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Covid-19 Risk Factors and Radiographic Severity Index Description in Covid-19 Patients Dr. Mohammad Hoesin Palembang 2021

Alfian Hasbi[1], Budi Santoso[2], Anjeli Primeisa[3]

[1]Staff of the Physiology Section, Faculty of Medicine, Sriwijaya University, [2,3]Medical Education Study Program, Faculty of Medicine, Sriwijaya UniversityJl. Dr. Muhammad Ali Kompleks RSMH Palembang Km. 3,5, Palembang, Indonesia.

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Abstract

Background: COVID-19 is a pandemic disease caused by droplet infection from SARS-CoV-2. Due to its rapid transmission and high case fatality rate, the identification of risk factors and prognostic factors is important. Obesity is a risk factor for poor outcomes in COVID-19. It is associated with chronic inflammation, disorders of the immune system. Obesity can be determined based on BMI. Chest X-Ray is supported in establishing the diagnosis and prognosis of COVID-19 patients. Assessment of the severity index of Chest X-Ray radiographs can use the Modified Chest X-Ray Scoring System of RSUP Dr. Soetomo. This study was conducted to analyze the relationship between BMI and chest radiography severity index in hospitalized COVID-19 patients at dr. Mohammad Hoesin Palembang in 2021.

Methods: This research used a cross-sectional analytic observational design. Sampling was done using a consecutive sampling technique with 70 samples and obtained from the patient's medical record. The data were analyzed by univariate and bivariate (Chi-Square) using IBM SPSS Statistics 26 software.

Results: Patients with BMI Overweight-Obesity had more in Moderate-Severe (18.6%) radiographic severity index scores (18.6%) than Normal-Mild (15.7%). Chi-Square bivariate analysis, BMI (p=0.033; p-value <0.05) had a significant relationship with the chest radiographic severity index with Odds Ratio 3,00, 95% CI (1,073–8,386).

Conclusion: There is a significant relationship between body mass index and chest radiography severity index in COVID-19 patients. Overweight-Obesity BMI patients have a 3-fold chance of having a Moderate-Severe category of radiographic severity index compared to Underweight-Normal BMI patients.

Keywords: COVID-19, Obesity; IMT; Chest-X-ray; radiography severity index.

Introductions

Coronavirus Disease-2019 (COVID-19) is an infectious disease caused by a species of coronavirus, known as Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2). Globally, as of 20 July 2021, a total of 190,671,330 confirmed cases of COVID-19, including 4,098,758 deaths, were reported

Corresponding Author: Alfian Hasbi, Jalan Volley Blok G-07 lorok pakjo Palembang Indonesia, Faculty of Medicine, Sriwijaya University.

E-mail: alfianhasbi@unsri.ac.id

to WHO.[1] Shortness of breath, cough and fever are the most common clinical symptoms of COVID-19.[2] COVID-19 is capable of being transmitted and spreads through droplets that come out through the nose and/or mouth when a person infected with COVID-19 is talking, coughing or sneezing.[3]

Patient who has a high risk and severe complications is the elderly group, this age factor is related to COVID-19 because the elderly group has an anatomical and physiological degenerative process so that they are susceptible to disease. Another group is people with comorbidities such as obesity, disease heart disease, hypertension, diabetes, etc. In addition, gender is also a risk factor for COVID-19. Compared to women, men are more at risk, this is related to lifestyle habits in the form of active smokers and a poor immune system in respiration and is also caused by hormonal and chromosomal factors. Women have protection from COVID-19 because they have the hormone progesterone and the X chromosome, which play an important role in innate and adaptive immunity.[3,4] One of the comorbidities that is a risk factor for COVID-19 is obesity.[5] Obesity is determined based on the nutritional status of a person who is assessed based on a measuring instrument, namely the body mass index (BMI) based on weight (weight) in kilograms (kg) and divided by TB (height) in meters squared (m2).[6]

Chest radiography has an important role in dealing with COVID-19.[7,8] presented at corona filtration center, Benazir Bhutto Hospital Rawalpindi, based on CXR classification of British Society of Thoracic Imaging (BSTI Chest radiography can be performed using a chest X-Ray or a computed tomography scan (CT-Scan). Recent COVID-19 radiology literature focuses mainly on CT-Scan findings which are more sensitive and specific than chest X-Ray radiographs.[9] Chest X-Ray is a first-line method with the advantage of faster results compared to using RT-PCR and reduces patient movement so as to minimize the risk of spreading infection.[10,11] So Chest X-Ray becomes a cheap, fast, simple and safe examination modality to be used in the examination of COVID-19 patients. The scoring system for COVID-19 Chest X-Ray radiography can use the Modified Chest X-Ray Scoring System of Dr. RSUP. Soetomo.[12]

Methods

This type of research is descriptive observational with consecutive sampling technique. The study took place from August to November 2021. The research sample was medical record data of hospitalized COVID-19 patients at the Department of Internal Medicine, Dr. Mohammad Hoesin Palembang in 2021. The number of samples taken was 70 samples.

Inclusion criteria included inpatients who were declared positive for COVID-19 through antigen examination and/or PCR swab, chest X-ray radiology examination and anthropometric measurements (weight and height) and recorded in the patient's medical record. Exclusion criteria included patients with missing or incomplete medical record data, chest X-ray results that could not be read or identified and chest X-ray results with the impression of pleural effusion. The data obtained will be processed and analyzed univariately using IBM SPSS Statistics 26 software.

Results

Distribution of respondent characteristics by age and sex of COVID-19 patients

Table 1: Shows the characteristics of respondents by age and gender. The majority of hospitalized COVID-19 patients in the adult age group are 75.7% and 51.4% are male.

Table 1: Distribution of respondent characteristics by age and gender

Characteristics	Frequencies (n)	Percentages (%)
Age		
Young age	4	5,7
Mature age	53	75,7
Elderly	13	18,6
Total	70	100,0
Gender		
Man	36	51,4
Woman	34	48,6
Total	70	100,0

Distribution of respondent characteristics based on clinical symptoms of COVID-19 and co-morbidities of COVID-19 patients

Table 2. shows the characteristics of respondents based on clinical symptoms of COVID-19 and comorbidities. Most of the clinical symptoms of COVID-19 were symptoms of shortness of breath as much as 35.7% followed by symptoms including cough, fever accompanied by shortness of breath as

much as 22.9% and the majority of patients did not have comorbidities, which was 30.0%.

Table 2: Distribution of respondent characteristics based on clinical symptoms of COVID-19 and comorbidities

Characteristics	Frequencies (n)	Percentages (%)
COVID-19		
Clinical Symptoms	5	7,1
Fever	4	5,7
Cough	25	35,7
Out of breath	6	8,6
Fever, cough	8	11,4
Fever, shortness of breath	1	1,4
Cough, shortness of breath	16	22,9
Cough, fever, shortness of breath	2	2,9
No symptoms	3	4,3
Others (weakness, anosmia)	70	100,0
Total		
Co-morbidities	14	20,0
Diabetes mellitus	13	18,6
Hypertension	5	7,1
Chronic disease (CKD)	17	24,3
Other chronic diseases	21	30,0
No Co-morbidity	70	100,0
Total		

Distribution of respondent characteristics based on BMI and chest radiographic severity index of COVID-19 patients

Table 3. shows the characteristics of respondents based on BMI and chest radiography severity index. Most of the patient's body mass index was in the normal group as much as 57.1% followed by the overweight group at 27.1%.

Table 3: Distribution of respondent characteristics based on BMI and chest radiographic severity index of COVID-19 patients

Characteristics	Frequencies (n)	Percentages (%)
BMI		
Underweight	6	8,6
Normal	40	57,1
Overweight	19	27,1
Obesity	5	7,1
Total	70	100,0
Radiographic severity index		
Normal	15	21,4
Mild	29	41,4
Moderate	14	20,0
Severe	12	17,1
Total	70	100,0

Discussion

In this study, the tendency of hospitalized COVID-19 patients was in the adult age group (75.7%) and the least age group was the young age group (5.7%) and there were 13 patients (18.6%) aged carry on. COVID-19 can be experienced in all age groups, but the elderly are the age group most at risk and are the group that is very vulnerable to infection with the COVID-19 virus.[13]last three of them entered our life with a fear of outbreak, pandemic or death. Last human coronavirus which emerged world from Wuhan China, SARS CoV-2 and its clinical expression, Coronavirus disease (COVID-19 The age of COVID-19 patients in Indonesia is mostly in adulthood (38.91%). This supports the results of this study, that the tendency of patients is the adult age group, namely in the age range of 20-60 years.[14]

However, it is stated that caution is needed in interpreting the characteristics and distribution of COVID-19 patients based on their age group. The reason is that some patients have not been treated at the hospital or have not been tested for COVID-19 so they are not recorded in the study. In addition, perhaps the proportion of COVID-19 patients in the elderly group is under-represented in Indonesia, considering that cases in Italy for COVID-19 patients in the elderly group reached 55% of cases. Another reason is the difference in understanding and access to information regarding the clinical symptoms of COVID-19 and patient mobility. It will be very easy for the adult age group to get more information about the clinical symptoms of COVID-19, which makes this age group able to identify the clinical symptoms of COVID-19 and then report the case to the hospital.[15] This is thought to be related to mobility and activities that are more frequent and high in the adult age group or commonly known as the productive age in several groups of individuals.[14]

Based on the results of this study, it was found that the tendency of hospitalized COVID-19 patients was male patients (51.4%) while female patients (48.6%). There are more male patients (62.5%) than women (37.5%).[16] Maino et al., found results in line with this study, from a total of 468 confirmed patients with COVID-19, the tendency for male patients was 328 patients and female patients were 140 patients.[17]

According to research, men have a higher risk of infection with the COVID-19 virus and death from COVID-19. This is related to a lifestyle in the form of active smokers and work factors that make men more likely to experience COVID-19 virus infection than women.18 Furthermore, viewed from the physiological aspect, women have the hormones estrogen and progesterone which play a role in suppressing COVID-19 virus infection through innate and adaptive immune responses in stronger women. The hormone estrogen is a steroid compound that plays a role in clearing the virus from the tissue and supporting the repair of damaged tissue. While the hormone progesterone plays a role in anti-inflammatory and prevents cytokine storms.[18,19] It also said there were other behavioral and social differences in favor of women, with previous research reporting that women were more likely to follow hand hygiene practices and seek preventative care than men.[20]

This study found that the clinical symptoms of COVID-19 that tended to be high were shortness of breath. The clinical symptoms of COVID-19 vary based on the severity of the disease. However, the main clinical symptoms are shortness of breath, fever, cough, diarrhea, nausea, headache, and myalgia. Until now, symptoms of fever, cough, and shortness of breath are clinical symptoms that are often encountered.[41,42]

In this study, patients were found to be asymptomatic (2.9%) this is contrary to the study in India where almost half (42.9%) patients were asymptomatic. However, in another study, only 23% of cases were asymptomatic.[19] Kermani, 2020 reported in his research that most of the clinical symptoms that appear are asymptomatic (without symptoms) to mild clinical symptoms. In patients who have the concomitant disease, severe clinical symptoms will be found more often.[21]

The most common comorbidities found were diabetes mellitus (20.0%) and other chronic diseases (24.3%). The other chronic diseases found in this study were lung cancer, anemia, Acute Kidney Injury (AKI), and sarcoma. The co-morbidities of diabetes mellitus are associated with imbalanced ACE-2 regulation associated with pro-inflammatory conditions and are considered to be the cause of the more severe clinical symptoms of COVID-19. The mechanism of diabetes mellitus resulting in high mortality and morbidity of COVID-19 patients has been studied by Pamantow et al., 2021. It has been reported that the relationship between diabetes mellitus in COVID-19 patients is based on the mechanism of chronic systemic inflammation, high coagulation activity, abnormal on the body's immune response, and possibly damage to the pancreas by SARS-CoV-2. In addition, there are changes in ACE-2 receptor expression, dysregulation of immune cell activity and number, endothelial and alveolar dysfunction.[22] In addition, patients with co-morbidities with diabetes mellitus have levels of Furin which is a protease that can increase viral invasion into the body. This makes patients with diabetes mellitus have a higher tendency to be infected with SARS-CoV-2.[21]

This study also obtained the discovery of COVID-19 patients with comorbidities CKD (Chronic Kidney Disease). It is known that patients with comorbidities with CKD must routinely perform hemodialysis, which is a dialysis therapy procedure using an artificial kidney or hemodialyzer.[23] Patients undergoing hemodialysis must apply health protocols such as the use of masks.[23,24] However, in some cases this causes uncomfortable conditions and sometimes makes the patient feel congested, washing hands and not being waited on by the family during hemodialysis therapy has an influence on the patient's quality of life and the emergence of stress and anxiety disorders. This patient is susceptible to contracting COVID-19 due to immune system dysfunction and must receive collective hemodialysis therapy three times a week for four hours causing cross-contamination to occur easily.[24]

The majority of BMI obtained in this study was in the normal category. This result is not in line with other studies which reveal that the obesity rate in Indonesia is high and increasing.[25] However, in this study, the majority of body weight was found to be normal, presumably due to gender, age, and changes in lifestyle and eating patterns which are risk factors for obesity.[26–28] The majority of the sexes with obesity are women (23.9%) from a total of 6,313

women this is related to the hormone estrogen can increase adrenergic antilipolytic-2A receptors on subcutaneous fat cells.[27] This is contrary to the prevalence of COVID-19 patients where COVID-19 patients are male relatives.[16,21] In addition, based on the distribution of comorbidities obtained in this study, 24.3% of patients had chronic diseases that could affect BMI in individuals. In the study of Kamisah et al., of 95 chronic disease respondents, 52 (54.7%) respondents showed normal BMI calculations, which was in line with the 2014 study, which showed a correlation between BMI and patients with a chronic disease which showed normal values.[29]

This study is in contrast to the 2013 study, which revealed that the BMI of patients with co-morbidities with diabetes mellitus mostly had an overweight BMI (51.4%). The accumulation of free fat can cause the oxidation of free fatty acids which can inhibit glucose metabolism in muscles.[29] However, the obesity BMI category must remain vigilant, because COVID-19 can become more severe with increasing BMI and obese patients admitted to hospital have a higher mortality rate and are more likely to require mechanical ventilation, with most patients with a BMI >35 kg/ m2 requires intubation.[30]

Most of the patients had a mild category score of 29 patients (41.4%). Chest X-Ray images are usually normal in the early or mild phase. Based on the research of Wong et al., of COVID-19 hospitalized patients, 69% had normal features on admission, and 80% had chest X-ray pneumonia during hospitalization. These findings often occur 10 to 12 days after the onset of clinical symptoms.[31]

Conclusion

The majority of COVID-19 patients included in the study sample were in the adult age group and were male. Most of the clinical symptoms of COVID-19 are symptoms of shortness of breath followed by symptoms that include cough, fever accompanied by shortness of breath and the majority of patients do not have comorbidities. Most of the patient's body mass index was in the normal group (57.1%) followed by the overweight group (27.1%). Description of the chest radiography severity index based on the Modified Chest X-Ray Scoring System, Dr. Soetomo were the normal (21.4%), mild (41.4%), moderate (20.0%) and severe (17.1%) groups.

Conflict of Interest: Nil

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