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Levels of Alpha-1 Acid Glycoprotein (AGP) in Stunting and Non Stunting Tolls Age 36-60 Months

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Abstract---*This study aimed to identify Alpha-1 Acid Glycoprotein (AGP) serum levels in stunting and non-stunted toddlers. The 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 Alpha-1 Acid Glycoprotein (AGP) levels using ELISA (Enzyme-Linked Immunosorbent Assay) the median value (minimum-maximum) for stunting toddlers was 343.86 (236.14 – 783.31) ng/mL and the median value (minimum-maximum) for non-stunted toddlers was 480.11 (160.21-796,'90) ng/mL.*

Keywords---*AGP, exclusive breastfeeding, non stunting, stunting, toddler age 36-60 months*

Introduction

The World Health Organization (WHO) estimates that 52 million children under five globally are stunted (Stevens et al., 2016; Gureje et al., 1998; Alexander et al., 2016). As many as 159 million children under five are stunted, almost 20 million children are acutely malnourished. Likewise, in Indonesia, in 2017, the nutritional problems of toddlers based on age groups, toddlers between the ages of 0-59 months experienced problems of malnutrition, short stature, and obesity, which increased from the previous year (World Health Organization, 2016). The emphasis on the under-five mortality rate in Indonesia did not achieve the MDGs target in 2015. This condition has an impact on the achievement of human development in 2030. Stunting is a short body condition that is a nutritional problem in Indonesia, the 2025 Global Nutrition Targets (Al Rahmad, 2016).

The prevalence of stunting among children under five in Indonesia is still relatively high compared to the figure in Asia, reaching 36.8%, with short toddlers (stunting) at 19.5% and very short (severe stunting) at 17.3%. Based on the Makassar City Health Office data in 2019, the malnutrition rate in Makassar City is still high, namely underweight 8.58%, wasting 4.57%, and stunting 8.51%. Toddlers aged 36 to 60 months have a risk of experiencing malnutrition problems because food problems often occur. After all, children have started to become active consumers who tend to be picky about consuming food (Sari et al., 2016; Sambo et al., 2020). 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 (Sambo et al., 2020).

The toddler period is a golden age that becomes a determinant 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 hormone (Fazeli & Klibanski, 2014; Hall et al., 1999). Disorders of the hormone system impact the fat oxidation process, causing excessive adipose tissue (fat) build-up or, in other words, can trigger overweight. This accumulation of adipose tissue triggers an inflammatory reaction, one of which is marked by increased levels of IL-6 (Interleukin 6) which stimulates an increase in Alpha-1 Acid Glycoprotein (AGP) (Mouliya et al., 2017; Gunawan & Adriana, 2020).

Alpha-1 Acid Glycoprotein (AGP), commonly known as Orosomucoid, is an acute-phase protein produced by the liver, which can also be used as a strong marker of inflammation. 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 Andrew in 2014 entitled Stunting is Characterized by Chronic Inflammation in Zimbabwean Infants concluded that higher levels of AGP and CRP in infants indicated an indication of stunting. High levels of AGP and CRP suppress growth. There is still a lack of research in Indonesia regarding the examination of AGP levels, especially in stunted toddlers, which is an exciting thing to be developed in research (Mulyani et al., 2017).

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. The purpose of this study was to determine the levels of AGP in stunting and non-stunted toddlers aged 36-60 months (Morrow et al., 1999; Coovadia et al., 2007). This research was carried out by the Kassi-Kassi Health Center in Makassar City 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 AGP levels. Questionnaires are data collection by providing a list of questions to respondents to provide answers to all the list of questions. Measurement of AGP (Alpha-1 Acid Glycoprotein) levels using ELISA (Enzyme-Linked Immunosorbent Assay) at the Research Laboratory Unit of Hasanuddin University Hospital (Fournier et al., 2000; Hansen et al., 1984).

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)

Characteristics	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 (Mulyani, 2018). 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 (Tylleskär et al., 2011; Dobrova-Krol et al., 2008).

Bivariate analysis

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

Nutritious Status	Mean (SD)	Median (Minimum-Maximum)	P Value
Non-Stunting	477,31 (160,91)	480,11 (160,21-796,90)	0,019*
Stunting	391,93 (127,11)	343,86 (236,14-783,31)	

Mann-Whitney test

The results of statistical tests showed that levels of Alpha-1 Acid Glycoprotein (AGP) were high in non-stunting toddlers.

Discussion

Based on the results of the Mann-Whitney test, it showed the levels of Alpha-1 Acid Glycoprotein (AGP) in stunting and non-stunted toddlers. Based on the median value, the levels of Alpha-Acid Glycoprotein (AGP) in stunted toddlers were 343.86 (236.14 - 783.1) ng/mL and non-stunted 480.11 (160.21-796.90) ng/mL. Alpha-1 Acid Glycoprotein (AGP), commonly known as Orosomucoi, is an acute-phase protein produced by the liver, which can also be used as a strong marker of inflammation (Pratiwi et al., 2016). Economic factors influence stunting; low education is a factor in stunting (Beal et al., 2018). The results of this study are not in line with previous research conducted by Andrew J. in 2014 entitled Stunting is Characterized by Chronic Inflammation in Zimbabwean Infants, which concluded that AGP and CRP levels in infants were higher, which indicated an indication of stunting. High levels of AGP and CRP suppress growth (Hochepped et al., 2003; Duché et al., 2000).

AGP is an acute-phase protein produced by the liver and synthesized by interleukin pro-proinflammatory cytokines such as IL-1 and IL-6 as markers of inflammation or inflammation. Inflammation is associated as a side effect of various diseases and linear growth failure (stunting, wasting, and underweight) (Burke & Emerick, 2016). AGP and CRP are also biomarkers of markers of inflammation caused by infection, prolonged lack of micronutrients, and the presence of acute disease. Stunting or stunting as a measure of chronic malnutrition can be associated with the chance of inflammation or inflammation. AGP is related to stunting (Fitzmaurice et al., 2017). AGP is a protein marker with a problem with innate immunity (immune) produced by the liver. Pratiwi et al. (2016), in the body, both in adults, adolescents, and children (Volanakis, 2001).

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