

# An 8-year-old Marasmic Boy with Miliary Tuberculosis: Case Report

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**Abstract**— Miliary Tuberculosis (TB) is a severe form of TB and accounts for 3-7% of all TB cases with a high mortality rate. This case presents an 8-year-old Indonesia boy with shortness of breath from six months before hospital admission. The patient is also said to have cough and fever throughout the day. The patient's grandfather died 1 year ago due to chronic lung infection. The physical examination of the general condition of the patient showed that the patient was very sick. The nutritional status according to Water low was found to be 61.5%. Pulmonary examination, starting from the inspection, showed a symmetrical chest shape but the right chest movement was seen to be left behind. On palpation, the chest movement is asymmetrical and the right vocal fremitus decreased. Percussion was dim in the right lung. Auscultation revealed bronchial sound and rhonchi in all lung fields. Chest X-ray examination suggest the presence of miliary pulmonary TB, atelectasis on superior lobe of the right pulmonary, and right pleural effusion. In contrast to adult TB, the symptoms of TB in children are often atypical and can interfere with children's growth and development. This case report is made to be able to increase the knowledge of paramedical colleagues in diagnosing and managing TB cases in children.

**Keywords**— Miliary tuberculosis, Tuberculosis, Children, Marasmus.

## I. INTRODUCTION

Tuberculosis (TB) is a disease that occurs due to a contagious infection caused by *Mycobacterium tuberculosis* (1). TB infection could be a systemic infection that can affect almost all organs of the body, with the most infected location being the lung which is usually the site of the primary infection (2,3). Miliary TB is a severe form of TB and accounts for 3-7% of all TB cases with a high mortality rate. Clinical manifestation of Miliary TB are varies from chronic infection, slowly progressive, to acute fulminant disease, which is caused by the hematogenous or lymphogenous spreading from infected caseous material into the bloodstream and affects many organs with tubercles similar to rice seeds (4,5).

Miliary TB is said to be a systemic lymphohematogenous disease due to the spread of *M. tuberculosis* from the primary complex which usually occurs within the 2-6 months after the initial infection. Miliary TB is more common in infants and young children, especially under 2 years of age, because of specific cellular immunity, macrophage function and local lung defense mechanisms are not yet fully developed so that TB are easy to multiply and spread throughout the body. However, miliary TB can also occur in older children and adolescents due to inadequate treatment of previous primary lung disease, or in adulthood due to reactivation of dormant bacteria (4,6).

In contrast to adult TB, the symptoms of TB in children are often atypical. It is known that a definite diagnosis of TB is made by finding the bacteria, but in the case of children, the diagnostic of specimens obtained are often difficult to be believed. In addition, other supporting examination facilities such as the Mantoux test or lung X-rays in some developing countries are still limited, making the diagnosis of TB in children is more difficult (7,8).

TB in children is a chronic infection that can interfere with growth and development in children. In a healthy child, the

basal metabolism will decrease at night, while in a TB disease, the metabolism will increase. This certainly disturbs the growth and development of children (9). In addition, the side effects of using anti-tuberculosis drugs in the long term can cause gastrointestinal disorders, hepatotoxicity, rash or itching, and fever. If these side effects occur, it will decrease the patient's immune system and cause growth problems for children (10,11). TB management in children is an inseparable unity between medical management and the surrounding environment, including nutrition. Medical management of TB cannot be separated from health education to the public or to the patient's parents about the importance of taking medication regularly for a long period of time, as well as monitoring the schedule of drug administration and the belief that the drug is being taken (12). This case report is made to be able to increase the knowledge of paramedical colleagues in diagnosing and managing TB cases in children.

## II. CASE PRESENTATION

An 8-year-old boy was taken by his family to the tertiary referral hospital in Bali Province, Indonesia with chief complaints of shortness of breath for 6 months before entering the hospital. Shortness of breath was said to occur continuously throughout the day, and was said to be getting more severe.

The patient was also said to have a cough that occurs throughout the day and was getting worse day by day, the cough was louder at night. The cough was said to be thick yellow phlegm of approximately 1 to 2 tablespoons at a time, and was often difficult to expel. Blood coughing was said to have occurred only once, with a blood volume of about 2 tablespoons about nine days before admission. Complaints of colds were denied by patients.

Fever was said to have increased day by day for 3 months before being admitted to the hospital, and the patient was said to often shiver in the middle of the night for 3 weeks before being admitted to the hospital. The patient was also said to

have had diarrhea for 1 month before being admitted to the hospital, and it comes and goes 3-5 times a day. The volume of diarrhea was said to be approximately 1 glass, yellow in color, liquid and foamy consistency, said to have no mucus and blood.

The patient's urination was said to be red for 15 days before admission to the hospital, the frequency of urinating 2-3 times a day with a urine volume of  $\frac{1}{2}$  cup. Pain when urinating was said to be absent.

The patient's appetite was said to have decreased since the last 6 months. For 6 months the patient was said to vomit frequently after being fed, with a vomiting volume of approximately 1-2 glasses of food or drink previously consumed, in a day the patient can vomit 1-3 times. The patient's weight was said to have decreased since illness, according to his father, the patient looks thinner than before the illness, it is estimated that there has been a weight loss of more than 10 kg.

Five months before being admitted to the hospital, the patient was brought to the *puskesmas* (local health center). The patient was given cough medicine and was only said to be malnourished. The *puskesmas* then provided cow's milk and bread. The patient was then asked to be taken to the hospital. However, by the patient's family, the patient was only given traditional medicine first. Three months before being admitted to the hospital, the patient was taken to the second referral hospital in the city of Mataram, Nusa Tenggara Barat. At the hospital, the patient was tested for sputum and X-ray, then tested positive for TB. The patient was given medicine and hospitalized for 1  $\frac{1}{2}$  months, but there was no improvement so he was referred to the third referral hospital in Bali.

The patient was said to have never experienced a disease like this before. The patient was also said to have never had a history of serious illness and a history of allergies. The patient's grandfather was said to be suffering from tuberculosis, but the treatment was not complete and the patient's grandfather died 1 year ago. The patient lived with his grandparents since he was 1 year old. The patient's father and grandfather were said to be heavy smokers. Family history of other diseases and allergies was said to be absent.

For the patient's father, the patient is the 3rd child. The patient's father married twice, and the patient is the son of his second wife. Now the patient's biological mother has married someone else. Since the age of 1 year, the patient lives and is cared for by his grandparents with complete basic immunization history and normal growth and development. The history of basic immunization is complete, namely BCG 1 time, Hepatitis B 1 time, Polio 4 times, DPT 3 times and measles 1 time.

The physical examination of the general condition of the patient showed that the patient was very sick, but the consciousness was still good. Pulse rate was 130 beats / minute, breath rate was 48 times / minute, and temperature was 36.3oC. Body weight was 16 kg, and height was 110 cm. The nutritional status according to Waterlow was found to be 61.5%. Nutritional status based on CDC 2000, it was obtained that the weight for age, height for age, and weight for height were less than the 5th percentile.

In terms of general status, it was found that the child was normocephalic, and had closed large crown (anterior fontanelle), no abnormalities were found. in the eye, in the ear there was no secretion. In the throat, there was no tonsil enlargement or hyperemia of the pharynx. The lip mucosa looked wet and there were no enlarged glands in the neck and neck stiffness. Cardiac examination appears normal. Pulmonary examination, starting from the inspection, showed a symmetrical chest shape but the right chest movement was seen to be left behind. On palpation, the chest movement is asymmetrical and the right vocal fremitus decreased. Percussion was dim in the right lung. Auscultation revealed bronchial sound and rhonchi in all lung fields. Axillary examination found no enlarged glands. Examination of the abdomen and genitalia found no abnormalities. The extremities were warm, edema was not found, capillary refill time was less than 2 seconds, and no petechiae was found.



Figure 1. Chest X-ray in AP examination

The chest X-ray in AP examination as shown in Figure 1 shows that the right heart border was closed with the impression that it was pulled to the right, there was an infiltrate in the left lung, there was a junction in the suprahillary, parahillary, and right paracardial, there was a thickening of the left hilum, the trachea was pulled to the right, the right costophrenic angle was hindered by the junction, right diaphragm was hindered by the junction, and there were no abnormalities in the bone. X-ray examination of the right lateral decubitus chest showed fluid displacement from inferior to lateral cranial. The two photographs suggest the presence of miliary pulmonary TB, atelectasis on superior lobe of the right pulmonary, and right pleural effusion.

Based on the anamnesis, physical examination, and supporting examinations, several diagnoses were concluded, namely miliary pulmonary TB, right pleural effusion, right lung superior lobe atelectasis, and malnutrition of condition V type marasmus. Procedures given to patients includes therapy with intensive phase anti-tuberculosis (OAT) drugs and a number of vitamins. Monitoring of vital signs and medication adherence was also carried out.

### III. DISCUSSION

Tuberculosis (TB) is a disease that occurs due to a contagious infection caused by systemic *Mycobacterium tuberculosis* that can affect almost all organs of the body, with the most infected location being the lungs which is usually the location of the primary infection. During the incubation period, lymphogenous and hematogenous spread may occur.

In the spread of lymphogens, the bacteria spread to the regional lymph nodes to form a primary complex. Whereas in the spread of hematogen, TB bacteria enter the blood circulation and spread throughout the body. This haematogenous spread throughout the body will cause acute clinical manifestations of TB disease, which is called disseminated TB (4,6,13). This disseminated TB occurs 2-6 months after infection occurs. The onset of the disease depends on the number and virulence of circulating TB bacteria and the frequency of recurrent spread. Disseminated tuberculosis occurs due to inadequate host system in addressing TB infection, for example in infants. Meanwhile, the term miliary tuberculosis itself comes from the description of disseminated lesions that resemble millet seeds. In anatomic pathology, this lesion is a yellow nodule 1-3 mm in size, which is histologically a granuloma (14,15).

Clinical manifestations that can be shown by TB sufferers are weight loss for no apparent reason or body weight does not increase in 1 month with nutritional management, anorexia with failure to thrive, prolonged subfebrile fever (more than 2 weeks) and / or recurring without apparent reason, it may also be accompanied by night sweats, enlarged superficial lymph nodes that are not painful and usually multiple, cough for more than 3 weeks, malaise and persistent diarrhea that does not resolve with treatment (16).

In this 8-year-old male patient, several symptoms were found in the form of shortness of breath for 6 months before he was admitted to the hospital, which occurred continuously and got worse, followed by a cough with thick yellow sputum with a history of coughing up blood once, body heat was getting higher for 3 months, and since the last 3 weeks the patient often shivered in the middle of the night. Decreased appetite and frequent vomiting when given food which caused the patient to lose weight. Weight loss was also accompanied by diarrhea for 1 month before being admitted to the hospital. Based on these symptoms, the patient showed general symptoms or non-specific symptoms of TB in children (16). Meanwhile, specific signs affecting certain organs have not been seen in this patient.

The risk factor for TB infection was having contact with another TB patient (4). In this case, the patient had a history of strong contact with another TB sufferer. Since the age of 1 year, the patient has been treated and lived at home with his grandparents. The patient's grandfather was said to be sick with TB and had died 3 years ago. In addition, another thing that can be a risk factor for TB infection is immunocompromised conditions such as malnutrition. Immunocompromised patients usually have a low immune system, so the spread of TB is easier (2,4). Judging from the patient's anthropometric data, the patient has a body weight of 16 kg and a height of 110 cm. The patient's ideal body weight should be 26 kg. From this data, according to Waterlow, it was found that the patient had malnutrition. Based on the CDC curve itself, the data on body weight for age, height for age and weight for height were all below the percentage 5. This shows that the nutritional status of patient is in the lower order compared to other children in the same age.

From the results of physical examination, on palpation, there was an asymmetrical chest movement where the right chest was left behind, the right tactile vocal fremitus decreased while the left side was normal. On auscultation, there was a faint sound in the right lung, sonor in the left lung and rales were heard on the lung examination. The results of this physical examination can show fluid in the right lung. This can be confirmed by a supporting examination in the form of a chest X-ray. The chest radiograph in this patient showed pleural effusion in the right lung. Pleural effusion itself is one of the complications of pulmonary TB which occurs due to the formation of excess fluid in the pleural cavity due to an inflammatory process that penetrates into the pleural cavity (17).

Based on the results of the history and physical examination that have been presented, the diagnosis leads to a clinical picture of specific lung infections by *Mycobacterium tuberculosis*. In establishing a working and definitive diagnosis of a TB infection, several criteria need to be met, including:

1. There is a history of contact with adult TB patients, in this case a history of contact with the patient's grandfather who has been diagnosed with TB and underwent several months of therapy but has died from the disease. A contact history can be ascertained because the patient's grandfather is someone who lived in the same house as the patient, because the patient himself was rarely cared for and directly cared for by the parents,
2. The results of the smear positive test
3. The chest radiograph that leads to TB: chest X-ray with left lung infiltrates with opacity in the right suprahilar region was obtained. In addition to the infiltrate, there was also junction in the right parahilar and paracardial space with a thickening of the left hilar. The chest radiograph of this patient also showed a small infiltrate that spread over almost the entire lung field and was described by radiologists as a miliary spot. This miliary picture in accordance with the diagnostic criteria is also a typical picture of suspected infection by TB and referred as Miliar TB Infection (18).

In this patient, superior lobe atelectasis was also suspected due to tracheal pulling to the right by the right lung parenchyma, which was suspected of having collapsed. This suspicion was also preceded by a decrease in the sound of the right pulmonary breath, a decrease in tactile fremitus and a retained right lung movement. In addition to the chest radiograph that pointed to the main picture of TB infection, there was also a picture of pleural effusion which was a complication of pulmonary TB infection. This complication is characterized by the presence of a closed pleural sinus that extends to the right diaphragm. Based on the theory, it is known that atelectasis, alveolar consolidation, interstitial density, and pleural effusion are chest features that often occur in TB patients along with miliary features that lead to the diagnosis of Miliary TB infection (5,16).

From the findings that have been described, the actual diagnosis of TB can be confirmed, but to be more certain of the diagnosis, it was better to do an examination to find the

*Mycobacterium tuberculosis* germ directly. As a third referral hospital with adequate health facilities, the diagnosis of TB can also be done by using a scoring system. The results of screening with this table in this patient showed that there was contact with TB BTA (+), namely the patient's grandfather with a score of 3, body weight / nutritional condition was similar to clinical malnutrition so that a score of 3 could be given, there was a fever for no apparent reason for more than 2 weeks with a score of 1, coughing for more than 3 weeks with a score of 1, X-rays with a typical infiltrate picture of TB infection were given a score of 3. Based on the results of this scoring, it was found that the total score of this patient was 11 points and had met the criteria for TB infection which was more than / equal to 6 points.

Evaluation of complications of the diagnosis of TB such as TB meningitis was also carried out even though clinical symptoms had not shown any lesions in the central nervous system and cerebrospinal fluid. The examination showed no abnormalities in the results of the analysis of the cerebrospinal fluid so that the diagnosis of TB meningitis could be ruled out. Complete blood counts should also be done to see the complete health status of the child, the profile of infection or the possibility of sepsis due to predisposing factors such as immunocompromise due to malnutrition, as evidenced by the emergence of miliary TB in this patient. Through a complete blood count, a high CRP value was obtained, but it was not followed by other septic marker components, thus, the diagnosis of sepsis could not be included (7,19).

TB treatment uses at least 2 types of drugs and is used for a relatively long time (6-12 months). TB treatment is divided into 2 phases, namely the intensive phase (the first 2 months) and the rest as an advanced phase. In severe TB such as miliary TB, TB meningitis, bone TB in the intensive phase, at least 4 types of drugs are given (rifampisin, INH, pyrazinamide, ethambutol, or streptomycin). Meanwhile, in the advanced phase, rifampin and INH are given for 10 months. This patient was given OAT therapy in the intensive phase in the form of Rifampin, isoniazid, pyrazinamide, ethambutol and streptomycin. Giving drug combinations like this aims to prevent drug resistance and kill intra and extracellular germs (20). Meanwhile, long-term drug administration aims to reduce the possibility of relapse. This patient was also given a combination of nebulizer salbutamol and ipratropium bromide to reduce complaints of tightness in patients (18).

Complications in tuberculosis generally occur in the advanced phase, patients without treatment or patients with relapse. This is due to the continuous development of the pathological process which increases the severity of the disease. Complications of miliary tuberculosis include pulmonary, extra pulmonary and cor pulmonale complications. Pulmonary complication can result in pleural effusions and destroyed lung. The radiological picture in this patient showed right pleural effusion and right lung atelectasis. Pleural effusion itself can occur due to a buildup of fluid due to an inflammatory process. Meanwhile destroyed lung consists of atelectasis, ectasis and pulmonary parenchymal fibrosis (21).

WHO estimates that TB is an infectious disease that causes the most deaths in children and adults. There are more deaths from TB than from malaria and AIDS (22). Death from TB can be caused by irregularity in taking medication and the emergence of complications(23). In this patient there have been complications in the form of pleural effusion and destroyed lung which can provide a prognosis that leads to unfavorable conditions.

#### IV. CONCLUSION

TB in children is a very complex disease and often causes various complications that endanger children. The definitive diagnosis of TB in children is often difficult, thus a scoring system is used as a screening test. Apart from complications, irregularity in taking medication can also affect the incidence of TB death in children, therefore, TB drugs in children are given every day to reduce the irregularity in taking medication. The high number of TB deaths in children making efforts to prevent TB in children is an important thing to do: one of which is by doing the BCG immunization.

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