CASE REPORT

Geriatric Patient with Osteoarthritis and Obesity Survived from Critically Ill of COVID-19: A Case Report

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ABSTRACT

Introduction: The Corona Virus Disease (COVID-19) pandemic has become a major problem worldwide. Currently, the group of geriatrics always coincidence with chronic diseases like hypertension, diabetes mellitus, and osteoarthritis discovered with a general level of severity, disability and even death. In addition, obesity is associated with several high risks of disease severity and worse clinical outcome in COVID-19.
Case: a geriatric patient with comorbidities of osteoarthritis and obesity class 1 suffered from critically ill COVID-19. Clinical manifestations that were atypical and without a history of epidemiology made it difficult to screen for COVID. Furthermore, it was found that the respiration rate, heartbeat, and blood pressure increased, oxygen saturation was only 86%, crackles all over the right lung, chest x-ray showed bilaterally infiltrates and reverse transcriptase-polymerase chain reaction (RT-PCR) test showed positive severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) on admission. Patients managed with high flow nasal canulla (HFNC) flow 40 lpm and FiO2 78% with temperature 37^0C, selection of appropriate hydrophilic antibiotic such moxifloxacin iv and antiviral therapy. Obesity-related calorie regulation is given according to The Indonesian Association of Clinical Nutritionists (PDGKI), osteoarthritis medication is still provided during the treatment resulted in a very good clinical progress. Furthermore, the patient finally recovered and was allowed to go home on the 13th day of treatment with maximum improvement.
Conclusion: It is very important for clinicians to know the complex therapy management of patients in the geriatric group. This is because this population generally had atypical clinical symptoms and those that were admitted to the hospital already had severe cases.

INTRODUCTION

The Corona Virus Disease (COVID-19) pandemic has become a major problem for all countries worldwide.[1] Furthermore, many factors have influenced the degree of severity and clinical outcome of this disease. People with older age and comorbidities have special challenges in controlling and treating COVID-19. Geriatrics is a term that refers to a group of elderly people that are very susceptible to infection with various diseases with high degree of severity which are often accompanied by disabilities. Therefore, increased mortality demands health services to provide appropriate measures to protect this population from various threats of infectious diseases.[2] Aging causes changes in lung function, tissue pathology, and defence when infected which could affect the responsiveness and tolerance to disease progression. Furthermore, it increases the production of interleukin-6 (IL-6), the expression of K^+ ion channels that interfere with the equilibrium potential of K^+ and Cl^- ions in the plasma membrane and potentially trigger the production of various inflammatory mediators, and impair the regulation of innate and adaptive immunity.[3] Poor health conditions, weak immune system, decreased organ function, comorbidities, and neglect of personal health increase the susceptibility to various diseases, especially COVID-19. In addition, geriatrics gets sick more easily and are more likely to suffer from the virus with complications.[4]

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A study showed that the mortality rate for COVID-19 patients over 65 years of age was 23% and those over 70 and 75 years old was over 89%.[5] Comorbidities such as diabetes, hypertension, chronic obstructive pulmonary and cardiovascular diseases increased the susceptibility to COVID-19.[6] In addition, some studies have shown recently that obesity could be a predictor of disease severity and clinical outcome in COVID-19 patients. Being overweight is a specific marker of disease severity in patients less than 60 years of age.[7] Several observational studies showed that patients who are admitted with COVID-19 have confirmed the marked advance of mortality with high BMI.[8] Most of the elderly people also suffered from other common diseases such as osteoarthritis (OA) and it was an important concern because this disease had a chronic inflammatory pathological disorder that could suppress the immune system. Therefore, it required an anti-inflammatory treatment.[9] OA is a degenerative joint disease that is mostly found in geriatrics, could interfere with quality of life, cause disability, and often found together with other chronic diseases. Therefore, geriatrics with OA have higher risk of being exposed to SARS-CoV-2 infection.[9] Generally, no studies have investigated the potential relationship between viral respiratory infections and cases of OA, respiratory diseases due to parainfluenza, and other types of coronavirus with cases of rheumatoid arthritis. Furthermore, there was no increased risk of OA sufferers with respiratory infections in the community. Patients with OA could always be found with other disorders such as obesity, low muscle mass, hyperuricemia in women, diabetes, hypertension, and cardiovascular disease with a higher ratio than the general population.[10] A previous study showed that the use of NSAID had a higher risk of pneumonia case and intensive care.[11]

Therefore, the aim of this case was to report the clinical management of geriatric patient with preexisting OA and obesity class I suffered from critically ill of COVID-19.

CASE

A 77-year-old woman experienced shortness of breath 3 days before being admitted to the hospital. This was felt especially during moderate activity and it was not affected by the weather and dust. Furthermore, there was no history of coughing up blood. Occasional coughs with no phlegm, undeniable chest pain, fluctuating fever, joint pain, and sore throat were experienced 5 days before being admitted to the hospital. The patient was easily tired and fatigued and decreased appetite was recognized and experienced 10 days before being admitted to the hospital. However, there were no complains about nausea and vomiting, loss of smell and taste, and diarrhea by the patient. Within last year, the patient had suffered from osteoarthritis and received regular therapy for NSAID, pulmonary tuberculosis (-), asthma (-), diabetes mellitus (-), hypertension (-), Allergies (-). Furthermore, the patient had no travel history in the last 14 days and received an OA examination at the hospital, two weeks before the symptoms appeared.

The physical examinations when admitted to the hospital were blood pressure: 130/80 mmHg, pulse: 120 beats/minute, respiratory rate: 32 breaths/minute, temperature: 37.5 ^{o}C, and oxygen saturation 86% on room air, body weight: 75 kg, height: 157cm, body mass index (BMI): 30.4 (obesity class I), hyperemic pharynx (+). Chest examination found muscle retraction between the ribs, and crackles all over the right lung on the auscultation.

Chest X-ray showed consolidation with infiltrate air bronchograms in both lung fields (Figure 1A). Ultrasonography (USG) of the thorax during treatment showed consolidation and irregular pleural line (Figure 2). The results of nasopharyngeal swab using RT-PCR method showed positive SARS-CoV-2. The results of the blood tests at the hospital admission showed that the percentage of lymphocyte cells decreased by 9% (lymphopenia), neutrophil cells increased by 88%, the liver function increased by 38 ml/dl, the D-dimer was >4,000, the fibrinogen was 731.00, and the ferritin was 2,109.00. Blood gas analysis using 15 liter/minute oxygen via a non-rebreathing mask (NRM) showed pH 7.591, pCO_2 29.50 mmHg, pO_2 97 mmHg, HCO_3 28.6 mmol/L, BE 7.8 mEq/L, SaO_2 97.9%, and the impression of a respiratory alkalosis. The blood culture during treatment showed no germ growth, while the macroscopic urine examination showed yellow color, positive protein, and urobilinogen. The ECG examination showed grade 1 AV block. Furthermore, the patient was diagnosed with critically ill of COVID-19 pneumonia, systemic microthrombosis, OA, and obesity class 1.

A comprehensive management was given to the patient, starting from the administration of weight-adjusted fluids infusion as initial resuscitation in patients and NRM oxygenation was replaced by HFNC with flow 40 lpm and FiO2 78% temperature 37^{0}C. Nutrition was provided by following the guidelines given by the Indonesian Clinical Nutritionist Association (PDGKI) with an energy requirement of 25 to 30 kcal/kg BW/day and 1.2 to 2 g/kg BW/day protein. Every day, the patient got a nutritional intake of 150 grams of protein and 1875 kcal. Remdesivir 200 mg iv drip on the first day, followed by 100 mg iv drip over 3 hours daily, Lansoprazole 20mg/24 hours, Dexamethasone 5mg/24hours, Heparin inj. 500 units/hour, Ostriol 0.25 mg/24 hours, Vitamin C 1000mg/24 hours, Vitamin E 400 IU/24 hours, Sodium Diclofenac 50mg/24 hours, Moxifloxacin 400 mg iv/24 hours, Azithromycin 500 mg/24 hours. While check PT/APTT and D-dimer was administered every three days.

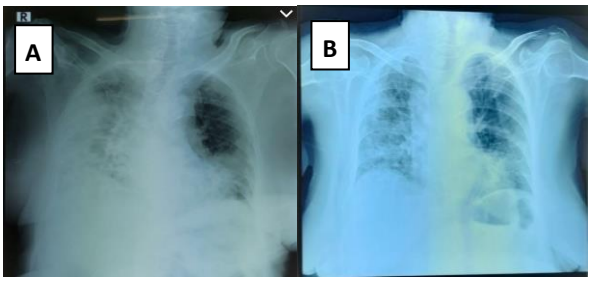

Figure 1. A. Chest X-ray when admitted to the hospital; B. Chest X-ray when recovered and post COVID-19 follow-up

Figure 2. *Ultrasonography* (USG) of the thorax on the second day of hospital treatment

DISCUSSION

An elderly person with COVID-19 and several comorbidities generally had atypical symptoms, such as atypical fever, cough, chest discomfort, or excessive phlegm production. These atypical clinical manifestations become a major problem that causes late diagnosis of this virus in older age that can suddenly become worse.[12] Furthermore, fever is often used as a typical clinical symptom in screening for COVID-19. A study in China showed that it was the most common symptom (83% of the 99 hospitalized patients with the average age over 70 years old had fever). The result of hematological examination frequently found in patients with severe COVID-19 was lymphocytopenia (<800 cells/μL).[5] COVID-19 severity in hospitalized patients is strongly associated with old age, comorbidities, sex and obesity.[8] In accordance with the severity presentation of this case, it was shown that the patient complained of acute shortness of breath, increased heart rate: 120 beats/minute, respiratory rate: 32 breaths/minute, temperature: 37.5 ºC, and oxygen saturation only 86% on room air, the percentage of lymphocyte cells decreased (lymphocytopenia) by 9%, neutrophil cells increased by 88%, the liver function increased by 38 ml/dl, the D-dimer was >4,000, the fibrinogen was 731.00, and the ferritin was 2,109.00. Chest x-ray showed bilateral infiltrates, and the USG of the thorax during treatment showed consolidation and irregular pleural line.

Obesity is a risk factor of difficulty in intubation and oxygen mask ventilation therapy. The oxygen delivery technique combining a high-flow nasal cannula (HFNC) and non invasive ventilation (NIV) were more effective at reducing oxygen desaturation than the method using NIV alone.[13] The patient was given oxygenation therapy using HFNC 40 lpm and demonstrated an improved oxygenation response. HFNC is a noninvasive oxygen delivery tool that can supply high concentrations of oxygen which can reduce the demand for tracheal intubation in obesity.[14] This action was in accordance with the study of Delay JM, *et al*. which showed that using Noninvasive Positive-Pressure Ventilation (NPPV) was safe, feasible, and efficient in obese patients with severe disease.[13,14]

There was a correlation between the severity of COVID-19 with overweight and obesity based on the evidence. Furthermore, a significant correlation between obesity, disease severity, and mortality has been reported in the H1N1 influenza virus pandemic in 2009. Obesity has been associated with the decrease of T-cell receptor diversity and has also been proven to reduce the lymph node size, the inhibition of the number of T-cells in the lymph nodes, and decrease the ability of the immune system to effectively recognize foreign antigens.[15] An adipocyte accumulation caused by obesity suppresses the anti-inflammatory pathway and the antigen presentation by the dendritic cell could ultimately cause T-cell fatigue and chronic inflammation. In obesity, it was found that increased levels of leptin, adipokine, and cytokine IL-6 in the circulation as proinflammatory mediators could affect the integrity of the immune system and trigger serious complications in SARS-CoV-2 patients.[16] Moreover, this mechanism has become the basis for the cause of a geriatric patient suffering from a disease with high degree of severity. Apart from old age, OA with chronic inflammation is also caused by the influence of obesity on inflammation.[17] OA is the most common degenerative disease of the joints and notable inflammation of the synovium. Indeed, the inflamed synovium produces several cytokines, chemokines, reactive oxygen species, prostaglandins, and nitric oxide, and, ultimately, oxidative stress that maintains inflammation. Overall, the allotment of drugs for the reduction of inflammation, hold down the response of the immune system, would be unfortunately affected in the initial phases of the viral infection, reducing the capability of the body against the SARS-CoV-2 invasion as observed in patients with chronically rheumatoid arthritis.

The role of NSAID in viral infection is still not fully understood due to a lack of clinical evidence. A recent review shows that the routine NSAID use prior to hospital admission had a higher risk of severe pneumonia and intensive care unit.[18] However, there is no conclusive evidence supporting or against the use of NSAID in the treatment of COVID-19 patients with OA.[9] Therefore, in this case, OA therapy was still given regularly for acute treatment of this virus.

The role of nutrition is very vital in the incidence of obesity. Furthermore, the estimation of the calorie and protein needs of patients with this disorder and other severe disease require a different approach from those with normal BMI.[19] International guidelines recommend the measurement of Equations Estimating Resting Energy Expenditure (REE) with indirect calorimetry in patients with obesity.[20] The American Society for Parenteral and Enteral Nutrition (ASPEN) recommends 65 to 70% of the REE and the use of 11 to 14 kcal/kg day (for a BMI of 30 to 50) or 22 to 25 kcal/kg/day (for BMI >50) to be given to patients with obesity. These guidelines suggest a hypocaloric high protein diet of 2.0 to 2.5 g/kg/day.[21] Nutrition administration in this case report used the ASPEN guideline, i.e. a 150 gr protein diet with a total of 800 kcal per day was given to the patient. According to PDGKI, it is recommended that patients with a high degree of severity or critically ill disease should be evaluated first for their digestive function and risk of aspiration. The selection of a proper nutrition for patients with intestinal disorders was recommended for easily absorbable chain peptide preparations. Furthermore, high-calorie whole protein preparations was recommended for patients with good gastrointestinal function and those with hyperglycemia need to pay attention to preparations in controlling their blood sugar levels. There was no difference between energy requirements with normal body weight 25 to 30 kcal/kg body weight/day and protein 1.2 to 2 g/kg body weight/day.[22] In this case, the provision of nutrition using the PDGKI guideline was a 150 gr protein diet with a total of 1875 kcal per day given to the patient.

Obesity could affect pharmacokinetics and pharmacodynamics when treating the patients. This interaction is very important because most of the drug effects show a relationship between the concentration and the dose regimen without consideration to the pathophysiology of critical illness or obesity based on pharmacokinetics. Furthermore, determining the dose adjustment in obesity or critical illness which is based on the physicochemistry of the drug, i.e. hydrophilic or lipophilic, could cause the expected pharmacokinetic changes and dosage requirements. Moxifloxacin is a respiratory methoxyquinolone that is very effective in destroying various pathogens that cause pneumonia. It is composed of hydrophilic molecules with maximum concentrations in serum and tissue.[23] Furthermore, the fixed dose of Moxifloxacin regimen is 400 mg and is administered once a day. No dosage adjustment is required in elderly people and patients with obesity.[24] In accordance with the therapy given, this patient was given the antibiotic Moxifloxacin 400 mg iv without adjusting the dose.

CONCLUSION

COVID-19 increasingly became a major health problem in the communities, especially the geriatric group that are very vulnerable to viral infections with a high degree of severity and mortality rate. This case reported a critically ill of COVID-19 geriatric patient with comorbidities of OA and obesity class 1, atypical clinical manifestations, and severe shortness of breath on admission complicated the diagnosis. Furthermore, after receiving complex therapy, the patient recovered and was able to return to normal activities.

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