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Levels of C-Reactive Protein (CRP) in Stunting and Non Stunting Tolls Age 36-60 Months

Rasmar Yanti
Midwifery Study Program, Graduate School Hasanuddin University, Makassar, Indonesia
Corresponding author email: yantir18p@student.unhas.ac.id

Andi Wardihan Sinrang
Department of Physiology, Faculty of Medicine, Hasanuddin University, Makassar, Indonesia
Email: wardihans@gmail.com

Aminuddin
Department of Nutrition, Faculty of Medicine, Hasanuddin University, Makassar, Indonesia
Email: aminuddin01@gmail.com

Abstract---*This study aims to identify serum levels of C-Reactive Protein (CRP) in stunting and non-stunted toddlers. This research was conducted using the cross-sectional method. Sampling was done randomly and obtained 60 respondents. The questionnaire material consisted of data on the mother's education, family income, birth weight, birth length, infection history, and history of exclusive breastfeeding. Nutritional status was determined using the Z-score and examination of CRP (C-Reactive Protein) levels using ELISA (Enzyme-Linked Immunosorbent Assay). The median value (minimum-maximum) for stunting toddlers is 0.55 (0.26-0.79) mg/L and the median value (minimum-maximum) for non-stunted toddlers is 0.30 (0.13-0.75) mg /L.*
Keywords---*CRP, stunting, toddler age 36-60 months.*

Introduction

According to the World Health Organization (WHO), stunting is one of the problems of malnutrition caused by deficiency, excess, or imbalance in nutritional intake. Stunting or short stature is a growth disorder characterized by a mismatch between height (TB) and age with a threshold (Z-score) less than -2 Standard Deviation (SD). WHO estimates that 159 million children under five years of age experience stunted growth. WHO also predicts that 175 million children in developing countries are malnourished based on weight data for age, and around 230 million are stunted in terms of height by age (World Health Organization, 2016). According to the United Nations Children's Fund (UNICEF) through the State of the World's Children 2019 report: Children, Food and Nutrition, it is stated that 50% of children under five in Indonesia are malnourished (UNICEF, 2019). Toddlers suffering from acute severe malnutrition and severely malnourished children are at 5-20 times greater risk than children with good nutrition. Reducing stunting is the first of the 2025 Global Nutrition Targets (Hall Moran, 2007; De Moura et al., 2008).

The prevalence of stunting in Indonesia is higher than other nutritional problems such as wasting or underweight, overweight, and obesity (Azizah et al., 2016). Indonesia is included as the third country with the highest prevalence in the South-East Asian Region after Timor Leste (50.5%) and India (38.4%) at 36.4% (Center for Data and Information Ministry of Health, 2018). The stunting prevalence rate in Indonesia is still above 20%, meaning that it has not reached the WHO target of below 20% (Teja, 2019). According to the 2019 Indonesian Toddler Nutritional Status Survey Results, the stunting rate in Indonesia has decreased by 3.1%, but the Indonesian Ministry of Health still has a target of reducing stunting by 19% by 2024. Although the percentage of stunting in Indonesia fell from 37.8% in 2013 to 27.67% in 2019, this figure is still relatively high (Ministry of Health, 2019). Stunting accounts for 14-17% of child deaths globally and causes long-term cognitive disability, more unsatisfactory performance in

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school, lower adult economic productivity, and an increased risk of stunting to the next generation due to stunting (Prendergast et al., 2014).

Children aged 3-5 years have a risk of experiencing malnutrition problems because, at this time, food problems often occur. After all, children have started to become active consumers who tend to be picky about the food to be consumed (Sari et al., 2016). For toddlers who consume breast milk, the age most prone to nutritional problems is the age of two because, during that period, there is a transition from breast milk to breast milk substitutes or weaning food. Breast milk substitutes and weaned foods often have high carbohydrate content but poor quality and protein content (Norman et al., 2008). In the first 1000 days of life, the toddler period is a determinant of quality in a future life (Kuntari et al., 2013). The cause of malnutrition is a lack of protein, calories, or total energy deficiency. In toddlers, it is characterized by resistance to growth hormones (Fazeli & Klibanski, 2014). Disorders of the hormone system impact the fat oxidation process, causing excessive adipose tissue (fat) buildup or, in other words, can trigger overweight. This accumulation of adipose tissue triggers an inflammatory reaction, one of which is marked by an increase in High Sensitive C-Reactive Protein (hsCRP). Toddlers who experience stunting tend to have low immune systems, so they are susceptible to disease or infection (Moulia et al., 2017).

C-Reactive Protein (CRP) is a protein marker that there is a problem with innate immunity (immune) produced by the liver; it can also be used as a strong marker of inflammation and also a marker of stress when the hormone cortisol (stress triggers) increases. then CRP decreases, (Pratiwi et al., 2016) in the body, both in adults, adolescents, and children (Volanakis, 2001). Economic factors influence stunting; low education is a factor in stunting (Beal et al., 2018). Previous research conducted by Sana Syed in 2018 entitled Biomarkers of Systemic Inflammation and Growth in Early Infancy is Associated with Stunting in Young Tanzania Children concluded that there is a relationship between inflammation (inflammation) and growth in children, namely high CRP levels will suppress growth. The lack of research in Indonesia regarding examining CRP levels, especially in stunting toddlers, is an exciting thing to be developed in research (Walker et al., 2005).

Research Methods

This study used a cross-sectional study method, which is a design by measuring or observing simultaneously or using the Mann-Whitney statistical test. This study aimed to determine CRP levels in stunted and non-stunted toddlers aged 36-60 months (Saran et al., 2002; Durán-Chávez et al., 1994). Kassi-Kassi Health Center Makassar City conducted this research with a total sample of 60 people consisting of stunting toddlers and non-stunted toddlers. The instrument used in this study was a questionnaire and measurement of CRP levels (Libby & Ridker, 2004; Mold et al., 1999). Questionnaires are data collection by providing a list of questions to respondents to provide answers to all the list of questions. Measurement of CRP (C-Reactive Protein) levels using ELISA (Enzyme-Linked Immunosorbent Assay) at the Hasanuddin University RSP Research Laboratory Unit.

Results

Univariate analysis

Characteristics of research respondents include education, family income, birth weight, birth length, history of infection, history of exclusive breastfeeding, as shown in the following table.

Table 1
Distribution of respondents characteristics in Kassi-Kassi Health Center Makassar City (n=60)

1	Non-Stunting	Stunting	P-Value
Education			
Basic	11 (36,7)	13 (43,3)	0,792
Advance	19 (63,3)	17 (56,7)	
Family Incomes			
< RMW	18 (60,0)	28 (93,3)	0,006*
≥RMW	12 (40,0)	2 (6,7)	
biography			
birth weight	birth weight	birth weight	birth weight
< 2.500 gr	0 (0)	6 (20,0)	0,024*

2.500-4.000 gr	30 (100)	24 (80,0)	
Birth Body Length			
< 48 cm	0 (0)	7 (23,3)	0,011*
48 -52 cm	30 (100)	23 (76,7)	
Toddler Age			
24-36 Months	3 (10,0)	4 (13,3)	1,000
36-60 Months	27 (90,0)	26 (86,7)	
Infection History			
Ever been hospitalized	5 (16,7)	2 (6,7)	0,424
Never Hospitalized	25 (83,3)	28 (93,3)	
Exclusive breastfeeding history			
Yes	20 (66,7)	15 (50,0)	0,295
No	10 (33,3)	15 (50,0)	

*Chi-Square Test

The table above shows the educational characteristics of the majority with higher education. When viewed from family income, more family income is low. Judging from the birth history, most of them had a birth weight of 2,500-4,000 g, birth length >48 cm, the majority of toddlers aged 36-60 months, a history of infection mostly had never been hospitalized and received exclusive breastfeeding (Grantham-McGregor et al., 1996; Berkman et al., 2002).

Bivariate analysis

Table 2
Differences in CRP levels in stunting and non-stunting toddlers

Nutritious Status	Mean (SD)	Median (Minimum-Maximum)	P Value
Non-Stunting	0,37 (0,16)	0,30 (0,13-0,75)	0,000*
Stunting	0,54 (0,16	0,55 (0,26-0,79)	

*Mann-Whitney test

Determine the difference in CRP levels in stunted and non-stunted toddlers; the Mann-Whitney statistical test was used. The results of statistical tests showed that there were differences in CRP levels in stunted and non-stunted toddlers ($p<0.001$). This shows that there is a high level of C-Reactive Protein (CRP) in stunting toddlers (Clyne & Olshaker, 1999; Haswadi et al., 2018).

Discussion

The Mann-Whitney test results show differences in levels of C-Reactive Protein (CRP) in stunting and non-stunted toddlers. Economic factors can influence the low levels of C-Reactive Protein (CRP) in stunting toddlers; low education is a factor in stunting (Beal et al., 2018). C-Reactive Protein (CRP) is a protein marker that there is a problem with innate immunity (immune) produced by the liver; it can also be used as a strong marker of inflammation and also a marker of stress when the hormone cortisol (stress triggers) increases then CRP decreases (Pratiwi et al., 2016).

Previous research conducted by Sana Syed in 2018 entitled Biomarkers of Systemic Inflammation and Growth in Early Infancy is Associated with Stunting in Young Tanzania Children concluded that there is a relationship between inflammation (inflammation) and growth in children, namely high CRP levels will suppress growth (Semba et al., 2008; Lantzouni et al., 2002). There is still a lack of research in Indonesia regarding examining CRP levels, especially in stunting toddlers. Malnutrition status and infection are the main determinants of the occurrence of child growth and development problems, one of which is stunting. The problem of malnutrition and infection is closely related to socio-economic conditions and the family environment. Poor economic status causes the family's inability to provide adequate nutritional intake and a home environment that meets health requirements (Perez-Escamilla et al., 2018).

Conclusion

A cross-sectional study has been carried out, and after statistical analysis, it can be concluded that CRP levels are high in stunted toddlers and can be used as a parameter to assess nutritional status.

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