

Current Intake and Infection Status were not Good Predictive Factors of Stunting among Children Aged 6-59 Months in Babakan Madang Sub-District, Bogor District, West Java, Indonesia

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Abstract

This study aims to discover the prevalence of stunting and determine the associations between the history of pulmonary tuberculosis disease with the prevalence of stunting among children under five years of age (6-59 months) in Babakan Madang Sub-District, Bogor District 2019. This study uses a cross-sectional design with a quantitative approach. The sample in this research was 194 children under five obtained by cluster sampling. Data collection was conducted through May 2019. The data collection process includes anthropometric measurements using calibrated microtoise and digital length board, dietary assessment using 1 x 24-h food recall, and a self-administered questionnaire. Data analyses were performed using the chi-square test and independent t-test. The result of this study shows that 35.6% of children under five are being stunted ($HAZ \leq -2.00$). The risk factor with a significant correlation with stunting is history of pulmonary tuberculosis disease (p-value 0.044), although careful interpretation is needed in this result due to the limited number of observed cases. However, this study recommends pulmonary tuberculosis disease prevention and improve nutritional education.

Keywords: stunting, children under-five, pulmonary tuberculosis disease

Abstrak

Penelitian ini bertujuan untuk mengetahui besaran prevalensi stunting dan membuktikan hubungan antara riwayat penyakit TB paru serta faktor lainnya dengan kejadian stunting pada balita umur 6-59 bulan di Kecamatan Babakan Madang Kabupaten Bogor Tahun 2019. Penelitian ini menggunakan desain studi cross-sectional dengan pendekatan kuantitatif. Sampel pada penelitian ini berjumlah 194 balita yang didapat dengan cara cluster sampling. Pengambilan data dilakukan selama bulan Mei 2019. Proses pengambilan data meliputi pengukuran antropometri menggunakan microtoise dan digital length board yang telah divalidasi, wawancara food recall 1x 24 jam, dan pengisian kuesioner. Analisis data dilakukan dengan uji chi-square dan independent-t. Hasil penelitian ini menunjukkan terdapat 35,6% balita stunting ($Z\text{-score PB/U atau TB/U} \leq -2,00$). Faktor risiko yang memiliki hubungan signifikan dengan kejadian stunting adalah riwayat penyakit TB paru, meskipun hasil ini memerlukan kehati-hatian dalam interpretasi mengingat sangat terbatasnya jumlah kasus TB paru yang diobservasi. Meskipun demikian, studi ini merekomendasikan upaya pencegahan terhadap penyakit TB paru dan peningkatan edukasi gizi.

Kata kunci: stunting, balita, riwayat TB paru

Introduction

Stunting, as an indicator of chronic malnutrition, reflects a failure in attaining a child's potential linear growth (1). Stunting has been associated with some serious health and social problems as risks, such as morbidity, deprived immune functions, and non-communicable diseases (2-4). The prevalence of stunting in Indonesia in 2018 showed about 30.8% of children were being stunted (5). This number is considered 'high' based on the threshold of public health problems for stunting by WHO (6). Regarding this situation, the Indonesian government has then made stunting one of the issues to be solved by prioritizing 100 districts/towns with a high burden of stunting to be given interventions, and Bogor District is one of them (7).

Pulmonary tuberculosis, as an infectious disease, has a reciprocal relationship with malnutrition in a form of a vicious cycle, which can lead to stunted growth (8). Research on the relation between pulmonary tuberculosis disease in children and stunting is very limited. Most studies reported malnutrition as a risk factor for TB disease, yet there are limited studies or literature investigating TB disease as a risk factor of malnutrition. An overview had highlighted TB as a specific infection that has a high impact on nutritional status, yet it mentioned that more research is needed regarding the relation of this specific infectious disease with malnutrition (9). Furthermore, a systematic review on research topics in TB does not mention any single study on the role of nutrition in the primary prevention of TB (10). Even so, the impact of TB, such as anorexia, vomiting, cough, fever, and weight loss, could rationally lead to stunted growth, given the time of TB treatment is 6 months by minimum (9,11).

This study aims to examine the associations between history of pulmonary TB disease and other factors with stunting in children aged 6-59 months. Regarding the very limited previous research on this topic, this study also aims to give a result that could be used as a starting reference for further research on this topic.

Methods

This study was a cross-sectional conducted through May 2019 in Babakan Madang Sub-District, Bogor District. Any children aged 6-59 months and their mother/caregiver that was willing to participate in this study were selected from 6 of 9 sub-districts using the cluster sampling method. The sample size was calculated using Z-Test difference between 2 proportions formula. The minimum number of samples taken by the researcher is the highest number of samples from the calculation results ($n = 38$). The minimum number of samples is multiplied by two and then by the design effect (def) of 2 (two) to increase the efficiency of the number of samples because the sampling technique used is cluster sampling. The final sample size obtained was 152 toddlers. 10% of the total amount to anticipate respondents dropping out during data collection was added to the sample result ($n=167$).

The sample result was 167 respondents. Some of the subject's inclusion criteria were, among others, residing in the selected village, each child from a different family head, and being the youngest child. Meanwhile, the exclusion criteria are children who have physical abnormalities that affect body length or height. A total of 194 respondents participated in this study as the actual subject. Length measurement data of the children were collected using a digital infantometer and microtoise

with a precision of 0.1 cm. The data collected were later compared with WHO Child Growth Standards. A child will be considered stunted when the HAZ is <-2.00 SD.

The data collection officer in this study is the researcher herself with the help of thirteen students, consisting of four undergraduate students and seven magister students of the Nutrition Study Program Faculty of Public Health who participated in the collaborative research. Researchers were divided into two groups, each containing seven people. One person is in charge of screening every mother of toddlers who come to Posyandu based on the inclusion and exclusion criteria, two people were in charge of measuring anthropometry of children (body weight and body length), and the remaining three people were in charge of carrying out interview and recall intake. To minimize the bias of measurement done by multiple operators, the operators were properly trained and used standardized and calibrated instruments.

Data on the history of pulmonary TB disease and other factors (history of diarrhea disease, history of ARI disease, hand-hygiene practice, vitamin A supplementation, completion of basic vaccinations, and demographic characteristics) were collected through interviews using questionnaires. Dietary assessments to collect the energy, protein, and zinc intake were collected using 24-hour food recall (1x24 hours).

Buku Foto Makanan (Porsimetri) by Indonesia Ministry of Health was used as a portion guide to minimize bias related to food recall. The data categorized was analyzed using SPSS v.22 and WHO Anthro 2005. Chi-square analyses were used to find any significant association between each independent and dependent variable.

Results

This study included 194 children aged 6-59 months in 6 sub-district of Babakan Madang Sub-District, Bogor District. 30.9% of the children were within the age group of 12-23 months old. Most of the children's families in this study received income below Rp3,760,000. Further information on demographic characteristics is provided in Table 1.

Results showed 35.6% of children were stunted, and 1.5% of children had a history of pulmonary TB disease. 69.6% of the children were being insufficient zinc intake. Further information on variables is provided in Table 2.

Bivariate analyses showed a significant association between history of pulmonary TB disease and stunting p -value of 0.044 (p -value <0.05). Table 2 provides further information on bivariate analyses. Since only one significant association was found, multivariable analyses were not conducted.

Table 1. Frequencies of children aged 6-59 months based on demographic characteristics

Variables	n = 194	
	n	%
Age groups		
6-11	45	23.2
12-23	60	30.9
24-35	34	17.5
36-59	55	28.4
Biological sex		
Male	105	54.1
Female	89	45.9
Maternal education level		
Basic	150	77.3
Middle	43	22.2
High	1	0.5
Paternal education level		
Basic	116	59.8
Middle	66	34.0
High	12	6.2
Family income		
< Rp3,760,000	128	66.0
≥ Rp3,760,000	66	34.0

Table 2. Bivariate analyses and stunting among children aged 6-35 months

Variable	HAZ				p-value
	Stunted		Not stunted		
	n	%	n	%	
History of Pulmonary TB Disease					
Yes	3	100.0	0	0.0	0.044*
No	66	34.6	125	65.4	
History of Diarrhea Disease					
Yes	18	36.0	32	64.0	1.000
No	51	35.4	93	64.6	
History of ARI Disease					
Yes	37	37.0	63	63.0	0.779
No	32	34.0	62	66.0	
Energy intake					
Inadequate	43	36.4	75	63.6	0.870
Adequate	26	34.2	50	65.8	
Protein intake					
Inadequate	41	33.9	80	66.1	0.634
Adequate	28	38.4	45	61.6	
Zinc intake					
Inadequate	46	34.1	89	65.9	0.621
Adequate	23	39.0	36	61.0	
Hand-Hygiene Practice					
Not good	29	32.6	60	67.4	0.517
Good	40	38.1	65	61.9	

Variable	HAZ				p-value
	Stunted		Not stunted		
	n	%	n	%	
Vitamin A Supplementation					
Not given	9	28.1	23	71.9	0.447
Given	60	37.0	102	63.0	
Completion of Basic Vaccination					
Not completed	37	34.3	71	65.7	0.585
Completed	31	39.2	48	60.8	
Maternal Education					
Basic	53	35.3	97	64.7	0.739
Middle	16	15.3	27	62.8	
High	0	0.0	1	100.0	
Paternal Education					
Basic	44	37.9	72	62.1	0.338
Middle	23	34.8	43	65.2	
High	2	16.7	10	83.3	
Family Income					
< Rp3,760,000	51	39.8	77	60.2	0.115
≥ Rp3,760,000	18	27.3	48	72.7	

Discussion

This study showed that 35.6% of children aged 6-59 months are stunting, higher than both national and province prevalence of stunting. Regarding the WHO thresholds for public health problems, the stunting prevalence of this population could also be classified as 'very high' ($\geq 30\%$). This very high problem magnitude implies the urgency for handling and preventing stunting problems in the Babakan Madang Sub-District. It is also associated with poor socio-economic conditions, the possibility of early and repeated exposure to diseases, and improper feeding practices in these populations. The prevalence of stunting in this population is highest in the age group of 36-59 months, and males than the counterparts.

As we can see from Table 2, variables like energy intake, protein intake, zinc intake, history of ARI did not give significant results. This means current dietary intake and history of

infections were not good predictive factors of stunting in children 6-59 months in this study area. Although the history of TB is significantly different among stunted and non-stunted children, the data should be carefully interpreted because the number of children with history of pulmonary TB disease was only 3 (three).

Pulmonary TB as an infectious disease has a major influence on nutritional status due to decreased appetite, anorexia, and vomiting. It also causes long fever, which lead to an increase in the nutritional needs of children. In addition, the treatment for pulmonary TB is a long process (6 months by minimum). During this period, a lack of intake in pediatric pulmonary TB patients will affect their body weight and height (9).

A similar study by Madanijah and Triana (2006) showed a significant correlation between the historical nutritional status of children and the incidence of TB in kindergarten children

(19). The lower the historical nutritional status of the children (using the anthropometric index of height according to age), the greater the risk of TB compared to children with normal nutrition.

One of the possible factors affecting the result of pulmonary TB association with stunting prevalence is the possibility of early and repeated exposure to diseases that causes a change in body weight and height.

According to Crofton, children have immature immune system. Immunity also decreases if the child suffers from malnutrition (12). In these children, primary infection can immediately be followed by miliary tuberculosis and TB meningitis. Of all people infected with TB, about 10% will develop TB disease, depending on the number of TB germs inhaled and the immune system of the infected person (a person's resistance). Initially the patient's defenses can control TB. However, after months or years, the defenses may weaken, due to malnutrition or other diseases, then TB disease begins to spread in the lungs. Stunted under-fives can reduce children's immunity and make children more susceptible to TB germs. Untreated TB in children can also lead to impaired nutritional growth.

Apparently, this association was also found in a study in India. India is one of the countries with the highest burden of TB in the world, accounts for approximately one fifth of the global incidence. Studies point the role of various social, behavioural, economic and environmental factors like undernutrition, indoor air pollution, smoking and alcohol addiction, ignorance and poverty as barriers to complete elimination of TB (13-17). Of these, undernutrition is the single most important predisposing factor for TB in India. It is in line with our study results.

With the association of history of pulmonary TB and stunting found in our study, future research could explore more on the possible factors of the association and propose possible interventions according to it.

Conclusion

Current dietary intake and history of infections were not good predictive factors of stunting in children 6-59 months in Babakan Madang Sub-District, Bogor District, West Java, Indonesia. With the limitation of our cross-sectional study design, hopefully future research could explore other study design such as cohort to provide better picture through time. Meanwhile, our study found history of pulmonary TB disease to be associated with stunting in children aged 6-59 months with precaution. Given the observed associations, prevention of pulmonary TB disease in children should still be a concern. The intervention programs include detecting TB infection, identifying children at high risk of disease progression, implementing treatment of infection, and support from other stakeholders like TB activist and Ministry of Health.

Ethical Clearance

Ethical clearance has been reviewed and released by Ethical Committee of Faculty of Public Health, Universitas Indonesia, issued from May 6, 2019 (No. 257/UN2/F10/PPM.0002/2019).

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