)	1(1.3)	7(9.3%)		
Stage C	6(8%)	1(1.3%)	9(12%)		
Stage D	14(18.7%)	8(10.7%)	12(16%)		
Total	**25(33.3%)**	**10(13.3)**	**40(53.3%)**		

*CI difference: 95%, p<0.05, df=6

Table 2. Exacerbation state and thyroid function state, N=75

Exacerbation state	Thyroid Function State			χ^2	p-value
	Hypothyroidism N(%)	Hyperthyroidism N(%)	Normal N(%)		
No exacerbation	0	0	12(16%)	14.79	0.02
One not requiring hospitalization	5(6.7%)	2(2.7%)	10(13.3%)		
One requiring hospitalization	7(9.3%)	3(4%)	8(10.7%)		
2 or more episodes	13(17.3%)	5(6.7%)	10(13.3%)		
Total	**25(33.3%)**	**10(13.3)**	**40(53.3%)**		

*CI difference: 95%, p<0.05, df=6

further analysis, there found 14(18.7%) were hypothyroid having COPD stage D and 8(10.7%) were hyperthyroid state having COPD stage D among patient with thyroid dysfunction (Table 1).

Most of the respondents 28(37.3%) had a history 2 or more episodes of exacerbation state. Similarly, there found prevalence of thyroid dysfunction in patient with 2 or more episodes of exacerbation accounts 18(24%). On further analysis, there found, 13(17.3%) were hypothyroid having 2 or more episodes of exacerbations among patient with thyroid dysfunction (Table 2).

DISCUSSION

COPD is a complex illness often associated with multiple comorbidities, including cardiovascular diseases, hypertension, metabolic disorders, osteoporosis, and osteoarthritis, which exacerbate its progression.[6,7] Among these, thyroid dysfunctions are commonly under recognized but can lead to worse outcomes, such as more frequent exacerbations, increased hospitalizations, and higher mortality rates in COPD patients.[8] In this present study that prevalence of thyroid dysfunction ranged from 2(2.7%) in Stage A to22(29.3%) in Stage D; thyroid dysfunction was higher in higher stages of COPD as compared to lower stages of COPD. On further analysis prevalence of hypothyroidism was more common in COPD than prevalence of hyperthyroidism with overall prevalence of 2(2.7%) hypothyroidism in stage A to 14(18.7%) hypothyroidism in stage D; 0(0%) hyperthyroidism in stage A to 8(10.7%) hyperthyroidism in stage D. Similar study from Indian also reveals that prevalence of thyroid dysfunction ranged from 8.6% (Stage A) to 32.7% (Stage D).[5] In another study, there observed 64.6% COPD patients were associated with thyroid disorders; higher than this study. On further distribution; 59.2 % had hypothyroidism and 5.4% had hyperthyroidism.[9] Likewise, a recent study discovered thyroid problems in 45 (37.2%) of 121 COPD patient in which almost 44 patients were found having hypothyroidism.[10] Thus hypothyroidism has been predominantly present in most of the study as comorbid thyroid disease state followed by hyperthyroidism. COPD exacerbations are significant events in the illness, accelerating lung function deterioration and causing additional morbidity and death.[1] COPD as a chronic condition often leads to exacerbations, severe respiratory symptoms that require significant medical and healthcare attention.[11]

Likewise, the prevalence of thyroid dysfunction in patient with one exacerbations not requiring hospitalization was 7(9.3%); 10(13.3%) among them with one exacerbations requiring hospitalization while 18(24%) among them who had 2 or more episodes of exacerbations. Overall prevalence of thyroid dysfunction among them with one or more exacerbation in our study was 35(46.7%.) Similar study revealed that the prevalence of thyroid dysfunction was 30.4% in those having two or more exacerbation episodes.[5] Similarly, another study also showed that acute exacerbation frequency (/year) found more in COPD patient with hypothyroidism (1.5±0.83) than COPD patient without hypothyroidism (0.80±0.83).[12] Therefore, addressing thyroid dysfunction as a contributing factor to exacerbations can be novel strategies to prevent them, which is a primary goal in COPD case management.

This was a cross-sectional study with the interview schedule. So, there might be possibility of information biases. The study results might not be representative in general due to purposive sampling technique. The study was conducted in a single center with a limited sample size. Hence, multicenter study with large sample size might be needed for validation.

CONCLUSION

The prevalence of thyroid dysfunction among COPD patients with one or more exacerbations were found to be 46.7%. The severity of COPD Stage and exacerbation state along with thyroid dysfuntion are found to be interrelated. Therefore, it would be better to have thyroid screening while managing COPD cases. Furthermore, prompt

treatment of thyroid dysfunction might decrease frequency of exacerbations and increase quality of life.

DECLARATIONS

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Conflict of Interest

None

Funding

None

Ethical Clearance

Ethical clearance was obtained from IRB of National Academy of Medical Sciences, Bir Hospital with Ref. No. 1836/2077/78.

Consent of the Study

It was taken from the participants of the study.

Consent for Publication from Authors

All the authors and the participants consented to the publication of the findings.

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