

## CORRELATION BETWEEN TSH LEVELS AND THE DEGREE OF ACUTE EXACERBATION IN COPD PATIENTS AT GOTONG ROYONG HOSPITAL

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### ABSTRACT

**Background:** Chronic Obstructive Pulmonary Disease (COPD) is a heterogeneous lung condition characterized by chronic respiratory symptoms, such as shortness of breath, cough, sputum production and/or exacerbation. Thyroid stimulating hormone (TSH) is a hormone that secretes two major metabolic hormones. Thyroid hormone plays an important role in lung development and pulmonary surfactant maturation. **Objective:** To determine the relationship between TSH levels and the degree of acute exacerbation of COPD. **Methods:** The study used an observational analytical study with a cross-sectional method with a simple random sampling technique. The results of the data will be analyzed with SPSS using the Fisher's Exact Test to see the correlation between TSH levels and the degree of acute exacerbation of COPD. **Results:** There was no significant correlation between TSH levels and the degree of acute exacerbation of COPD at Gotong Royong Hospital with  $p = 1,00$ . **Conclusion:** There was no significant correlation between TSH levels and the degree of acute exacerbation of COPD.

**Keywords:** COPD; TSH levels; acute exacerbation; degree; thyroid hormone

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## INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is a heterogeneous lung condition characterized by chronic respiratory symptoms, such as shortness of breath, cough, sputum production and/or exacerbations, caused by airway or alveolar disorders that cause persistent and increasing airflow obstruction.<sup>1</sup> COPD exacerbations are characterized by airway inflammation, excessive mucus production and gas trapping.<sup>2</sup>

COPD is a significant health issue in Indonesia. This is due to increasing life expectancy and increasing exposure to risk factors, such as increasing smokers and air pollution, both in the workplace and outdoors.<sup>3</sup> According to the World Health Organization (WHO), COPD is now one of the three leading causes of death in the world with a death toll of 3.23 million in 2019 and almost 90% of these deaths occurred in people under the age of 70 in low- and middle-income countries.<sup>4</sup>

TSH (thyroid stimulating hormone) secretes two major metabolic hormones, namely thyroxine (T4) and triiodothyronine (T3). These two hormones both significantly raise the body's metabolic rate.<sup>5</sup> Thyroid hormones have a complex metabolic system and play an important role in lung development and pulmonary surfactant maturation. Thyroid disorders are common extrapulmonary manifestations in COPD patients. This is often associated with frequent exacerbations that affect the patient's quality of life.<sup>6</sup>

Research by Dan Huang et al., in 2021 found that FEV1 percent predicted (FEV%pred) has a positive correlation with TSH and FT3 (free T3) levels. This study suggests the possibility of the influence of thyroid hormone levels on the prognosis of acute exacerbations of COPD.<sup>7</sup> Research on

thyroid dysfunction was also conducted by Sakine Nazik Bahcecioglu et al., in 2023 with the results of finding low pO<sub>2</sub> (partial pressure of oxygen) and pCO<sub>2</sub> (partial pressure of carbon dioxide) in patients with NTIS 2 (Nonthyroidal Illness) compared to patients with normal thyroid function.<sup>8</sup>

Research on the correlation between TSH levels and the degree of acute exacerbation in COPD patients is still rare. Therefore, the author is interested in conducting research on the correlation between TSH levels and the degree of acute exacerbation in COPD patients at Gotong Royong Hospital.

## METHODS

The research was conducted using an observational analytical study with a cross-sectional method. The data used in this study are clinical examinations result, medical records, and TSH level examinations in COPD patients with acute exacerbations at the Gotong Royong Hospital in Surabaya during the period September-November 2024. The sample size obtained was 17 patients. The inclusion criteria for this study were patients aged 30-80 years who were diagnosed with exacerbation of COPD and were willing to participate in the study. Meanwhile, the exclusion criteria for the study were patients with a history of malignancy and thyroid gland surgery, consumption of levothyroxine or antithyroid, and a history of pregnancy. TSH level examination will be carried out using the ELFA method using the Mini Vidas tool. The TSH levels are categorized into two groups, normal and abnormal. The data results will be analyzed with the Statistical Package for Social Science (SPSS) 26.0 using the Fisher's Exact test.

## RESULTS

**Table 1.** Distribution of Characteristics by Age

Age Interval	Number of Samples	Percentage (%)
30-35	1	5,9
36-45	2	11,8
46-55	2	11,8
56-65	8	47
65-80	4	23,5
<b>Total</b>	<b>17</b>	<b>100</b>

Table 1 shows the age group with the smallest number is 30-35 years with only 1 person (5.6%). The majority of patients experiencing acute exacerbations are in the 56-65 year age group with 8 people (47.1%).

**Table 2.** Distribution by Gender

Gender	Number of Samples	Percentage (%)
Male	6	35,3
Female	11	64,7
<b>Total</b>	<b>17</b>	<b>100</b>

Table 2 shows that of the total 17 patients, more female patients experienced an acute exacerbation of COPD, with a total of 11 people (64.7%), compared to male patients who only numbered 6 people (35.3%).

**Table 3.** Distribution of Severity Degrees

Severity Degrees	Number of Samples	Percentage (%)
Mild	2	11,8
Moderate-severe	15	88,2
<b>Total</b>	<b>17</b>	<b>100</b>

Table 3 shows that the number of patients experiencing acute exacerbation of COPD with moderate-severe degrees has the largest number, which is 15 people (88.2%). While patients with mild degrees have the smallest number, which is 2 people (11.8%).

**Table 4.** Distribution by TSH Levels

TSH Levels	Number of Samples	Percentage (%)
Normal	15	88,2
Abnormal	2	11,81
<b>Total</b>	<b>17</b>	<b>100</b>

Table 4. shows the distribution of TSH levels in patients with acute exacerbation of COPD. It was found that 15 people (88.2%) of the total 17 patients had normal TSH levels and 2 people (11.8%) had abnormal TSH levels.

**Table 5.** Distribution by Comorbidities

Comorbidities	Number of Samples	Percentage (%)
Hypertension	2	11,8
Pneumonia	3	17,6
Pneumonia+DM+Hypertension	1	5,9
Pneumonia+Hypertension	1	5,9
Without comorbidities	10	58,8
<b>Total</b>	<b>17</b>	<b>100</b>

Table 5 shows the distribution of samples with comorbidities. In the results obtained, it was found that around 3 people (17.6%) experienced acute exacerbation of COPD with pneumonia, 2 people (11.8%) with comorbidity hypertension, and other comorbidity groups such as pneumonia+DM+hypertension and pneumonia+hypertension, each had only 1 patient (5.9%). The largest number of patients was found in COPD exacerbation patients without comorbidities, namely 10 people (58.8%).

**Table 6.** Analysis Results of the Correlation Between TSH Levels and the Degree of COPD Exacerbation

Variable	Severity degree		Total	Fisher's Exact Sig. p
	Mild	Moderate - Severe		
TSH	Normal	2	13	1,00
	Abnormal	0	2	
<b>Total</b>	<b>2</b>	<b>15</b>	<b>17</b>	

Table 6 shows the analysis results of the correlation between TSH levels and the degree of COPD exacerbation using the Fisher's Exact test. Patients with normal TSH levels were found in patients with mild (11.8%) and moderate-severe (76.4%) exacerbations. While abnormal TSH levels were only found in moderate-severe exacerbations,

totalling 2 people (11.8%). The test results are said to be significant if the  $p$ -value  $< 0.05$ . The calculation results using Fisher's Exact obtained a value of 1.00 which means that no significant relationship was found.

## DISCUSSION

Based on the results of the study, it was found that the majority of patients who experienced COPD exacerbations were aged 56-65 years (late elderly). Similar results were also found in a study by Najihah et al., with the results that the majority of patients with COPD were in the elderly age group (46- $\geq$ 65 years), namely 92.2% of patients. Another study was also conducted by Nurfitriani et al., with the results that patients diagnosed with COPD were mostly found in the elderly-elderly age range. Aging is a progressive tissue degeneration that can have a negative impact on vital structures and organs, this causes older patients to be more susceptible to lung disease and is compounded by bad habits.<sup>9,10</sup>

In this study, a significant difference was found in the number of patients experiencing COPD exacerbations when categorized by gender. Women were more prevalent than men, with 11 women (64.7%) and only 6 men (35.3%). In a study conducted by Hatice Kilic et al., it was reported that the number of patients who had previously experienced exacerbations was higher among women than men (92.7% vs. 82.5%). The study also suggested that female COPD patients are more prone to exacerbations, have higher hospitalization rates, and experience longer hospital stays. The most common risk factor for COPD in women is exposure to biomass. Women are more susceptible to the adverse effects of indoor air pollution, such as cooking smoke and biomass fuel smoke.<sup>11</sup>

The distribution of COPD exacerbation severity result's showed that most patients had moderate-to-

severe exacerbations, totaling 15 individuals (88.2%). Meanwhile, only 2 patients (11.8%) had mild exacerbations. This study yielded results similar to those of a study conducted by Juye Bae et al., in which the highest degree of exacerbation was also found in patients with moderate-to-severe exacerbations, accounting for 41.9%.<sup>12</sup> COPD patients typically only visit the hospital when they experience shortness of breath during activities, sometimes accompanied by coughing and sputum production. Conversely, patients with mild exacerbations rarely seek hospital treatment, as they often perceive their coughing and sputum production as normal symptoms of aging or smoking habits.<sup>13</sup>

Out of a total of 17 samples, 7 patients experienced COPD exacerbation with comorbidities such as pneumonia, diabetes mellitus (DM), and cardiovascular disease. In a study by Sogaard et al., it was reported that 33.3% of patients experiencing COPD exacerbation had pneumonia, while 66.7% were COPD exacerbation patients without pneumonia.<sup>14</sup> COPD exacerbation and pneumonia have identical symptoms, and their underlying mechanisms are also similar. There is no difference in the lung microbiome of COPD patients with or without pneumonia infiltrate, and their triggers and treatments are the same. Therefore, in a study conducted by Juan Jose et al., pneumonia is included in the COPD exacerbation syndrome.<sup>15</sup> Based on several studies, the prevalence of metabolic syndrome was found to be approximately 22.5% in patients with COPD. Diabetes negatively impacts the progression of COPD by increasing the length of hospitalization and raising the risk of death during exacerbations.<sup>12</sup> Hypertension is another common comorbidity in COPD patients. In a study conducted by Haiyan Ge et al., it was found that hypertension has a strong association with acute exacerbations in COPD.<sup>16</sup>

The analysis of the correlation between TSH levels and the degree of COPD exacerbation in patients at Gotong Royong Hospital Surabaya, was conducted using Fisher's Exact test due to the small sample size and the presence of 75% of cells with an expected count of  $<5$ . Based on the test results, the findings were not significant, with  $p = 1.00$  (significance value  $p < 0.005$ ). In several previous studies, such as the one by Dan Huang et al., it was shown that TSH levels were higher in patients with moderate- to-severe exacerbation severity than in those with very severe.<sup>7</sup> Similarly, research by Amira Shoukry et al. found a significant decrease in serum total T3, FT3, TSH levels, and the TT3/TT4 ratio in patients with COPD exacerbation compared to the control group and those with stable COPD.<sup>17</sup>

In the present study, only two patients were found to have abnormal TSH levels, and most patients with COPD exacerbation had normal TSH levels. The differing results of this study are believed to be influenced by the small sample size, which could result in a false negative, meaning that a relationship exists but was not detected. Additionally, the presence of comorbidities may affect thyroid function and the degree of COPD exacerbation. In several previous studies, lung function tests were performed, and the frequency of COPD exacerbations over a year was observed. Lung function is used as a basis for determining the severity of COPD and has a strong correlation with the severity of acute COPD exacerbations.<sup>7</sup> However, this study did not include lung function tests or assess the frequency of prior COPD exacerbations.

Although no significant association was found in this study, these findings may contribute to understanding the relationship between TSH and the degree of COPD exacerbation. A very limited sample may show an insignificant relationship.

However, it does not rule out the possibility that there is a relationship between TSH levels and the degree of COPD exacerbation. These results indicate the need for further research with a stronger design, such as a larger sample size and control for factors such as comorbidities.

## CONCLUSION

Based on the research that has been conducted, it can be concluded that the incidence of COPD patients with acute exacerbation at Gotong Royong Hospital over a 3-month period was 17. Normal TSH levels were most commonly found in patients with acute exacerbation of COPD with a total 15 patients. Additionally, no significant relationship was found between TSH levels and the degree of acute exacerbation of COPD in patients at Gotong Royong Hospital Surabaya.

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