



STUNTING AND ANEMIA ARE ASSOCIATED WITH COGNITIVE ABILITIES IN PRIMARY SCHOOL CHILDREN

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ABSTRACT

Background Stunting and anemia in children are still a serious problem in Indonesia. Stunting was related to cognitive function in children. In addition, anemia is also associated with that function.

Objective To analyze the relationship between stunting and anemia with cognitive ability in primary school children in Sikapas village, Sumatera Utara.

Methods A cross-sectional study was performed in Sikapas Village, Sumatera Utara, from March 2016 until April 2016. The population in this study was primary school children in SD Negeri 384, Sikapas vilage. Stunting was assessed by CDC curve with the percentile height of body per age below the 3rd percentile. Anemia as if Hb less than 12 mg/dl. Cognitive ability was examined by psychologist using Weschler IV substest. Processing and data analysis was conducted using SPSS 18.0 for windows with a significance level of $p < 0.05$.

Results Fifty four percents of student following the study suffered stunting, most students did not suffer anemia (55.2%) and 49.4% have impaired cognitive ability. Bivariat analysis showed that there was a statistically significant relationship between stunting and cognitive ability in children (p value = 0,023 and OR = 2,992), while there was no statistically significant relationship between anemia and cognitive ability in children (p value = 0,598 and OR= 1,379).

Conclusion It can be concluded that there was relationship between stunting with impaired cognitive ability.

KEYWORDS : *Stunting, anemia, cognitive ability, primary school children*

INTRODUCTION

Stunting prevalence in Southeast Asia in 2015 was 26.3%.¹ According to UNICEF (United Nation Children's Fund) in 2016 showed that stunting prevalence in children below 5 years old in Indonesia at 2013 was 33 % in cities and 42 % in countryside.² According to *Ikatan Dokter Anak Indonesia (IDAI)* in 2016, Indonesia become the fifth place of the highest stunting prevalence in the world.³

Stunting was disturbance linear growth causes by chronic malnutrition and or chronic infection or recurring shown by the z-score height/age < -2 SD according to World Health Organization (WHO).⁴ Chang, et al, 2010, showed that stunting in early childhood related with the lack of fine motor works like movement of fingers and hand, hence the children will has more risk to be lower in cognitive and academic.⁵

Children with anemia also one of the factor that can cause growth disturbance, decrease of cognitive function, fine psychomotor, gross psychomotor, and language development compare to children that are not anemic.⁶

METHODS

This study was approved by the Health Research Ethical Committee, Medical Faculty of University of Sumatera Utara/Haji Adam Malik General Hospital, Medan, North Sumatera. An analytic observational study with a cross sectional design was performed at elementary school in Sikapas village, Muara Batang Gadis, Mandailing Natal district, North Sumatera from March 2016 to April 2016. The inclusion criteria were children that agreed to be checked anthropometry, haemoglobulin, and intelegent quotient. The exclusion criteria were children with vertebrae deformities, children with central neurology problems, children with severe disease that cannot follow cognitive function test, and children with symptomatic congenital disease (such as cardiac abnormalities etc). Informed consent was obtained from all parents of the subjects prior to subject enrollment.

Characteristics of the subjects including sex, age, nutritional status, and cognitive function test. The anthropometry was

measured for each subject with Camry wight and height scales. The nutritional status of the subjects were plotted according to weight for length chart from CDC 2000 growth chart for subjects 5-18 years old. The haemoglobin test was performed with haemoglobin strip tes that only shown anemia (Hb < 12gr/dl) or not anemia (Hb > 12gr/dl). The cognitive function test was performed with Wechsler Intelligence Scale for Children IV (WISC-IV) tools test.

Data was analyzed with few steps. The first step was analyzed to see the distribution and frequency of every variable. The second step was multivariate, Chi-square test with by SPSS Statistics ver. 18.0. Statistical significance was considered at P value < 0.005.

RESULT

There were 87 children with average age 10,45 years old, and 56,3% were boys and 43,7% were girls. In 87 children, there were 54% with stuntinf condition. The haemoglobin showed that 55,2% of the childred were not anemic. The cognitive test was shown on table 1. After classified, there were 44 children (50,6%) with normal cognitive test and 43 children (49,4%) with lack in cognitive.

From table 2, achieved that in 47 children with stunting, 61,7% children had cognitive disturbance 38,3% did not have cognitive impairment. In children with no stunting, 65% did not have cognitive impairment and 35 % had cognitive impairment.

Tabel 1. Children Cognitive Test

	Children Cognitive Function	N	%
1	Mental Defective	14	16,1
2	Borderline	29	33,3
3	Low Average	21	24,1
4	Average	21	24,1
5	High Average	1	1,1
6	Superior	1	1,1
	Total	87	100,0

Tabel 2. Relation of Stunting with Children Cognitive Function

Stunting	Cognitive disturbance				Total		OR (95% CI)	P*
	Yes		No		N	%		
	n	%	N	%				
Yes	29	61,7	18	38,3	47	54,0	2,992 (1,246 -7,187)	0,023
No	14	35,0	26	65,0	40	46,0		
Total	43	49,4	44	50,6	87	100		

*chi-square test

In bivariate analysis between stunting and cognitive function, the p value= 0.023 that can be concluded that there was significant difference between them means that the children in normal height status are better in cognitive function. The Odds Ratio was= 2.992 means that in children with stunting had 2.992 times the risk to have cognitive impairment compare to normal height children.

From 39 children with anemia, 53.8% had cognitive impairment and in 48 without anemia there were 54,2% that had cognitive impairment as shown in table 3. Bivariate analyzed was done and the p value= 0.598 so there is no significant difference between anemia and the impairment of cognitive.

Table 3. Relation of Anemia With Children Cognitive Function

Anemia	Cognitive Impairment				Total		OR (95% CI)	P*
	Ya		Tidak		N	%		
	N	%	N	%				
Ya	21	53,8	18	46,2	39	44,8	1,379 (0,591 -3,219)	0,598
Tidak	22	45,8	26	54,2	48	55,2		
Total	43		44		87	100		

*chi-square test

DISCUSSION

Stunting was indicator of problem in children nutrition causes by chronic malnutrition relate with environment and socioeconomic status.^{4,7} Stunting prevalence in Southeast Asia on 2015 was 26.3%.¹ The children in Sikapas elementary school that suffer from stunting was 54%. Anemia prevalence on the world was 47.4% or around 300 millions children suffer from anemia.⁸ in this study reported that 44.85% of the sample that had anemia.

This study reported that in 47 children that had stunting majority had cognitive impairment that is 61,7% with p value= 0.023% with OR 2.992%. this was in line with other study by Suvarna and Itagi, 2008, that found children with stunting had inferior IQ and mentally retarded in positive correlated by statistic.⁹ Pradita, 2009, also showed that there are significant correlation between IQ score in elementary school children.¹⁰ In Wonogiri on elementary school children age 9-12 years old showed that children with stunting had 9.2 risk of getting IQ score below average, and average achievements.¹¹

If intake was inadequate, children's body will limit the social activity and cognitive growth, and the limit the energy for overall growth.¹² Stunting was related with under-developed brain with dangerous consequences with lack of mental ability and capability of learning, lack of school performance, increasing of nutritional risk such as chronic disease, such as diabetes, hypertension, and obesity in future days.¹³ There was combination of inadequate nutrition with unsupported environment maybe disrupts the cognitive development on poor children.¹⁴

In this study 39 children with anemia, 53.8% had cognitive impairment and in 48 without anemia there were 54,2% that

had cognitive impairment as shown in table 3. Bivariate analyzed was done and the p value= 0.598 so there is no significant difference between anemia and the impairment of cognitive. This was differ with Kordas, et al, 2004, where he found children with anemia with Hb <12 g/dl worse to done number sequencing compare to that was not anemic (P=0,004). Zulaekah, et al, 2014 explained that children with anemia had low fine motor, gross motor score, and language development compare to children with no anemia.⁵ Carter, et al, 2010 and Jauregui, Lobera, 2014 was support iron deficiency anemia can cause deficit in cognitive function.^{8,15}

Iron was needed to form haemoglobin, an essential protein to bind oxygen. Therefore, if iron was decrease, organs and tissues cannot get adequate oxygen and causes fatigue, decrease of performance, and immunity. Inadequate iron that not treated can cause serious problem like delay of growth and cognitive development.¹⁶

In early life, brain, muscle and skeleton of babies was growing so fast. 95% brain was develop in first 3 years of life. Several essential nutrient for example amino acid and iron was highly needed for formation of synaps and neurotransmitter dan affect the speed of mind response.⁵

Lack or excess of nutrient in age 0-2 years, commonly irreversible and will impact on short-term and long-term life.⁵ lack of nutrition affect brain area dan included for cognition, memor, and locomotor skills. Brain need energy especially in early children and most of cerebri development happened in the first two years of life. Although the correlation of bad linear growth and impairment of neuro development was not yet understand very well.³

Limitation of this study was the sample was not as much as other studies so can gave different interpretation. This study also only measure the hemoglobin with only Hb test trip, this can make bias in anemia result. Our study does not assessed the effect of socioeconomic parenteral education, and environment hygiene on the subject cognitive test.

Conclusion of this study was, that the stunting can affect cognitive function, making it lower than the children with no stunting. But anemia did not proof to have effect on cognitive problems. Further studies on cognitive problems on stunting and anemia are needed.

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