Complete recovery of severe coronavirus disease 2019 (COVID-19) infection in an obese patient

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ABSTRACT

There is strong evidence indicating that excess adiposity in obesity impacts immune function and host defence. However, almost no known mechanism of how the immune and host defence are affected by the low-grade inflammatory response of the obese has been established. The significance of altered immune response in obesity was presumed to be an independent risk factor for increased morbidity and mortality following the influenza pandemic back in 2009. Similarly, obesity is linked with a higher risk of severity and a worse clinical outcome of severe acute respiratory coronavirus 2 (SARS-COV-2) infection.This case reports a complete recovery of a severe coronavirus disease 2019 (COVID-19) infection despite having morbid obesity aggravated by metabolic syndrome.

ABSTRAK

Penelitian menunjukan jaringan lemak berlebih pada obesitas menyebabkan perubahan fungsi sistem imun dan pertahanan tubuh. Akan tetapi, masih belum diketahui pasti bagaimana inflamasi derajat rendah pada obesitas mempengaruhi sistem imun serta pertahanan tubuh. Perubahan respon imun pada pasien obes dinilai merupakan faktor risiko independen morbiditas dan mortalitas pandemi influenza tahun 2009. Demikian juga, obesitas dinilai meningkatkan risiko infeksi *severe acute respiratory coronavirus 2* (SARS-COV-2) yang lebih berat serta luaran klinis yang lebih buruk. Telah dilaporkan pemulihan sempurna pasien *coronavirus disease* 2019 (COVID-19) derajat berat dengan komorbid obesitas berat dan sindrom metabolik.

INTRODUCTION

Coronavirus disease 2019 (COVID-19) caused by severe acute respiratory coronavirus 2 (SARS-CoV-2) has emerged as a global pandemic since December 2019. According to WHO, by May 2021, there have been 160 million confirmed cases worldwide, 1.72 million of which are specifically found in Indonesia.[1,2]

Obesity is a common metabolic disorder which has a rising pattern worldwide.[3] Nearly 650 million people are affected by obesity, of which roughly 1.2 million are found in Indonesia. Obesity is characterised by a state of low-grade, chronic inflammation in addition to disturbed levels of circulating nutrients and metabolic hormones.[4]

COVID-19 appeared to have a strong connection between those with obesity and the risk of hospitalization, needing treatment in intensive care units (ICUs) and even death.[2,5] Despite all the poor

prognosis either by many proposed mechanism and research evidence, we present a case of a morbidly obese patient with severe COVID-19 infection with a complete recovery.

CASE

A 32-y.o. man presented with shortness of breath and headache accompanied by non-productive cough was brought to the emergency department. The headache was first experienced six days earlier and were accompanied by breathlessness which worsen with mild physical activity, altered sense of smell and the feeling of generalized weakness. Physical examination revealed laboured breathing with respiration rate thirty times per minute, oxygen saturation of ninety five percent using non rebreathing mask (NRM) with fifteen litres of oxygen, blood pressure of 148/68, heart rate of 110 times/min, temperature of 36.8 °C and body mass index (BMI) of 41.5. Laboratory result revealed elevated C reactive protein (CRP), elevated lactate dehydrogenase (LDH) and lymphocytopenia thus resulting in AIFFEL COVID-19 scoring system of high probability. A positive polymerase chain reaction (PCR) swab was taken revealing cycle threshold (CT) value of 24.50 (Reference range: positive if < 36.0). Chest x-ray revealed severe bilateral pneumonia typical of COVID 19 appearance with normal heart size (FIGURE 1.A). Hence, severe COVID-19 infection, stage 1 hypertension, obesity and metabolic syndrome diagnosis was established given its physical examination, laboratory and radiological workup.
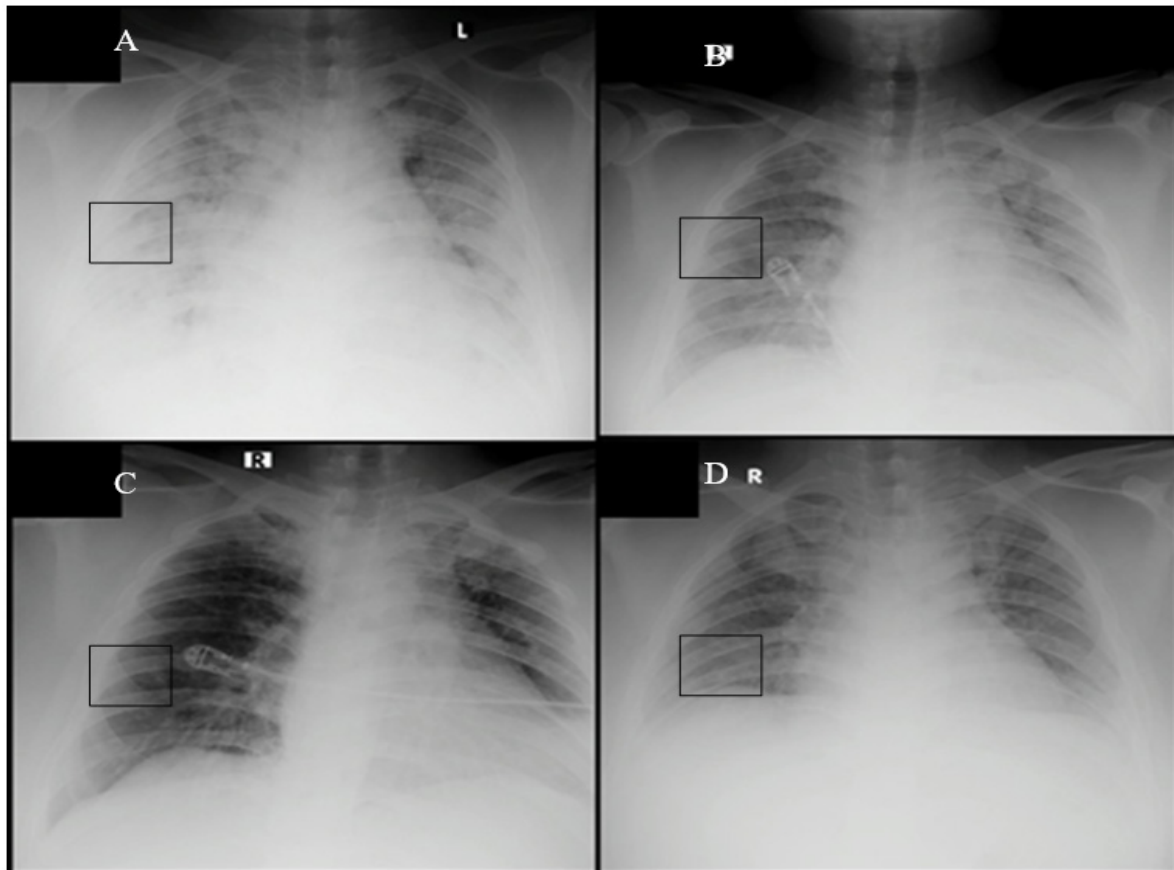

FIGURE 1. Serial Chest X-ray. (A) Chest X-ray taken on 1st day of admission (B) Chest X-ray taken on 5th day of admission (C) Chest X-ray taken on 8th day of admission (D) Chest X-ray taken on 13th day of admission.

The patient was admitted to the intensive isolation ward and was given high flow nasal cannula (HFNC) of 100/60 for oxygen therapy instead of using NRM. Meropenem 1 g/8 h and levofloxacin 750 mg/d was given empirically. Loading dose (200 mg/d) of remdesivir was given intravenously and was followed by maintenance dose (100 mg/d), enoxaparin was given twice daily subcutaneously with dose adjustment of 120 mg every 12 h, 6 mg of dexamethasone once daily, 5 mg of amlodipine taken once daily for blood pressure control and other supportive adjuvant agents such as intravenous N-acetylcysteine 5 g/d, vitamin C 1 g/d, vitamin D 400 mg/12 h, zinc which were given in order to treat the patient. On the fourth day of hospitalization, oxygen therapy was down titrated using HFNC of 70/60 based on blood gas analysis parameters. Chest x-ray evaluation revealed severe bilateral pneumonia typical of COVID-19 appearance with signs of radiological improvement compared to the previous result on the fifth day of hospitalization (FIGURE 1.B), On the sixth day of hospitalization, staphylococcus aureus was identified in the sputum culture revealing meropenem and levofloxacin resistance, hence vancomycin 1 g/12 h was initiated based on the sensitivity test. Blood culture did not reveal any grown organism. On the seventh day of hospitalization Chest x-ray evaluation revealed signs of radiological improvement compared to its previous one (FIGURE 1.C). Oxygen therapy was down titrated the following day with HFNC 60/30 and nasal cannula of 4 L/min respectively, vancomycin injection was switched into trimethoprim-sulfamethoxazole 960 mg every 12 h orally. On the eleventh day, the patient was transferred to the non – intensive isolation ward. The patient was treated for three more days and no event was recorded. Radiographic thorax image was evaluated revealing signs of radiological

deterioration compared to the previous radiological chest image (FIGURE 1.D) The patient was discharged and was planned to be assessed five days later in the pulmonary clinic. His discharge medications include cotrimoxazole 960 mg/12 h, amlodipine 10 mg/d, zinc 20 mg/d, vitamin C 250 mg/d, and vitamin D 400 mg/12 h. Laboured breathing, fatigue and headache were denied during follow up and no complaints were reported.

DISCUSSION

Individuals suffering from obesity were more at risk for COVID-19 positive, for hospitalization, for ICU admission, and for mortality.[2] There is a clear relationship between obesity and basal inflammatory status characterized by higher circulating IL-6 and CRP levels. Adipose tissue in obesity is proinflammatory, with increased expression of cytokines and particularly adipokines.[6] Obesity is characterized by adipose tissue expansion and affects the inflammatory response. Adipocytes secret pro-inflammatory cytokines, such as IL-1, IL-6 and IL-10, which results in elevated circulating levels of cytokines and chemokines in the plasma of obese patients.[8] The function of various immune cells is also altered in obese patients, which significantly affects the immune system. Laboratory findings suggest that the number of lymphocytes including CD4+, T cells, CD8+ T cells, B cells, and natural killer (NK) cells are dramatically decreased in COVID-19 patients. Unfortunately, obesity impairs both T and B cell responses, therefore retards the adaptive immune response to infection. The weakened immune system in obese patients may result in higher viral load, rapid viral replication and spreading.[7]

Despite suffering from obesity, this patient eventually had a full recovery its symptoms of severe COVID-19 infection. We proposed several reasons

which might be use as a rationale to determine the prognosis of the patient. We may consider CT value as one of the prognostic variables along with other biomarkers. Lower CT value might be associated with increased ICU admission, higher mortality and increased length of ICU stay.[9] Haematological parameters specifically lymphopenia is associated with disease severity, in which the case we present showed normal laboratory parameters particularly leucocyte count and normal distribution of lymphocyte. Patients who have died from COVID-19 have had significantly lower lymphocyte counts than survivors.[10]

Pulmonary function parameter measured by blood gas analysis (BGA) namely the P/F ratio shows improvement within the first week in ICU survivors as opposed to non-survivors.[11] This finding is in line with the case we report which showed an early improvement of P/F ratio on the third day of care. Long COVID-19 was characterized by symptoms of fatigue, headache, breathlessness and anosmia and was more likely with increasing age, BMI and female gender.[12-14] There are five symptoms experienced during the first week that were most predictive of long COVID-19, the symptoms are fatigue, headache, breathlessness, hoarse voice and myalgia.[15] This case report presents a man with all the symptoms mentioned excluding hoarseness and still completely recuperated despite obesity and had a chest x-ray deterioration one day before discharge.

CONCLUSION

Obesity is linked with poorer outcome compared to lean body mass. Despite all the theory and mechanism explaining its worse outcome, the patient in this reported case was completely recovered from severe COVID-19 infection. A prospective study with a large specific sample might be required to establish and prognosticate the relationship between obesity and COVID-19 infection.

STATEMENT OF ETHICS

Written informed consent for publication of their details was obtained from the patient himself. Institutional approval was not required to publish this case report.

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CONFLICT OF INTERESTS

The author declares no conflict of interests

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