Clinical profile of pneumonia in COVID-19 patients upon initial admission to Dr. Soetomo General Academic Hospital during June to August 2021

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Abstract

Introduction: Corona virus disease-19 (COVID-19) is a highly contagious disease caused by the SARS-CoV-2 virus. Pneumonia is one of COVID-19 moderate manifestations which could lead to ARDS and end in several organ failures. This study aims to describe the clinical profile of COVID-19 patients with pneumonia upon initial admission to the emergency departments of Dr. Soetomo General Academic Hospital during June to August 2021. Methods: this study is a single-centered, descriptive analysis of COVID-19 patients with pneumonia (n= 193). Demographic data, comorbidities, and clinical symptoms were collected from the electronic medical records and analyzed using SPSS version 26. Results: from 193 COVID-19 patients in this study, 86.01% of which are aged 18 to 64 years old and 50.78% of which are male. Most patients work as private employees (30.57%) and are high school graduates/equivalent (61.14%). The most common comorbidities are diabetes mellitus (48.48%), obesity (35.35%), and hypertension (33.33%). Most patients show symptoms of dyspnea (95.13%), cough (24.86%) and fever (18.92%). Conclusion: This study provides a description of clinical findings in COVID-19 patients with pneumonia. Based on the clinical symptom, most patient show dyspnea which could possibly mean that most patients in this study suffer from moderate to critically ill patients. However, further research is needed to prove this assumption.

Keywords: COVID-19; pneumonia; SARS-CoV-2; infectious disease

1. Introduction

The first case of corona virus disease-19 (COVID-19) is reported to be in Wuhan, China at the end of 2019. The virus that caused COVID-19 is called the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The SARS-CoV-2 virus is highly contagious [1]. During 17th June to 22nd August 2021, Indonesia experienced a surge of confirm COVID-19 cases with an average of 30475 cases daily [2].

SARS-COV-2 most commonly affects the lower respiratory tract. The clinical manifestation of COVID-19 can range from mild to severe symptoms. Pneumonia is one of COVID-19 moderate manifestations. Pneumonia is an inflammation of the lungs. It's usually caused by infections from bacteria, virus or fungus. Pneumonia exhibits symptoms such as fever, cough, dyspnea, and rapid breathing. Pneumonia can lead to ARDS (acute respiratory distress syndrome) which could end in several organ failures [3–5].

One of the risk factors for developing pneumonia in COVID-19 is being ⩾65 years old [6]. In the context of gender, male have a higher risk of mortality due to COVID-19 compared to female [7]. Generally, individuals with comorbidities tend to have lower immune system, making them more susceptible to infections [8]. People from low socioeconomic status (low income, low education, and live in overcrowded house with poor conditions) are more prone to COVID-19. A study showed that healthcare workers, employment in social assistance, and transportation industries along with no or low levels of education were associated with a higher risk of COVID-19 incidence [9]. Occupations that require direct contact with the general public could also increase the risk of contracting COVID-19 [10].

The diagnosis of COVID-19 with pneumonia can be made with history taking (including contact tracing), physical examinations, and additional examinations such as imaging and laboratory diagnosis which include Nucleic Acid Amplification Test (NAAT). According to Indonesia's COVID-19 prevention and control guideline, it is recommended to take NAAT, such as RT-PCR, for all patients suspected with COVID-19 infection. RT-PCR can confirm COVID-19 infection [5]. Patients with confirmed COVID-19 infection can either be symptomatic or asymptomatic [11]. In COVID-19 patients with negative RT-PCR results, imaging plays a role in diagnosing and monitoring the patient's condition [12]. However, chest x-rays have low sensitivity in detecting lung infiltrates in the early stages of COVID-19 and in mild COVID-19 cases. Nevertheless, chest x-rays are commonly used because of its availability and affordable price [13,14].

Recognizing both the potential risk factors and clinical manifestations of COVID-19 with pneumonia can help to identify the illness promptly, which in turn allows for timely interventions to forestall its worsening. The aim of this study is to describe the demographic data, which include age, sex, education levels, occupations, along with comorbidities and pulmonary symptoms of COVID-19 patients with pneumonia who were first admitted to the emergency departments of Dr. Soetomo General Academic Hospital between June and August 2021.

2. Methods

This study is a single-centered, descriptive study, focusing on 193 COVID-19 patients with pneumonia [15]. All patients included, show positive RT-PCR results along with positive chest x-rays results for pneumonia. All patients included are adults, from 18 years and older, who were first admitted to the emergency department of Dr. Soetomo General Academic Hospital between June and August 2021. The variables include demographic data (age, sex, education level, and occupation), pulmonary symptoms, and pre-existing comorbidities, which were collected from the electronic medical record. The data then analysed using Statistical Package for the Social Science (SPSS) version 26 [16].

3. Results

Table 1. Pulmonary symptoms based on the age and sex of COVID-19 patients with pneumonia

	Pulmonary Symptoms n =185 (95.85%)					n = 193 (100%)
	Dyspnea	Cough	Fever	Fatigue	Runny nose	
Age						

18 to 64 years old	151 (90.97%)	39 (23.50%)	29 (17.47%)	16 (9.64%)	4 (2.41%)	166 (86.01%)
65 years and older	25 (92.59%)	7 (25.92%)	6 (22.22%)	2 (7.41%)	0 (0.00%)	27 (13.99%)
Sex						
Male	92 (93.88%)	24 (24.49%)	20 (20.40%)	11 (11.22%)	3 (3.06%)	98 (50.78%)
Female	84 (88.42%)	22 (23.16%)	15 (15.79%)	7 (7.37%)	1 (1.05%)	95 (49.22%)
Total pulmonary symptoms	176 (95.13%)	46 (24.86%)	35 (18.92%)	18 (9.73%)	4 (2.16%)	

From 193 COVID-19 patients included in this study, 185 (95.85%) of which shows pulmonary symptoms such as stated in Table 1, while the other 8 (4.14%) patients did not show any pulmonary symptoms.

Table 2. Education level of COVID-19 patients with pneumonia

Education level	n = 193 (100%)
High school graduate/ equivalent	118 (61.14%)
Bachelor's degree/ equivalent	36 (18.65%)
Non-Schooled Individuals	20 (10.36%)
Elementary school graduate/ equivalent	11 (5.70%)
Middle school graduate/ equivalent	8 (4.14%)

Table 3. Occupation of COVID-19 patients with pneumonia

Occupation	n = 193 (100%)
Private employee	59 (30.57%)
Housewife	41 (21.24%)
Others	35 (18.13%)
Entrepreneur/self-employed	17 (8.81%)
Civil servant	12 (6.22%)
Unemployed and student	11 (5.70%)
Healthcare worker	6 (3.11%)
Retiree	6 (3.11%)
Lecturer/teacher	2 (1.04%)
Freelancer	2 (1.04%)
Labourer	1 (0.52%)
Farmer	1 (0.52%)

Table 4. Pulmonary symptoms based on the comorbidities of COVID-19 patients with pneumonia

Comorbidities	n = 193 (100.00%)

Total patients with comorbidities	99 (51.29%)
Total patients without comorbidities	94 (48.70%)
Diabetes mellitus	48 (48.48%)
Obesity	35 (35.35%)
Hypertension	33 (33.33%)
Chronic kidney disease	13 (13.13%)
Pregnancy	6 (6.06%)
Heart disease	6 (6.06%)
SLE	3 (3.03%)
Asthma	2 (2.02%)
Cancer	2 (2.02%)
Mental health conditions	2 (2.02%)
Tuberculosis	2 (2.02%)
HIV	1 (1.01%)

4. Discussion

This study includes 193 COVID-19 patients with pneumonia, which were divided into two age groups, 18 to 64 years old and 65 years and older. Most of the patients in this study are in the age group of 18 to 64 years old. This result is align with a study of 108 COVID-19 confirm cases, where 85.2% of which are under 65 years old [7]. Another study with 763 COVID-19 patients, shows similar result with 31.1% of patients being between 40 to 49 years old [17]. Compared to elderly, young individuals tend to have higher mobility which could increase their susceptibility to COVID-19 infection [9]. During June to August 2021, the Delta variants, responsible for the deadly COVID-19 surge in India, are dominant. This virus could simply infect the young individuals and worsen the COVID-19 infection, making more people suffers from pneumonia. However, the strain of COVID-19 that infected the patients is not included in this study [2,18].

Regarding the gender, most of the patients in this study are male (50.78%). Similar results have been reported in other studies [7,19]. The high number of male patients compared to female patients in this study can be caused by various factors such as sex-based immunological difference. Compared to female, male patients may have higher expression of ACE2 (angiotensin converting enzyme 2), which may be regulated by the male sex hormones [8]. High levels of ACE2 may facilitate SARS-CoV-2 invasion [7]. Male individuals are also less likely to adhere to COVID-19 prevention measurements compared to female [20].

The most common pulmonary symptom recorded in this study is dyspnea (95.13%) with most patients being $\geqslant$65 years old and male. However, this result is not align with other studies that found that fever is the most common symptoms in COVID-19 [19,21]. The difference in the number of patients with dyspnea could possibly be related to “silent” hypoxia. “Silent” or “happy” hypoxia is the absent of dyspnea in COVID-19 patients with severe hypoxia and it could present as an early symptom. While “silent” hypoxia could present as an early symptom, dyspnea appears in moderate to critically ill patients. Based on this, it could possibly mean that most patients in this study suffer from moderate to critically ill COVID-19 [11,22]. In addition, cough, fever, fatigue, and runny nose are symptoms of upper respiratory tract infection, which could be found in mild

COVID-19 [11,23]. The absent of dyspnea could possibly lead to miss diagnoses of COVID-19, thus making more patients suffer from moderate to critically ill COVID-19 later in the future [11,22].

The number of dyspnea is highest in patients with age 65 years and older (92.59%). Since dyspnea appears in moderate to critically ill patients, it could be possible that most elderly patients in this study suffers from a more severe type of COVID-19 compared to the young and middle aged patients. This is in line with a study that reported that the mortality rate of elderly patients (⩾60 years old) with COVID-19 was higher compared to young and middle aged patients (<60 years old). Additionally, elderly patients with COVID-19 are more likely to progress to severe disease [24]. As we get older, natural immunity declines gradually, thus making older people more prone to infection [8]. The condition in which the immunity decreased at old age is called immunosenesscences. This can cause uncontrolled SARS-CoV-2 infection, thus increasing the susceptibility and severity of COVID-19 clinical manifestations. Changes in the elderly's lung such as reduced number and activity of cilia in the upper respiratory tract, can lead to decrease mucociliary clearance. This could make elderly patients more prone to respiratory tract infections such as COVID-19 [25]. In addition, a study postulated that patients older than 50 years old, may have higher expression of ACE2 which may cause elderly patients to be more prone to COVID-19 infection and have poor clinical outcome [8].

Based on gender, most COVID-19 patients in this study that show symptoms of dyspnea are male (93.88%). It is assumed that most male patients in this study suffer a more severe type of COVID-19 compared to female. This is in accordance to a study that stated that the severity and mortality rate of COVID-19 is higher in male rather than female [20]. Compared to females, males are more prone to infection. This may be due to the protective effect of the X chromosome and certain sex hormones which have an important role in both innate and adaptive immunity [26]. As stated before, the expression of ACE2 is higher in male. High expression of ACE2 may put male patients in greater risk for having poor clinical outcome along with increased risk for SARS-CoV-2 infection [8].

The most common comorbidities in this study are diabetes (48.48%), obesity (35.35%) and hypertension (33.33%). This result is in line with a study of 172 COVID-19 pneumonia patients where most comorbidities are BMI 25 kg/m^2 and above (52.3%), hypertension (33.3%), and type II diabetes (19.2%) [21]. The diabetes mellitus group in this study consists of type I and type II diabetes mellitus. This is because the severity of COVID-19 does not significantly differ between patients with type I or type II diabetes mellitus [27]. Diabetes patients have certain conditions, such as low grade inflammation, deteriorated immune response and deficient nutritional status, which make them more susceptible to severe COVID-19. The chronic inflammation in diabetes is thought to be the key factor in the development of cytokine storms in COVID-19. This hyper-inflammatory condition can lead to multiple organ failure, thus worsening the severity of COVID-19 [28].

In patients with diabetes mellitus or hypertension treated with ACE inhibitors (ACEIs) and angiotensin II type I receptor blockers (ARBs), the expression of ACE2 in the epithelial cells of the lungs, intestines, kidneys, and blood vessels increased [8]. The expressions of ACE2 also increase in mature adipocyte cells in patients with obesity [29]. This condition may exacerbate SARS-CoV-2 infection which could possibly increase the risk of developing severe and fatal COVID-19 in patients with diabetes, obesity and hypertension [8].

In patients with diabetes, obesity, and hypertension, a decrease in microRNA-146a gene regulation has been observed. MicroRNA-146a gene plays a role in the regulation of excessive inflammatory response in viral infections. Down-regulation of this gene can lead to impaired response in limiting inflammation caused by COVID-19 infection. This could be one of the factors contributing to the high number of COVID-19 patients with diabetes, obesity, and hypertension in this study [28].

A study discovered that there's a relation between a person education level and adherence to COVID-19 prevention measures. Individuals with higher education levels are more likely to be mindful of their actions, making them more likely to follow COVID-19 prevention guidelines. However, this does not rule out the possibility that some individuals with higher education levels may fail to practice prevention behaviors

effectively, while some individuals with lower education levels may practice them effectively. This could explain why there are more COVID-19 patients with bachelor's degrees (18.65%) in this study compared to those who only graduate from middle school/ equivalent (4.14%) and non-schooled individuals (10.36%). It's important to keep in mind, that many factors can influence a person's behavior [30].

Most of the COVID-19 patients in this study were private employee (30.57%). This result aligns with the statement that occupation involving direct interaction with crowds, carry a high risk of contracting COVID-19 [10]. The second most reported occupation in this study is housewife (21.24%). Housewives tend to visit the market, a crowded place, making them more prone to COVID-19 infection. During the pandemic, most families also suffer from financial issues. Their income decreased and the price for basic necessities increased. It could be possible that some housewives would try to open small businesses to help increase their household income. Those informal businesses are often carried out with poor adherence to COVID-19 prevention guidelines [31]. It is also possible that the COVID-19 patients, who were private employees and housewives, had low income. Individuals with low income tend to live in small, crowded units. This could increase their risk of contracting COVID-19 [10]. Their work condition could also affect their risk for contracting COVID-19. Private employees may work indoors with poor ventilation, which increases the likelihood of droplet accumulation from individuals with COVID-19. In addition, air conditioning can lower the room's temperature and humidity levels, allowing droplets to travel more than a meter and increasing the virus's reproduction effectiveness. In contrast, individuals who work in open spaces, such as farmers, are exposed to high temperatures and humidity, which can reduce the virus's reproduction effectiveness and thus lower the risk of contracting COVID-19. This could explain the high number of patients who worked as a private employee and the low number of patients who worked as a farmer reported in this study [9].

5. Strength and Limitations

The strength of this study is that the variables included in it are measured precisely using a highly reliable software. The limitations of this study include the small sample size, the inability to further clarify "others" in the context of patient's occupation, and the inability to differentiate pneumonia caused by COVID-19 and pneumonia caused by COVID-19 with secondary bacterial infection.

6. Conclusion

This study provides a description of clinical findings in COVID-19 patients with pneumonia. Based on the clinical symptom, most patient show dyspnea which could possibly mean that most patients in this study suffer from moderate to critically ill patients. However, further research is needed to prove this assumption.

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