


Stunting in a Child with Pulmonary Tuberculosis and Iron Deficiency Anemia

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ABSTRACT

Background: Stunting is defined as low height-for-age caused by chronic or recurrent undernutrition. Undernutrition is the leading risk factor for tuberculosis (TB) globally. It is usually associated with poverty, poor maternal health and nutrition, frequent illness and/or inappropriate feeding and care in early life. Stunting prevents children from reaching their physical and cognitive potential, so appropriate management is needed. **Case:** A 4 year-old girl was referred with breathing difficulty since 2 weeks accompanied with decreased appetite and weight. She was in normal weight for age but severely stunted and suggestive TB. Blood study result showed anemia with Mentzer index >13. Bone age showed the age of 3 years and below chronological age. Management was focused on TB, nutritional, and anemia treatment. **Conclusion:** Nutritional assessment should be integrated into standard TB care and also simultaneously treat iron deficiency anemia.

Keywords: Stunting, pulmonary tuberculosis, iron deficiency anemia.

ABSTRAK

Latar belakang: *Stunting* didefinisikan sebagai tinggi badan rendah untuk usia yang disebabkan oleh kekurangan gizi kronis atau berulang. Kekurangan gizi merupakan faktor risiko utama tuberkulosis (TB) secara global; biasanya dikaitkan dengan kemiskinan, kesehatan, dan gizi buruk ibu, serta sering sakit dan/atau pemberian makan dan perawatan yang tidak tepat pada masa awal kehidupan. *Stunting* menghambat anak untuk mencapai potensi fisik dan kognitifnya, sehingga perlu tata laksana yang tepat. **Kasus:** Seorang anak perempuan berusia 4 tahun dirujuk dengan kesulitan bernapas disertai berat badan turun dan nafsu makan menurun. Pada pemeriksaan fisik didapatkan berat badan terhadap tinggi badan normal, namun sangat pendek dan sugestif TB. Sampel darah menunjukkan anemia dengan indeks Mentzer >13. Usia tulang 3 tahun di bawah usia kronologis. Tata laksana pasien difokuskan pada pengobatan TB, perbaikan gizi, dan anemia. **Simpulan:** Penilaian gizi harus diintegrasikan ke dalam perawatan TB standar dan secara bersamaan mengobati anemia defisiensi besi. **Asterisa Retno Putri, Runi Arumndari, Claudia Natasha Liman, Made Ratna Dewi. *Stunting* pada Anak dengan Tuberkulosis Paru dan Anemia Defisiensi Besi.**

Kata Kunci: Stunting, tuberkulosis paru, anemia defisiensi besi.

INTRODUCTION

Indonesia is still facing nutrition problems, such as energy and protein deficiency (PEM), which causes stunting. Based on data from the Indonesia Ministry of Health in 2021, 24.4% of children under five years old were stunted.[1] Stunting often goes unrecognized in communities where short stature is so common that it is considered normal.[2]

Nutritional status is an important factor in the occurrence of infectious diseases, including tuberculosis (TB). The body is able to fight infection well with adequate nutrition; a child's past nutritional status determines their ability to fight TB. Well-nourished children are able to prevent the spread of disease. However, undernourished children, including stunted children, may develop lung disease with extensive cavities at an early age. In a population with a high BTA-positive TB case rate, children will risk TB; it is highest at the age of less than 3 years.[3]

Stunting prevents children from reaching their physical and cognitive potential. A child may also develop iron deficiency anemia due to a lack of nutritious food; anemia may affect their cognitive performance and physical growth. Anemia and stunting are multiple overlapping influencers.[4]

CASE

A 4-year-old girl was referred to Wangaya General Hospital with breathing difficulties for 2 weeks. It was preceded by a cough for 6 months and increasingly aggravated. The parents also said that the patient's weight was decreasing along with a decreased appetite, and there was also vomiting that accompanied the cough. No information of confirmed TB or history of chronic cough in the family. The patient was delivered by spontaneous labor, at a weight of around 3000 grams and a length of 50 cm, with no abnormal developmental history; immunizations were completed.

Examination at the emergency room showed body weight 12 kg and body height 93 cm. Temperature 36.3°C, pulse rate 95 beats/min, respiratory rate 38 times/min, and oxygen

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saturation 98% with low flow 2 liters/min oxygen support. The patient was underweight with weight for age between -2 and -3 SD, severely stunted with height for age below -3 SD, and normal interpretation of weight for height between -1 and 0 SD. The age of weight (27 months) of this patient is below the age of height (33 months) and chronological age (54 months old).

There was intercostal retraction during respiration, rhonchi in both basal lungs, and multiple bilateral lymphadenopathy coli with a size of 2-3 cm. Laboratory tests showed leukocytes 11.060/µL, hemoglobin 10.3 g/dL, hematocrit 30.4%, platelet count 551,000/µL, MCV 74.7 fL, MCH 25.3 pg, and MCHC 33.9 g/L. The diagnoses were pneumonia and probable stunting because the age for weight and age for height is below the chronological age despite normal interpretation of weight for age.

The medications were ceftriaxone 350 mg IV twice a day, dexamethasone 4 mg IV every 8 hours, ipratropium bromide inhalation 0.52 mg every 6 hours, and ambroxol syrup 7.5 mg three times a day. The patient was discharged on the 7th day with an improving condition.

Four days later, at follow-up in the pediatric clinic, the patient still has a cough and lymphadenopathy. The tuberculin test resulted in induration >10 mm, a radiological examination found a suggestive TB (**Figure 1**), and the thyroid examination showed a normal result. Blood studies showed iron deficiency anemia with elevated TIBC, normal serum iron and ferritin, and a Mentzer index of 18. Bone age showed the age of 3 years and below to chronological age, indicating stunting.

Management focused on TB and nutritional treatment; the patient received age-appropriate fixed drug combinations for TB containing rifampicin 75 mg, isoniazid 50 mg, and pyrazinamide 150 mg every 12 hours and nutritional counseling; this patient's calorie requirement is 1300 kcal, with a protein energy ratio (PER) of 15% of animal protein. The patient will be observed every month for 6 months. After 4 months, the height became 97 cm, and the height-for-age z-score was increased to between -2 SD and -3 SD; an iron supplement was added.

DISCUSSION

Stunting is difficult to assess since this examination was not always performed in detail in many public health facilities, and many children were lost to follow-up. Stunting can be confirmed if the height for age is below -2 SD. accompanied by chronic undernutrition: the age of weight is below the age of height and chronological age, using the diagnosis pathway shown in Figures 1 and 2.[5]

This case was confirmed as stunting (**Figure 1**): age of weight (27 months) is below age of height (33 months) and chronological age (54 months old), and the bone age was below the chronological age, with no red flag in anamnesis and physical examination, and showed normal weight for age (<+1 SD) (**Figure 2**). The initial evaluation represents no disproportion, such as skeletal dysplasia or pathological abnormalities of postnatal condition; confirmed TB with weight for height <+1 SD suggests nutritional problems and organic causes.

TB in children represents almost 10 percent of all TB cases in Indonesia in 2021.[1] Tuberculosis can be confirmed by the TB score index (**Table**) or the gold standard of mycobacterium culture, but cultures were difficult due to a lack of facilities in certain areas.[6]

This patient had persistent cough, prolonged fever, lymphadenopathy, suggestive TB in X-ray, and induration from the tuberculin test; the score was more than 6, an indication of TB.

In a study by Nurwitasari and Wahyuni (2015), 79.2% of tuberculosis children were in poor nutritional status.[7] Jahiroh and Prihartono

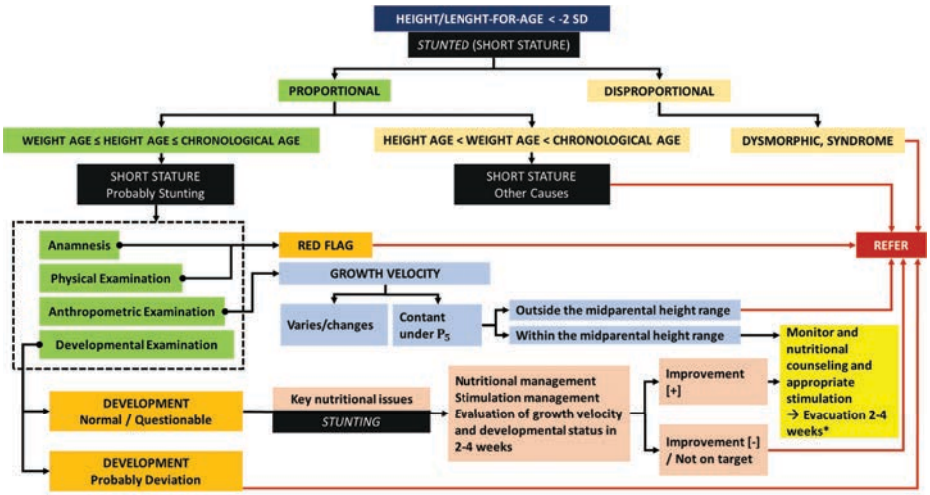

Figure 1. Pathway for diagnosis and management of stunting.[5]

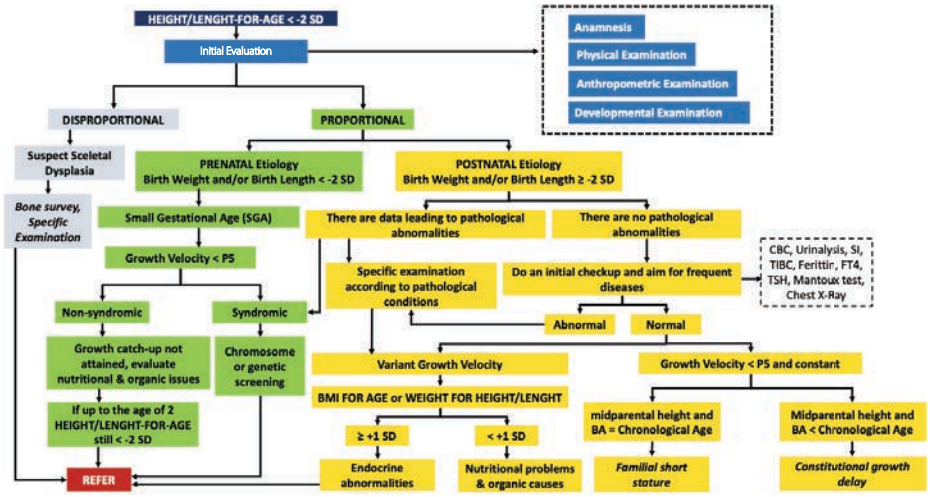

Figure 2. Pathway for diagnosis and management of stunting.[5]


Table. Scoring for tuberculosis diagnosis.[6]

Variable	0	1	2	3
Household Contact	Unknown		Contact with smear negative TB patient or unknown sputum smear result	Contact with smear positive TB patient
Tuberculin skin test	Negative			Positive (> 10mm, or in immunocompromised children > 5mm)
Nutritional State		BW/age < 80%	Severe malnutrition (BW/age < 60%)	
Fever or unknown origin ≥ 2 weeks		Present		
Cough ≥ 3 weeks		Present		
Lymph node (cervical, axillary, inguinal) enlargement		Multiple, nontender, diameter ≥ 1 cm		
Join swelling (knee, phalanges)		Present		
Chect X-Ray	Normal	Suggestive of TB		

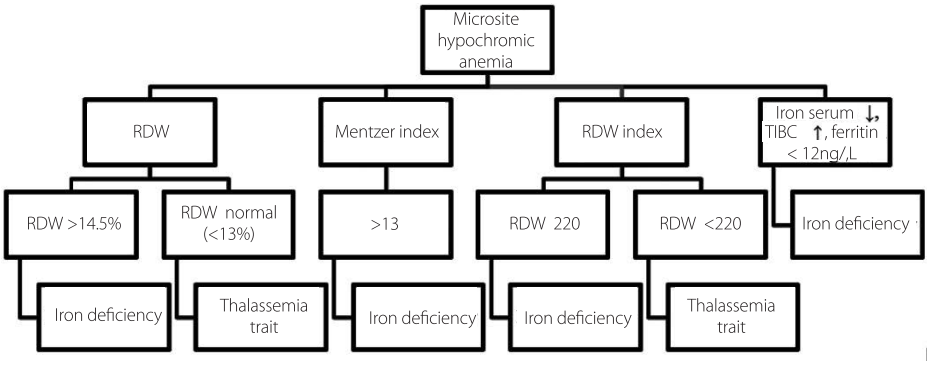

Diagram. Diagnostic pathway for anemia.[8]
Abbreviations: RDW: Red blood cell distribution width; TIBC: Total iron binding capacity.

(2013) mentioned that out of 98 toddlers with tuberculosis, 25 were stunted, 14 severely stunted, and 59 had normal nutritional status. Toddlers with stunting have a 2.96 higher risk to have TB as compared to toddlers with normal nutritional status, and toddlers with severely stunted nutritional status have an 8.18 higher risk to have TB.[9]

This patient also has microcytic hypochromic anemia, confirmed as iron deficiency anemia (Mentzer index >13). The management of anemia is through better nutrition, simultaneous with the management of stunting. Anemia can be grouped into two broad categories: nutritional anemia and anemia caused by disease or disorder.[10] Nutritional anemia has a variety of causes, including deficiencies of iron, vitamin B12, and folate, whereas anemia caused by disease or disorder can be chronic and hereditary or an acute response to a disease state.[8] Iron deficiency anemia can be diagnosed using the pathway (**Diagram**).

The efficient use of resources targets the shared causes to eliminate various forms of malnutrition simultaneously.[11] It is necessary to tackle both nutritional deficiency and anemia simultaneously under the same program.[12]

CONCLUSION

Undernutrition, such as stunting, is associated with many diseases, including TB and anemia. Nutritional assessment should be integrated into standard care based on the underlying disease.

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AUTHORS CONTRIBUTION

Asterisa Retno Putri was involved in concepting, designing, literature search, and data analysis. Runi Arumndari and Claudia Natasha Liman were involved in the literature search. Made Ratna Dewi in supervising the manuscript. All authors prepare the manuscript and agree for this final version of the manuscript to be submitted to this journal.

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None.

CONFLICT OF INTEREST

There is no conflict of interest between the authors.

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