MECHANICAL VENTILATION DEPENDENT IN VENTILATION ACQUIRED PNEUMONIA AND SUSCEPTIBILITY PULMONARY FUNGAL INFECTION OF HIV PATIENT: A CASE REPORT

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ABSTRACT

Introduction: People with HIV infection who are admitted to the ICU are generally diagnosed with respiratory failure. Ventilator-associated pneumonia (VAP) is a complication of patients in the ICU. It is one of the most common nosocomial infections. VAP encounters problems in many patients, such as chronic ventilator dependence. Prolonged reliance on mechanical ventilation in patients suffering from severe impairment of physical function and cognitive status upon discharge and most requiring institutional care simultaneously increases mortality on or after discharge.
Case Illustration: A 45-year-old woman with stage 4 HIV, diagnosed in 2017, experienced multiple hospitalizations over the past five months. Patient in a conscious state, TD 130/60mmHg, HR 92x/min, RR 30x/min intubated SpO2 99% (Ventilator Spontaneous Mode Ps 8, PEEP 10, Tidale Volume 400-500mL FiO2 50%), temperature 36.8oC. The pulmo sound increases crepitation. Vancomycin antibiotics were resumed, ARVs were resumed, Cotrimoxazole was resumed, and Fluconazole was given. BGA evaluation results showed an average pH of 7.45, PO2 102mmHg, PCO2 38mmHg, and lactate 1.3mmol/L. The patient eventually died of septic shock, with his last sputum culture showing Acinetobacter baumanii.
Discussion: Among People with HIV (PLWHIV), the reason for using mechanical ventilators could be due to AIDS-related respiratory illnesses. The risk of pneumonia in PLWHIV is still higher than in other people who are not infected with HIV despite ART. Critical patients are at risk of mental stress when requiring mechanical ventilation because their breathing ability depends on the help of machines. The patient repeatedly fails in weaning attempts caused by weakening or unconditioning of the respiratory muscles due to the presence of depressive disorders that may interfere with weaning pragmatics.
Conclusion: VAP is associated with high mortality and can result in ventilator dependence, especially in patients with weakened immune systems. Only appropriate initial empirical antibiotic therapy can cope with this critical situation, so the ventilator release is successful.

Keywords: HIV infection; prolonged mechanical ventilation; Sepsis; VAP.

INTRODUCTION

Highly Active Anti-Retroviral Therapy (HAART) has been increasing life expectancy in patients infected by HIV since HAART was introduced. However, in this patient population, there is a chance that they will get infectious or non-infectious complications and need critical care support. Patients with HIV infection who are treated in the ICU are commonly diagnosed with respiratory failure, and the mortality of these patients remains substantial. However, medical therapy is advanced enough as intensive care medicine [1].

Ventilator-associated pneumonia (VAP) is a complication of patients in the ICU and is one of the most common nosocomial infections. VAP has an estimated incidence of 9-27% and a high mortality rate of 25-50%, and it remains a significant morbidity and mortality cause among critically ill patients. VAP encounters problems in many patients, such as chronic ventilator dependence. Prolonged dependence on mechanical ventilation in patients suffer from profound impairment in physical function and cognitive status at the time of discharge, and most require institutional care while increasing mortality in or after discharge from the hospital. Chronic ventilator dependence is a highly uncomfortable condition for patients and a severe problem in medicine, even with considerable social and financial implications [2].

Sepsis condition also contributes to failed attempts of the weaned ventilator and improves the survival rate of sepsis patients. However, some of the sepsis patients subsequently need mechanical ventilation. Among these later ventilated patients, some have been weaned off ventilation in one attempt, but for others, multiple shots are necessary to wean them off mechanical ventilation successfully. However, in another proportion of the surviving patients, it is possible to have repeated experiences of failed attempts at being weaned off ventilation. These patients are at substantial risk of long-term ventilator dependence [3].

Psychological problems and psychiatric disorders also have a significant effect on weaning failure of ICU patients. Barriers to diagnosing this disorder make clinicians often ignore it and ultimately provide inadequate therapy to overcome it [4].

In this case report, we presented an HIV patient that has been diagnosed for six years and was in stable condition until she had a respiratory infection, which deteriorated her situation, and finally died after 25 days of mechanical ventilator support.

CASE REPORT

A woman, 45 years old, has been diagnosed with HIV since 2017. The patient was diagnosed with her husband and underwent ARV treatment for five years at Sragen District Hospital. The patient and her husband's condition improved during the two treatments, and the patient could work and care for her two children. 2018, the patient experienced shortness of breath, which worsened with activity. The patient then underwent an examination at Surakarta District Hospital, which showed bilateral pleural and pericardial effusions. Even though the results of the M. tuberculosis sputum test were negative, the team decided to give the patient anti-tuberculosis therapy for six months, considering that the results of the pleural effusion fluid analysis were exudates. The patient's condition improved. She had no complaints and completed her tuberculosis treatment.

In January 2023, the patient returned to treatment at a private hospital in Surakarta because of a cough without phlegm and shortness of breath. The patient underwent treatment for a week, and the condition improved, but she had not fully recovered. March 3, 2023, the patient returned to undergo treatment at a different private hospital with complaints of fever, cough without phlegm, shortness of breath, and weight loss. On admission to the hospital, the patient's condition was fully conscious with vital signs: Blood Pressure (BP) 124/80 mmHg, heart rate (HR) 100x/minute, respiratory rate (RR) 25x/minute, temperature 36.7oC, oxygen saturation 97%. A specific examination of the lungs reveals crackles and a body mass index of 24.03. There is no Oral candidiasis was found, No. Pruritus prurigo exanthema (PPE) and other skin infections. Laboratory test result: Hb 13.6 g/dl, leucocyte count 9.190/mm3, segment 77.1%, lymphocytes 9.1%, monocytes 10.4%, eosinophil 3.3%, basophil 0.1%,

thrombocyte count 233.000/mm3, AST 34 U/L, ALT 43 U/L, blood glucose 116 mg/dl, sodium 136.9 mmol/L, potassium 5.07 mmol/L, ESR 66 mm/h. SARCOV-2 antigen negative. Her chest x-ray showed cardiomegaly, pulmonary oedema, and bronchopneumonia (Figure 1a). Her echocardiography result: concentric LVH with Ejection Fraction of 56%, mild mitral regurgitation, pseudo normal diastolic dysfunction. During this period of hospitalization, the patient was treated with the antibiotic levofloxacin, diuretic, mucolytic, and beta-agonist. Her condition improved except for her oxygen saturation, only a maximum of up to 94% in room air. The x-ray evaluation showed an increase in infiltrate (Figure 2a). However, the patient proposed outpatient treatment. She was discharged on the 10th day of hospitalization with spironolactone, macrolide, and oral tuberculosis agent despite her non-productive cough. The patient and his family during this time withheld information about his HIV status and ARV treatment. The patient's family admits that over the last few months, the patient's adherence to ARV has decreased. She often cries and has visited a psychiatrist several times and then given anxiety therapy (clobazam and fluoxetine). Her family is worried about the patient's mental condition if her HIV status is notified to other people.

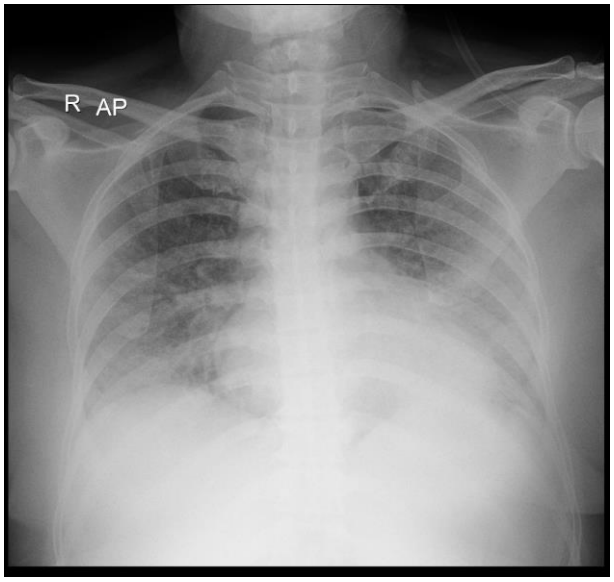

Figure 1a. Chest x-ray showed cardiomegaly, pulmonary oedema, and bronchopneumonia.

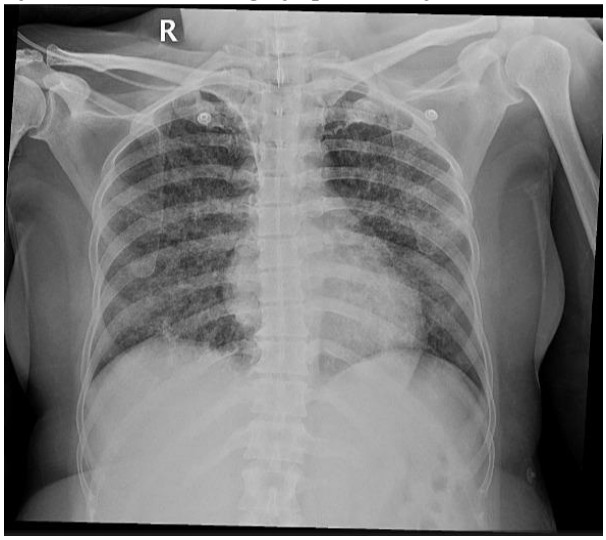

Figure 2a. X-ray evaluation showed an increase in infiltrate.

March 21, 2023, the patient was brought back to the emergency room with complaints of recurrent fever, coughing up phlegm, and severe shortness of breath. The patient is still conscious, with BP 117/69 mmHg, HR 123x/minute, RR 36x/minute, temperature 39.5oC, and oxygen saturation 68% room air. The patient was admitted

to the ICU with a ten lpm non-rebreathing mask (NRM), and her oxygen saturation rose to 95%. Examination of the lungs showed increasingly pronounced crackles. Laboratory examination results in Hb 12.7 g/dl, leucocyte 12.900/mm3, with neutrophils 88.8%, lymphocytes 6.9%, thrombocyte 246.000/mm3, AST 96U/L, creatinine 0.7 mg/dl, blood glucose 112 mg/dl, sodium 135.9 mmol/L, potassium 4.27 mmol/L, chloride 95 mmol/L. His blood examination doesn't seem to show any significant difference except for an increase in his leucocyte count. Viral infection tracking, hepatitis B, showed negative results, SARSCOV-2 PCR was negative, and because of clinical suspicion, the patient was finally tested for HIV antibodies with reactive results. The patient was then managed as HIV stage 4 with suspicion of relapsing tuberculosis (TBC), Hospital Acquired Pneumonia (HAP), and Suspicious Clinical Pneumonia Pneumocystis Carinii (PCP). The patient was given broad-spectrum antibiotics (meropenem) and Cotrimoxazole 1x960 mg. Blood gas analysis (BGA) results showed pH 7.50, PCO2 63 mmHg, HCO3 35.1 mmol/L, BE 11.9 mmol/L, SO2 91%, lactate 1.2 mmol/L, CD4 yield 45 cells/mm3, CD8 833 cells/mm3, CD4:CD8 = 0.07. The results of the chest examination showed cardiomegaly and pneumonia (Figure 3a). Due to this progressively decreasing state of consciousness with an increasing respiratory rate of up to 42x/minute, the patient was given breathing assistance with mechanical ventilation. The TBC molecular Rapid Test results showed negative results, and Sputum culture revealed Staphylococcus hemolyticus, which was resistant to clindamycin and ampicillin but sensitive to vancomycin. Blood cultures showed no bacterial growth. Potassium Hydroxide (KOH) direct examination was negative, and PCP staining was also negative. Antibiotics were immediately adjusted to vancomycin. The oral tuberculosis drug was discontinued, starting to be given ARVs Tenovofir, Lamivudine, and Dolutegravir, as well as steroid.

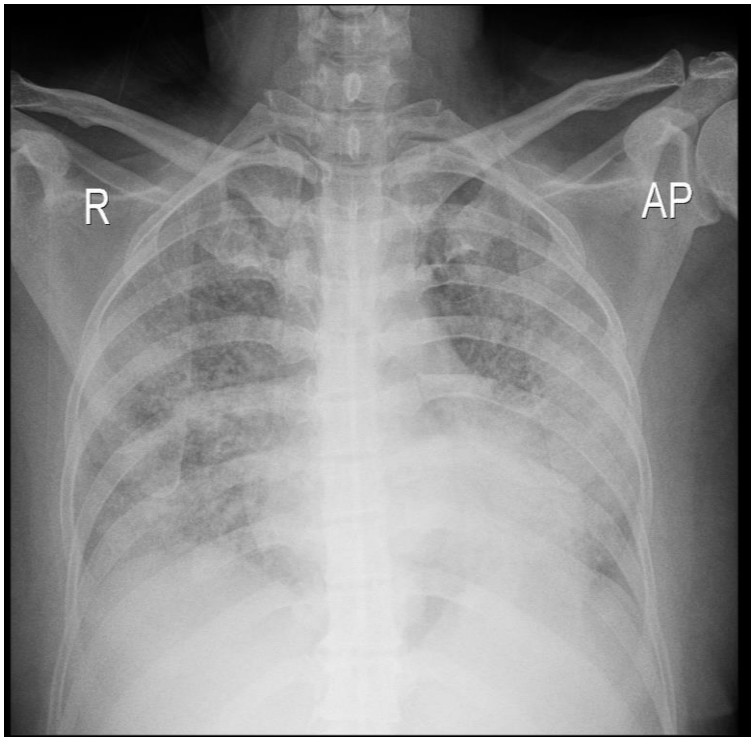

Figure 3a. Chest examination showed cardiomegaly and pneumonia.

Although the patient's condition improved, she was fully conscious, able to follow orders, had no fever, and had stable BP and HR. However, she still had a high RR average of 20-30x/minute to gain 100% oxygen saturation. The ventilator weaning experiment was still hampered. However, the chest X-ray evaluation (Figure 4a) showed reduced pneumonia infiltrates. Due to the length of stay, the team of doctors decided to refer the patient to a higher-referral hospital in Surakarta.

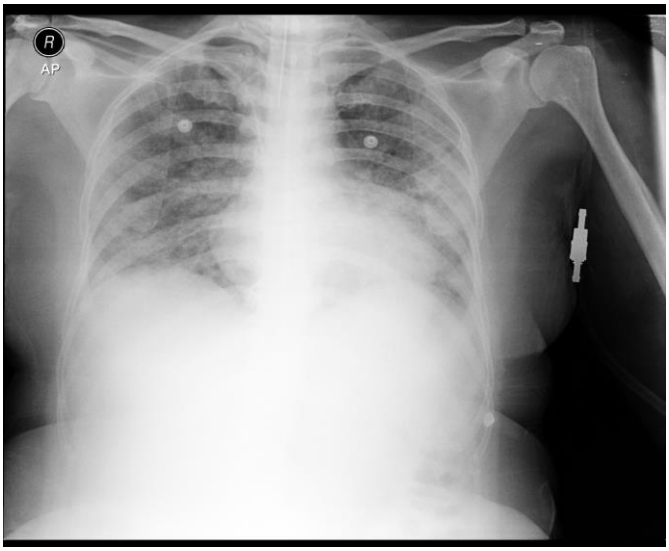

Figure 4a. Chest X-ray evaluation showed reduced pneumonia infiltrates.

On April 3, 2023, the patient arrived at the referral centre hospital. The patient is conscious, with BP 130/60 mmHg, HR 92x/minute, RR 30x/minute, intubated with SpO2 99% (Ventilator Spontaneous Mode Ps 8, PEEP 10, Tidale Volume 400-500mL FiO2 50%), temperature 36.8oC. Pulmo sound increased crepitation. The patient was treated with stage 4 HIV, Acute Respiratory Distress Syndrome due to Ventilator Acquired Pneumonia, Clinical PCP, and Susceptible Pulmonary Fungal Infection. Vancomycin antibiotics continued, ARVs continued, Cotrimoxazole continued, and Fluconazole was given. BGA evaluation results show an average pH of 7.45, PO2 102 mmHg, PCO2 38 mmHg, and lactate 1.3 mmol/L. Chest X-ray examination showed bilateral pneumonia (Figure 5a.). On April 4, 2023, the patient had accidentally self-extubated. Then, she was given NRM for 10-15 lpm with an oxygen saturation of 100%. However, she could only maintain adequate breathing for 12 hours. After that, she began to become desaturated and hard to breathe. Doctors decided to reintubate for life-saving. IV Titratable sedation was applied to her, and The medical intensive care unit was standardizing the titration protocol. The standard clinical practices were performed for weaning the patient from mechanical ventilation.

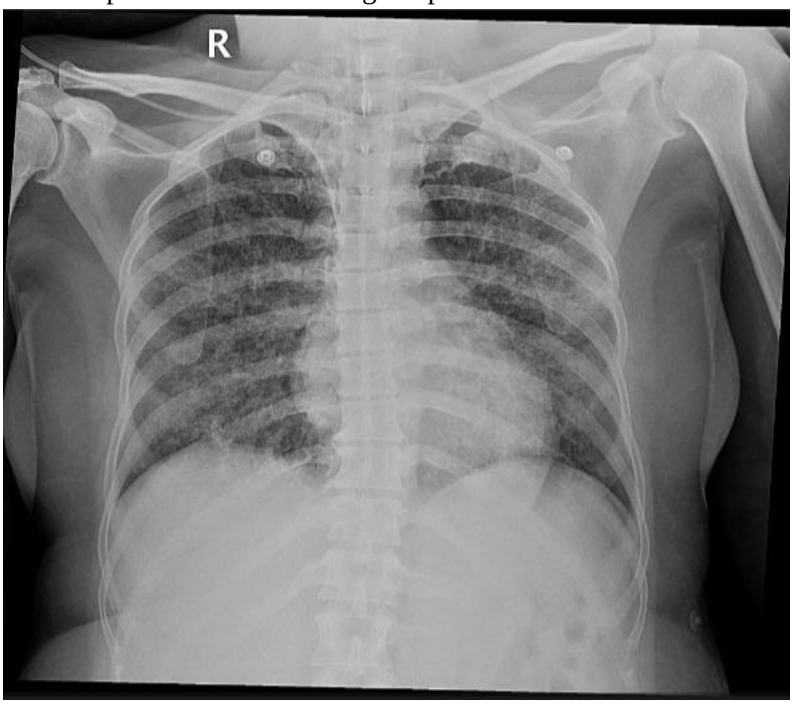

Figure 5a. Chest X-ray examination showed bilateral pneumonia.

On April 10, 2023, her condition began to drop. Her laboratory examination showed Hb 9.5 g/dl, leucocyte 16.000/mm3, thrombocyte 112.000/mm3, and her heart rate began to increase average 120-130x/minute, along with altered mental status. The sputum culture results found Acinetobacter baumannii sensitive to amikacin and resistant to gentamycin, ciprofloxacin, ampicillin, and Cotrimoxazole. Adjustment of antibiotics was given amikacin. The results of the second blood culture still did not grow germs.

On April 13, 2023, she began to need a vasopressor to maintain blood pressure. She seems to have minimal contact, with a high respiratory rate of>30x/minute and tachycardia of 120-130x/minute. She died two days later.

DISCUSSION

Mechanical Ventilation in HIV Patients

The Centres for Medicare and Medicaid Services in the United States defined PMV (Prolonged Mechanical Ventilation) as at least six hours per day in more than 21 days of mechanical ventilation. It is estimated that 4-13% of mechanically ventilated patients and 7,250-11,400 patients who undergo mechanical ventilation annually require prolonged mechanical ventilation. In the different situations, the proportion of patients requiring prolonged ventilation [3].

Among People Living with HIV (PLWHIV), the reason for a mechanical ventilator could be due to AIDS-related respiratory disease (e.g., tuberculosis, PCP) and bacterial infections (e.g., pneumonia) with or without sepsis [5]. Among patients with sepsis, mortality was observed increasingly, and organ dysfunction was due to multiple comorbidities (heart disease, diabetes, hypertension) in patients who received mechanical ventilation [1].

Pneumonia risk in PLWHIV is still higher than in other people without HIV infection despite HAART. This condition is due to the altered immune status of PLWHIV itself. One study also mentioned that 25% of HIV had chronic obstructive pulmonary disease due to a history of lung disease before smoking behaviour, including passive smoking. Not mentioned, conditions of intermittent or loss of ARV adherence, undernourished, or mental disorder (depression) can decrease the CD4 count infected by pneumonia to 2.8 for every 100 PLWHIV infected [6].

This condition is likely to occur in this patient, where the patient has been stable for six years and then experienced a rapid decline in physical condition due to depressive disorders. The family and patient also cover up the patient's HIV status, making the underlying disease not well explored despite several hospitalizations. The patient also already has underlying lung disease and previous heart involvement, which is one of the risk factors for severe pneumonia in this patient.

Fatigue, weight loss, and more than one opportunistic disease are usually present in hospitalized patients with advanced HIV disease. The plethora of simultaneous and similar clinical manifestations of different infection causes hinder the initial approach of that characteristic. 40% of the cases common in PLWHIV had concomitant opportunistic infections (IO) (e.g., oesophageal candidiasis, chronic herpes, tuberculosis, cerebral toxoplasmosis). Sometimes, it was difficult to mention which IO-driven deteriorating condition in one patient [1].

Initiation of ARV

Recognizing HAART is a difficult decision in critically ill patients. There was no data concerning anti-retroviral therapy of pharmacology or pharmacokinetics in hemodynamically unstable patients. It was a common challenge among intensivists when we were concerned about drug-to-drug interactions and toxicity, medication absorption, and variability of drug levels (1). Because many reports mentioned critically ill HIV patients with ARV naive, the use of HAART was not associated with survival. This condition is different when the patient is already in HAART and enters the hospital with a high CD4 count. Patients with higher CD4 had better outcomes than lower CD4 in patients already in HAART [1].

This patient decided to restart ARV therapy, which had been interrupted several times. With the belief that the patient has had ARV before, this severe condition is possible due to a decrease in her immune status. The

patient is under surveillance in the hospital so that the effect of IRIS that may occur can be observed. Patients are also given steroids to prevent the possibility of the IRIS.

Ventilator Weaning Protocol

In the Intensive Care Unit, the ventilator weaning profile was protocolized. Patients will be indicated to be weaned from ventilators if there is improvement or resolution of their underlying cause of acute respiratory failure with adequate gas exchange observed as shown by a PaO2 above 60 mmHg while breathing with FiO2 of 0.40 or less with positive end-expiratory pressure of 5 cm H2O or less, temperature below 38oC, and no further require for vasoactive or sedative agents. In addition, The physician of attending patients had to give an agreement that the patient was in stable condition and had already weaned from the ventilator. When the rapid shallow breathing index (respiratory rate/tidal volume) was <105 breaths/minute/L and maximal inspiratory pressure was below 20 cm H2O, Patients can undergo a spontaneous breathing trial for 120 minutes. If the tests were re-evaluated daily, patients failed to meet these criteria. Suppose the patient had any of the following signs such as respiratory rate exceeding 35x/min, oxygen saturation below 90%, heart rate above 140x/min or sustained increase or decrease in the heart rate of more than 20%, systolic blood pressure above 200 mmHg or below 80 mmHg, and agitation, diaphoresis, or anxiety. In that case, the respiratory therapist can be terminated. Mechanical ventilation can be reinstituted if patients have any signs of poor tolerance during the trial. Immediately extubated and provided supplemental oxygen by face mask when patients demonstrated no signs of poor tolerance at the end of the trial.

The ventilator termination trial procedure had been examined in this patient. Her high respiratory rate became the most significant obstacle, even though other criteria, BGA, and laboratory examination were within reasonable marks. Reducing the oxygen fraction will decrease the patient's oxygen saturation and increase agitation [8].

One clinical trial based on four variables independently associated with ventilator dependence in the multivariates analysis was calculated score including thrombocytopenia, acidosis, previous stroke, and higher FiO2. The sum of four variables calculated the ventilator dependence risk score after adjusting the proportion to the beta coefficient. This study was assigned by the history of stroke (1 point), platelet counts on admission day seven or less than 150,000/µL (1 point), pH value on admission day seven or less than 7.35 (2 points), and the FiO2 on admission day seven over 39% (2 points) [3]. Following these criteria, this patient only had two points due to FiO2 higher than 39% on admission. This score is unable to describe the prognosis of this patient.

Congestive cardiac failure (p=0.009), initial high oxygenation index (p=0.04), increased SOFA scores (p=0.01). Increased APACHE II score (p=0.02) were identified as underlying factors by mentioned multivariate logistic regression analysis as independent predictors of ventilator dependence. Initial therapy (antibiotics) could increase the ventilator weaning rate (log Rank test, p <0.001), as indicated by results from the Kaplan-Meier method. Based on these criteria, she had clinical heart failure with preserved EF, initial high oxygen index value, SOFA score 4 (initial SOFA Score ≤9 predict ≤33,3% mortality) [9], APACHE II score was 10 (15% estimated non-operative mortality) [10]. This score is also not proper to predict the outcome in this patient. Analyzed her clinical and laboratory results, we concluded that her psychological condition could be an essential factor in her weaning failure.

Critically ill patients are at risk of mental stress when they require mechanical ventilation because their ability to breathe depends on assistance from a machine. Physical and emotional needs will be challenging in ventilated patients because of the presence of an endotracheal (or tracheostomy) tube. Furthermore, it will decrease the patient's sense of control to feelings of helplessness, anger, and despair. The feeling of wanting to give up and the desire to die was a result when coping mechanisms became overwhelming. Emotional reactions will increase as the duration of mechanical ventilation increases, which may negatively impact the patient's ability to wean from a ventilator [4].

Patients repeatedly fail weaning attempts caused by weakened or deconditioned respiratory muscles through the presence of depressive disorder that might interfere with the pragmatics of weaning. Spontaneous

breathing can be used as one approach to reconditioning. The healthcare team controls the initiation of spontaneous breathing trials. Immediately after the trial commences, many patients in chronic weaning facilities wish to be placed back on the ventilator. There was a speculative reason that it is possible that patients with depressive disorder would make such a request. Loss of energy and diminished motivation were commonly seen in depression. Depressed patients may not tolerate the challenge of daily spontaneous breathing trials because they have no power and motivation. If it is kind of like that, depressive disorder has a chance to contribute to weaning failure.

This condition is likely to occur in this patient. Unfortunately, psychological assessment had not been adequately assessed to her. One thing that has not yet been decided given to this patient was her anti-depressant therapy. This is considering that the patient has also received the necessary sedation therapy to support his mechanical ventilation therapy.

Factors present before the onset of acute respiratory failure, the functional level before acute illness, and previous psychiatric illness were related to the presence of depressive disorder, and it is also associated with weaning loss and a higher mortality rate. This necessitates the requirement of mental health assessment and psychological interventions that are applied for patients with mechanical ventilation [8].

The best strategies to increase the survival rate in HIV patients with pneumonia are as follows:

1. Maintain a healthy lifestyle, including abstaining from smoking and alcohol consumption.
2. Maintain immune status by adhering to anti-retroviral so that virus levels remain undetectable and CD4 >500 cells/mm3.
3. Provide pneumococcus and influenza vaccinations to HIV patients regularly.
4. Provide adequate antibiotics according to the guideline and distribution map of germ sensitivity of the area.
5. Do not give fluoroquinolone antibiotics to HIV patients suspected of tuberculosis because it will affect the patient's sputum culture and blood tests.
6. Always consider the diagnosis of HIV as comorbid in patients who have severe recurrent infections or recurrent hospitalizations with no other comorbidities that could underlie the condition.
7. Routine screening of common psychiatric conditions among HIV-positive subjects should be practised to optimize patient care and improve clinical outcomes. Given the availability of effective pharmacological and psychotherapeutic interventions for depression, neglect of this aspect will affect adherence to therapy and the quality of life of HIV-infected patients [11].

CONCLUSION

VAP is associated with high mortality and can result in ventilator dependence, particularly in immunocompromised patients. Only initial empiric antibiotic therapy can remedy this critical situation, resulting in successful liberation from the ventilator.

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CONFLICT OF INTEREST

The author declares there is no conflict of interest.

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