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ORIGINAL ARTICLE

Prevalence of chronic obstructive pulmonary disease among TB patients at Royal Prima Hospital

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ABSTRACT

Chronic Obstructive Pulmonary Disease (COPD) is a respiratory disease characterized by a reduction in lung capacity and is the third leading cause of death worldwide. COPD is a complex disease involving various environmental and genetic factors. This study aimed to determine the prevalence of COPD among TB patients at Royal Prima Hospital in Medan. This was a retrospective descriptive study with a cross-sectional design. The population of this study was all outpatient TB medical records at Royal Prima Hospital in Medan. Purposive sampling was used, resulting in a sample size of 68 individuals. Data was analyzed univariately using descriptive statistics presented in frequency distribution tables and percentages. The results showed that most COPD patients at Royal Prima Hospital were elderly (73.5%), male (85.3%), employed (64.7%), had a junior high school education (47.1%), had suffered from COPD for less than 10 years (70.3%), and were active smokers (63.2%). Most COPD patients were categorized as having moderate disease (39.7%). It is hoped that Royal Prima Hospital will continue to develop prevention programs for Chronic Obstructive Pulmonary Disease to reduce the number of cases, and that COPD patients who frequently visit healthcare facilities will receive instructions on self-care management for their long-term condition to reduce disease severity.

Keywords: COPD, elderly, gender, smoking, prevalence

Introduction

Chronic Obstructive Pulmonary Disease (COPD) is a respiratory disease characterized by chronic airway inflammation, progressive decline in lung function, and a gradual deterioration in quality of life. The disease is generally irreversible and is primarily caused by exposure to cigarette smoke, genetic predispositions, and both indoor and outdoor air pollution.[1] As a chronic disease, COPD poses a significant public health challenge and is a leading cause of chronic morbidity and mortality worldwide.[2,3] WHO reported in 2021 that COPD is the third leading global cause of death, claiming 3.23 million lives in 2019. Most of these deaths occurred in low- and middle-income countries, and COPD is projected to rank fourth by 2030.[2,4] In the US, chronic lower respiratory diseases, predominantly COPD, were the fourth leading cause of death in 2018. The Global Initiative for Chronic Obstructive Lung Disease forecasts a continued rise in COPD prevalence until 2060 due to increasing smoking rates and other risk factors.[5]

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The prevalence of COPD in Indonesia in 2018 stood at 4.5%.[6] Nusa Tenggara Timur exhibited the highest prevalence, with a figure of 10.0%, followed by Central Sulawesi at 8.0%, South Sulawesi and West Sulawesi, both at 6.7%. Conversely, the highest number of cases was found in South Kalimantan (5.0%), followed by Central Kalimantan (4.3%), West Kalimantan (3.5%), and East Kalimantan (2.8%).[2] Data from hospitals in several regions of Indonesia indicated that COPD was the leading cause of morbidity, accounting for 35% of cases, followed by asthma at 33%, lung cancer at 30%, and others at 2%.[4,7,8] COPD is one of the four leading non-communicable diseases causing mortality and disease burden, after cardiovascular diseases, cancer, and diabetes mellitus.[3]

COPD is a complex disease influenced by both environmental and genetic factors. The most significant environmental contributor to COPD development is exposure to cigarette smoke. An estimated 15-20% of smokers are at risk of their condition deteriorating into COPD. Cigarette smoke contains various particulate matter that induces numerous adverse effects on the respiratory system, including excessive mucus production, cough, impaired ciliary function, inflammation, and damage to bronchial and alveolar walls.[4,9] Smoking is the primary risk factor for COPD, characterized by respiratory symptoms and impaired lung function. Approximately 90% of COPD patients are current or former smokers, and the increase in COPD cases is directly proportional to the rising prevalence of smoking.[3] A study conducted in Tarakan City revealed that 78.9% of COPD patients had a history of smoking.[9] The risk of developing COPD increases with the duration and intensity of smoking.[4] Data from the Central Bureau of Statistics from 2020 to 2022 indicate that 28.26% of the Indonesian population aged 15 and over are smokers. The Global Adult Tobacco Survey (GATS) 2021, compiled by the Ministry of Health, showed an increase in the number of adult smokers from 60.3 million (2011) to 69.1 million (2021).[6] Consistent with the findings of Madania & Sawitri[4], a history of COPD is more commonly found in individuals over the age of 40. However, COPD can also occur at a younger age due to smoking behavior.

COPD exhibits a marked male preponderance. Previous research corroborates this finding, with a study from the Pulmonary Clinic of the West Sumatra Pulmonary Hospital revealing that 93.8% of COPD patients were male.[3] Nurfitriani & Ariesta[7] attributed this gender disparity to occupational exposures and smoking habits, which are more prevalent among males. The higher prevalence of smoking and occupational hazards associated with male-dominated professions increases the risk of developing COPD. Meanwhile, age is another significant risk factor for COPD. Ekaputri's[3] study of 44 COPD outpatients at the West Sumatra Pulmonary Hospital found that 52.1% were in the late elderly age group (56-65 years). These findings align with Fazmi et al.[6] who reported that 96.7% of COPD patients were over 50 years old. The aging process, characterized by declining lung function, exacerbates the risk of COPD, as noted by Nurfitriani and Ariesta[7].

Socioeconomic and environmental factors also contribute to COPD prevalence. COPD is more prevalent in rural areas and among individuals with lower educational levels, outdoor occupations, and lower socioeconomic status.[6] The ongoing epidemiological transition, influenced by increasing affluence, has impacted disease patterns.[7] Ekaputri's[3] findings support this, demonstrating a higher prevalence of COPD among individuals with lower educational levels. The majority of COPD patients in her study had a primary school education (47.9%) and were employed as farmers (64.6%). Similar findings were reported by Firdausi et al.[10] who found a higher prevalence of COPD among rural and less educated respondents. Based on these findings, this study aims to investigate the prevalence of COPD among tuberculosis patients at Royal Prima Medan Hospital.

Method

This cross-sectional study aimed to investigate the prevalence of COPD among tuberculosis patients. The study was conducted at Royal Prima Hospital from October to November 2024. The study population comprised all medical records of TB patients undergoing outpatient treatment at the hospital. A non-probability purposive sampling technique was employed, with the following inclusion criteria: (1) medical records of patients diagnosed with COPD; (2) medical records documented in the Pulmonary Department between January 2023 and September 2024; and (3) medical records of COPD patients without cognitive impairment. Medical records that were incomplete or belonged to COPD patients undergoing inpatient treatment were excluded.

The study analyzed several factors associated with COPD. The primary variable was COPD, defined as a lung condition characterized by progressive narrowing of the airways, impaired gas exchange, and

breathing difficulties. COPD severity was measured based on medical record data and categorized into four ordinal scales: mild, moderate, severe, and very severe. This ordinal scale indicated severity levels, with "very severe" representing the most severe level.

In addition to COPD, this study collected demographic and health history data from the respondents. Respondent age was calculated based on their date of birth up to the time of the study, obtained from medical records. Age was categorized into five ordinal categories: infant (1-<5 years), child (5-9 years), adolescent (10-18 years), adult (19-59 years), and elderly (>60 years). This ordinal categorization reflects developmental stages. Respondent gender was recorded based on biological sex assigned at birth, with two nominal categories: male and female. A nominal scale was used as these categories are merely different without any ranking. The respondent's highest level of education was also recorded through medical records, with five ordinal categories: no schooling, primary school completion, junior high school completion, high school completion, and bachelor's degree. These categories indicate an increasing level of education. Respondent employment status was categorized into two groups, employed and unemployed, based on medical record data. A nominal scale was used as it only differentiates employment status. The duration of COPD was calculated from the first diagnosis to the time of the study, obtained from medical records, and categorized into two ordinal categories: less than 10 years and more than 10 years. Finally, this study recorded the respondent's smoking history, including current and past smoking habits. This data was obtained from medical records and categorized into three nominal groups: current smoker, passive smoker, and former smoker.

Descriptive statistics were used in a univariate analysis to examine the characteristics of tuberculosis patients, including the prevalence of COPD. Frequency distributions and percentages are provided.

Results

Table 1 presents the characteristics of the 68 subjects included in the study. Regarding age, the majority (73.5%, n=50) were over 60 years old, while 26.5% (n=18) were between 19 and 59 years old. The sample was predominantly male, with 85.3% (n=58) males and 14.7% (n=10) females. In terms of education, nearly half of the participants (47.1%, n=32) had a middle school education. 30.9% (n=21) had completed high school, 11.8% (n=8) had an elementary school education, and 10.3% (n=7) held a bachelor's degree.

Concerning occupation, 64.7% (n=44) of the subjects were employed, while 35.3% (n=24) were unemployed. The duration of illness was less than 10 years for 60.3% (n=41) of the participants, and greater than 10 years for 39.7% (n=27). Smoking history revealed that 63.2% (n=43) were current smokers, 20.6% (n=14) were passive smokers, and 16.2% (n=11) were former smokers. Finally, concerning the COPD category, the distribution was as follows: 35.3% (n=24) had mild COPD, 39.7% (n=27) had moderate COPD, 22.1% (n=15) had severe COPD, and 2.9% (n=2) had very severe COPD.

Table 2 presents the prevalence of COPD among tuberculosis patients, categorized by the severity of COPD (mild, moderate, severe, and very severe) and several risk factors. A clear trend emerges with age. In the mild COPD group, 54.2% (13 patients) were between 19 and 59 years old, while 45.8% (11 patients) were older than 60. However, in the moderate, severe, and very severe COPD groups, the vast majority of patients were over 60 years old: 85.2% (23 patients), 93.3% (14 patients), and 100% (2 patients), respectively. This strongly suggests that older age is a significant risk factor for more severe COPD in tuberculosis patients. Males were significantly more represented across all COPD severity levels. In the mild group, 83.3% (20 patients) were male. This proportion remained high in the moderate (88.9%, 24 patients) and severe (86.7%, 13 patients) groups. In the very severe group, the distribution was even, with 50% (1 patient) being male and 50% (1 patient) being female.

The level of education appears to be inversely related to COPD severity. In the mild COPD group, the majority had a high school education (45.9%, 11 patients), followed by those with a bachelor's degree (20.8%, 5 patients), middle school education (25%, 6 patients) and elementary school education (8.3%, 2 patients). However, as COPD severity increased, the proportion of patients with middle school education increased substantially: 48.2% (13 patients) in the moderate group, 73.3% (11 patients) in the severe group, and 100% (2 patients) in the very severe group. This indicates a potential association between lower educational attainment and more severe COPD among tuberculosis patients.

Table 1. Subject characteristics (n=68)

Characteristic	n	%
Age		
19-59 years	18	26,5
>60 years	50	73,5
Gender		
Male	58	85,3
Female	10	14,7
Education		
Elementary school	8	11,8
Middle school	32	47,1
High school	21	30,9
Bachelor's degree	7	10,3
Occupation		
Employed	44	64,7
Unemployed	24	35,3
Duration of illness		
<10 years	41	60,3
>10 years	27	39,7
Smoking history		
Current smoker	43	63,2
Passive smoker	14	20,6
Former smoker	11	16,2
COPD severity level		
Mild	24	35,3
Moderate	27	39,7
Severe	15	22,1
Very severe	2	2,9

A similar trend is observed with occupation. Employed individuals constituted the majority in the mild (79.2%, 19 patients) and moderate (70.4%, 19 patients) COPD groups. However, in the severe and very severe groups, unemployed individuals were more prevalent: 66.7% (10 patients) and 50% (1 patient) respectively. The duration of tuberculosis illness shows a strong correlation with COPD severity. All patients in the mild COPD group (100%, 24 patients) had a disease duration of less than 10 years. Conversely, in the severe and very severe groups, all patients (100%, 15 patients and 100%, 2 patients respectively) had a disease duration of more than 10 years. In the moderate group, 63% (17 patients) had a duration of less than 10 years and 37% (10 patients) had a duration of more than 10 years. This highlights the impact of long-term tuberculosis infection on the development of more severe COPD.

Smoking plays a significant role in COPD development. In the mild COPD group, passive smokers were the most prevalent (58.3%, 14 patients), followed by current smokers (37.5%, 9 patients). However, in the moderate and severe groups, current smokers formed the majority (85.2%, 23 patients and 66.7%, 10 patients, respectively). In the very severe group, the distribution was even with one patient each being a current, former smoker. This reinforces the established link between active smoking and increased COPD severity, even in the context of tuberculosis.

Discussion

This study found that the majority of TB patients at Royal Prima Hospital who also suffered from COPD were classified as having moderate disease. These findings are consistent with those of Sari et al.[1] who also reported a moderate severity of COPD among TB patients in hospitals in the Yogyakarta region. This consistency may be attributed to findings from studies on age, where the majority of COPD patients were 60 years and older. This is supported by theories suggesting that lung function decline occurs more rapidly in smokers who continue to smoke after the age of 45. This significant decline in lung function contributes to an increased severity of COPD with advancing age. The risk of COPD is highly dependent on

smoking dose, which is influenced by the age at which smoking begins, the number of cigarettes smoked per day, and the duration of smoking.[11]

Table 2. The prevalence of COPD in tuberculosis patients according to risk factors

Variable	COPD severity level							
	Mild		Moderate		Severe		Very severe	
	n	%	n	%	n	%	n	%
Age								
19-59 years	13	54,2	4	14,8	1	6,7	0	0
>60 years	11	45,8	23	85,2	14	93,3	2	100,0
Gender								
Male	20	83,3	24	88,9	13	86,7	1	50,0
Female	4	16,7	3	11,1	2	13,3	1	50,0
Education								
Elementary school	2	8,3	3	11,1	3	10,0	0	0
Middle school	6	25,0	13	48,2	11	73,3	2	100,0
High school	11	45,9	9	33,3	1	6,7	0	0
Bachelor's degree	5	20,8	2	7,4	0	0	0	0
Occupation								
Employed	19	79,2	19	70,4	5	33,3	1	50,0
Unemployed	5	20,8	8	29,6	10	66,7	1	50,0
Duration of illness								
<10 years	24	100,0	17	63,0	0	0	0	0
>10 years	0	0	10	37,0	15	100,0	2	100,0
Smoking history								
Current smoker	9	37,5	23	85,2	10	66,7	1	50,0
Passive smoker	14	58,3	0	0	0	0	0	0
Former smoker	1	4,2	4	14,8	5	33,3	1	50,0

This study demonstrates that the prevalence of COPD is predominantly among the elderly, accounting for 73.5% of cases. These findings align with the Global Initiative for Chronic Obstructive Lung Disease (GOLD) 2024 report[5], which indicates that COPD is more prevalent among individuals aged ≥ 40 years compared to those aged < 40 years. The results of this study are consistent with several previous studies. Nurfitriani & Ariesta[7] also found that a majority of COPD patients at the Meuraxa General Hospital's Pulmonary Clinic were in the elderly age category. El Naser et al.'s[11] study at Dr. M. Djamil General Hospital showed that the average age of COPD sufferers was 61.85 years. Similarly, Sari et al.[1] reported that COPD patients in Yogyakarta hospitals were predominantly aged ≥ 60 years (58.33%). However, there are discrepancies with other studies that found a younger age range among COPD patients. For instance, a study at Dr. H Soewondo Kendal General Hospital recorded COPD patients aged between 21 and 60 years.[12] These differences may be attributable to variations in the characteristics of the study populations, differing risk factors, or methodological differences. Age is a significant risk factor influencing the occurrence of COPD. The incidence of COPD tends to increase with age, which is associated with the aging process and declining lung function. As individuals age, their lungs' ability to function optimally decreases, making them more susceptible to lung diseases. Unhealthy habits, such as smoking, also contribute to an increased risk.[1,7] The decline in immunity with age further contributes to vulnerability to diseases, as the aging process leads to a decreased ability of tissues to repair, replace, and maintain their normal structure and function.[13]

This study demonstrates that the prevalence of COPD is predominantly among male patients, accounting for 85.3% of cases. The distribution of COPD severity among male patients was as follows: mild (83.3%), moderate (88.9%), severe (86.7%), and very severe (50%). These findings align with the study by Asyrofy et al.[12] at RSUD dr H Soewondo Kendal, which also reported a higher proportion of male COPD patients. Data from the GOLD (Global Initiative for Chronic Obstructive Lung Disease) 2024 report, encompassing studies from 28 countries between 1990 and 2004, reinforces this trend by indicating a higher prevalence of COPD in males compared to females.[5] Similar results were reported by Yari et al.[14] who found that males constituted a larger proportion of COPD patients (11.8%) than females (8.8%). Furthermore,

Nurfitriani & Ariesta[7] supported these findings, with male COPD patients accounting for 88.4% (260 out of 294 respondents) and female patients for 11.6% (34 out of 294 respondents). Asyrofy et al.[12] suggested that males have a higher likelihood of developing COPD. This gender disparity in COPD prevalence is likely linked to smoking habits and occupational exposures. The prevalence of male smokers is notably higher than that of female smokers. Additionally, occupations commonly held by males tend to involve greater exposure to substances or particles that can trigger COPD. Other contributing factors include comorbidities experienced by males, which may exacerbate COPD conditions.[1,7]

Educational attainment was hypothesized to influence individuals' ability to manage COPD. This study found that 47.1% of COPD patients had completed junior high school or less. Among this group, the distribution of COPD severity was as follows: 25% mild, 48.2% moderate, 73.3% severe, and 100% very severe. Similar findings were reported by Asyrofy et al.[12] at dr H Soewondo Kendal Hospital, where 30.4% of COPD patients had a junior high school education. Conversely, El Naser et al.[11] reported the highest proportion of COPD patients with a high school education (40%). These discrepancies highlight the importance of considering socio-economic contexts and educational access across different populations. Lower levels of education are likely associated with difficulties in comprehending health information and motivating oneself to avoid COPD risk factors, such as smoking.[1]

This study investigated the prevalence of COPD based on occupation among patients. The majority of COPD patients (64.7%) were employed. The distribution of COPD severity among working patients was as follows: 79.2% had mild COPD, 70.4% had moderate COPD, 33.3% had severe COPD, and 50% had very severe COPD. These findings are consistent with previous research. El Naser et al.[11] reported that 50% of COPD patients at Dr. M. Djamil Padang General Hospital were laborers. Similarly, Asyrofy et al.[12] found that 71.4% of COPD patients at Dr. H Soewondo Kendal General Hospital were still actively employed. These results can be attributed to COPD risk factors, where workers exposed to high levels of dust and air pollution in their workplace are at a higher risk of developing COPD.

This study found that the majority of COPD patients had suffered from the disease for less than 10 years (60.3%). The distribution based on COPD categories showed that all patients (100%) were in the mild category, 63% were in the moderate category, and the remainder (100%) were classified as severe and very severe. These findings align with Sari et al.'s[1] study in Yogyakarta, which reported that 58.33% of respondents were diagnosed with COPD for less than 3 years. Another study by Asyrofy et al.[12] (2021) at RSUD dr H Soewondo Kendal also reported a COPD duration of 1 to 4 years. This trend is likely related to the fact that many patients still ignore the early symptoms of COPD and only seek medical attention when the disease has reached a more advanced stage.

This study found a high prevalence of active smoking among COPD patients at 63.2%. The distribution of active smokers based on COPD severity was as follows: mild (58.3%), moderate (85.2%), severe (66.7%), and very severe (50%). These findings are consistent with previous studies that have demonstrated a strong association between smoking and COPD. Several other studies have reported significant proportions of smokers among COPD patients. For instance, a previous study stated that most COPD patients were smokers.[12] Another study found that 56.7% of COPD patients were smokers.[15] Research by Sari et al.[1] showed that 57.69% of COPD patients had a history of smoking. A higher percentage was found by Fazmi et al.[6], who reported that 80% of surveyed COPD patients had a smoking habit. These findings are supported by the study of Lutter et al. [16] which found high smoking rates among 616 participants. Research by Nguyen et al.[17] also showed that the majority of respondents (143 people or 85.1%) had smoking behavior. A study by Horner et al.[18] also reported that most respondents were COPD patients with a history of smoking, at 86.3%.

Cigarette smoke is a primary risk factor for COPD, in both active and passive smokers. Continuous exposure to cigarette smoke triggers bronchial inflammation, leading to decreased ventilation and diffusion, resulting in reduced oxygen intake. In addition to cigarette smoke, other risk factors contributing to COPD include exposure to air pollution (dust, chemicals, workplace fumes, and indoor air pollution), genetic factors, abnormal lung development, age, and bronchial hyperreactivity.[5,12] Harmful particles inhaled from cigarette smoke induce lung inflammation. Although inflammation is a natural defense mechanism, in COPD patients, this chronic inflammatory response changes and instead causes tissue damage (leading to emphysema) and impaired defense mechanisms (leading to small airway fibrosis). This process results in progressive airflow obstruction and limitation, which are characteristic of COPD. Several mechanisms underlie the development of COPD.[12]

Conclusion

This study identified the characteristics of COPD patients at Royal Prima Hospital. Results showed that the majority of COPD patients were elderly, male, had an education up to junior high school, and had a history of smoking. Most patients were still employed and had suffered from COPD for less than 10 years. The majority of patients were classified as having moderate COPD.

Most patients with mild COPD were in the adult age range (54.2%), while patients with moderate (85.2%), severe (93.3%), and very severe (100%) COPD were predominantly elderly. Males dominated in all COPD categories: 83.3% in the mild category, 88.9% in the moderate category, and 86.7% in the severe category. In the very severe category, there was an equal proportion of males and females (50% each). Most patients with mild COPD had a high school education (45.9%), while patients with moderate (48.2%), severe (73.3%), and very severe (100%) COPD were predominantly educated up to junior high school. The majority of patients with mild (79.2%) and moderate (70.4%) COPD were still working. Conversely, most patients with severe COPD (66.7%) were not working. In the very severe category, there was an equal proportion of patients who were working and not working (50% each).

All patients with mild COPD had suffered from the disease for less than 10 years (100%). The majority of patients with moderate COPD also suffered for less than 10 years (63%). Conversely, all patients with severe and very severe COPD had suffered for more than 10 years (100%). Most patients with mild COPD had a history of passive smoking (58.3%), while the majority of patients with moderate (85.2%) and severe (66.7%) COPD were active smokers. In the very severe category, there was one active smoker and one former smoker (50% each).

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