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CORRELATION BETWEEN MATERNAL FACTOR AND STUNTING AMONG CHILDREN OF 6-12 MONTHS OLD IN CENTRAL LOMBOK

Hubungan Faktor Maternal Terhadap Kejadian Stunting Pada Anak Usia 6-12 Bulan di Lombok Tengah

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ABSTRACT

Background: *Stunting is a child growth and development disorder that has been one of the nutritional problem in children living in developing countries until now. Maternal factor might be one of the risk factors of stunting.* ***Method:*** *This was an analytical observational study with cross sectional design that aimed to identify the correlation between the maternal factor and stunting, especially in children aged 6-12 months in 3 villages in Central Lombok.* ***Result:*** *There were 21,9% (33 of 151) of children suffering from stunting. Based on the maternal factor in stunting children, there were 6,1% of mothers who had low body mass index (BMI), 27,3% of mothers who had low arm circumference, 61% of mothers who had low weight gain during the pregnancy, and 39,4% of mothers who had height <150 cm. Maternal height was the only factor that significantly associated to the incidence of stunting (p = 0.044, OR = 2.3).* ***Conclusion:*** *Based on analysis of several maternal factors, there is a significant correlation between mother's height and stunting (p<0,05 and OR=2,3).*

Key Words: maternal factor, stunting, mother's height

ABSTRAK

Latar Belakang: *Stunting* merupakan gangguan pertumbuhan dan perkembangan pada anak, yang sampai saat ini masih menjadi salah satu masalah gizi anak terutama di negara berkembang. Faktor maternal adalah salah satu faktor risiko stunting. **Metode:** Penelitian analitik observasional dengan rancangan *cross sectional* ini bertujuan untuk menganalisis hubungan antara faktor maternal dan *stunting* pada anak usia 6-12 bulan di 3 desa di Lombok Tengah. **Hasil:** Terdapat 21,9% (33 dari 151) anak yang mengalami stunting. Berdasarkan faktor maternal pada anak dengan stunting, sebanyak 6,1% memiliki ibu dengan indeks masa tubuh (IMT) rendah, 27,3% memiliki ibu dengan lingkar lengan atas rendah, 61% memiliki ibu dengan peningkatan berat badan yang rendah selama kehamilan, dan 39,4% memiliki ibu dengan tinggi badan <150 cm. Faktor tinggi badan ibu merupakan satu-satunya faktor yang berhubungan signifikan dengan kejadian stunting (p=0,044, OR=2,3). **Kesimpulan:** Berdasarkan analisis beberapa faktor maternal, terdapat hubungan yang signifikan antara tinggi badan ibu dan *stunting* (p<0,05 dan OR=2,3).

Kata Kunci: faktor maternal, *stunting*, tinggi ibu

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INTRODUCTION

In developing countries, stunting is still known as one of the nutrition problems in children. Based on several studies, data on stunting in the world is still high. It was estimated that 171 million children under five were stunted in 2010 and 167 million of them lived in developing countries (Onis et al, 2012). In 2017, the incidence of stunting was 150.8 million (22.2%) in children under age five and 83.6 million of them live in Asia (UNICEF, 2018). The prevalence of stunting in Indonesia were 30.8%, and 33.5% of them were in West Nusa Tenggara based on Riskesdas 2018 (Kemenkes RI, 2018).

Stunting is a term that describe about growth and development disorders in children with chronic nutritional deficiencies and poor psychosocial stimulation. Meanwhile, the term stunted is specifically defined as Z-score <-2 SD for the ratio of height to age (height/age) or ratio of body length to age (length/age). Stunting can cause inhibition of organ formation and development with long-term consequences including inappropriate body size and low intellectual ability (WHO, 2018).

One of the associated factors of stunting is maternal factors. Maternal health factors such as process of pregnancy, mother's height, and mother's nutritional status, can affect the child nutritional status (Ali et al, 2017; Manggala et al, 2018). Poor maternal factors can lead to poor quality of children's health at birth and insufficient nutritional components of breast milk (Gruca, 2017; Manggala et al, 2018). Poor nutritional status before and during giving birth can cause babies born with low birth weight, which we known as a risk factor for stunting (Manggala et al, 2017). Besides that, supplementation and food intake during pregnancy will also affect the macronutrient components of breast milk which are the main source of nutrition for children in the first 6 months of birth (Gruca, 2017).

Data of chronic energy deficiency (KEK) in Indonesia based on Riskesdas 2018 was still quite high about 14.5% in women of childbearing age and 17.3% in pregnant women. West Nusa Tenggara has higher percentage (Kemenkes RI, 2018). Maternal chronic energy deficiency is one of risk factor for stunting (Ali et al, 2017). Furthermore, several studies have shown an association between maternal factors and stunting (Ali et al, 2017; Manggala et al, 2018). However, research related to this topic is still limited in West Nusa Tenggara. Therefore, this study aims to analyze the correlation between maternal factors and stunting, especially in children aged 6-12 months in Central Lombok, West Nusa Tenggara.

METHOD

This was an analytic observational study that used cross-sectional design, which was held in Central Lombok from June to August 2019. The sample was selected randomly using the cluster sampling method. A total of 18,071 children aged 6-12 months in Central Lombok were grouped into several village clusters, then 3 villages were randomly selected using the SPSS application. The three selected villages were Mantang, Sukadana, and Teratak. Sample of this study was 151 children of 6-12 months old who had met the inclusion and exclusion criteria. This research has passed an ethical review by Ethical Committee of Medical Research in Medical Faculty of Mataram University on December 1st 2018 with register number 376 / UN18.8 / ETIK / 2018.

The inclusion criteria were: (1) children of 6-12 months old who lived in Mantang, Sukadana, and Teratak village; (2) children and mothers were present at the interview; and (3) parents, who represented by the mother, agreed to participate in the study and signed the informed consent. The exclusion criteria were: (1) uncooperative parents; and (2) parents who did not complete the questionnaire according to instructions given. Interviews for the parents were conducted by trained researchers using a validated questionnaire. Some of the maternal factor information was collected from the maternal and child health textbook from each mother. Data about standardized anthropometric measurements were applied for each child.

Stunting was categorized as Z-score <-2 SD for the ratio of height to age (height/age) or ratio of body length to age (length/age) (WHO, 2018). Maternal body mass index was calculated from mother's weight and height before pregnancy, then categorized into underweight (<18,5 kg/m^2), normal (18,5-24,9 kg/m^2), overweight (25,0-29,9 kg/m^2), and obese (>30,0 kg/m^2) (WHO, 2020). Based on BMI before pregnancy, weight gain during

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pregnancy was categorized into "normal" if it was 14-20 kg for underweight; 12.5-17.5 kg for normal BMI; 7.5-12.5 kg for overweight; and 5.5-10 kg for obese (Cunningham, 2013). Maternal height was categorised as 'at risk' if it was <150 cm (Kemenkes RI, 2018). Upper arm circumference was categorized 'normal' if it was ≥23,5 cm. Gestational age at delivery was categorized as preterm (<37 weeks), a term (37-42 weeks), and post-term (>42 weeks). Pregnant woman was recommended to do antenatal care (ANC) visits at least 4 times, thus ANC was categorized into 1-3 times and ≥4 times. (Kemenkes RI, 2013). Correlation between maternal factor and stunting was analyzed by chi square and kruskal wallis methods, using SPSS 25 application.

RESULT

A total of 151 children participated in this study, consisted of 43, 57, and 51 children respectively in Mantang, Sukadana, and Teratak village. The mean age of children in this study was 9.3 months, and most of them (55%) were female. About 43,7% of children were first-born children. The mean age of their mother was 27.3 years, and 60.9% of them did not go to school or only graduated from elementary school or junior high school (table 1).

Based on the maternal health factor data, most of the mothers (66.9%) had a normal Body Mass Index (BMI). Meanwhile, their nutritional status based on the upper arm circumference, were mostly normal (72.8%). However, majority of them had low weight gain during pregnancy. According to WHO, the increase of body weight during pregnancy is based on body mass index (BMI) of the mother before pregnancy.

Table 1. Demographic Profile

Parameter		N (%)
Children's age	6-9 months	81(53,6%)
	9-12 months	70(46,4%)
Gender	Male	68(45%)
	Female	83(55%)
Birth Order	1	66(43,7%)
	2	53(35,1%)
	3	26(17,2%)
	≥4	6(4%)
Mother's age	<20 years	16(10,6%)
	20-30 years	92(60,9%)
	>30 years	43(28,5%)
Mother's Education	<High School	92(60,9%)
	High School or Higher Degree	59(39,1%)

Table 2. Stunting Incidence in Each Village

Parameter		N (%)			Total
		Sukadana	Teratak	Mantang	
Stunting Incidence	Stunting	9 (15,8%)	12 (23,5%)	12 (27,9%)	33 (21,9%)
	Normal	48 (84,2%)	39 (76,5%)	31 (72,1%)	118 (78,1%)

About 91.4% of mothers received at least 4 times antenatal care and the majority gave birth at the term of gestation (89.4%). For childbirth factors, most mothers had normal delivery (91.4%), however, there were 18,5% of them had delivery complications. The several delivery complications which found in this study were premature rupture of membranes (PROM) (29,6%), prolonged labor (29.6%), preterm labor (14,8%), and head-to-pelvic disproportion (CPD) (14.8%). A total of 112 (74.2%) mothers had a height ≥150 cm (table 3). There was a total of 33 children (21.9%) who were stunted, with a distribution of 15.8% in Sukadana Village, 23.5% in Teratak Village, and 27.9% in Mantang Village (table 2).

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This study analyzed the association between maternal factors (pregnancy factors, childbirth factors, and genetic) and stunting incidence in 3 villages in Central Lombok (Mantang, Sukadana, and, Teratak). The chi square analysis showed that there was a significant association between genetic factors (the mother's height) and stunting in the children, with 2.3 times higher risk to suffer from stunting in the children of mothers with height <150 cm compared to mothers who have height ≥ 150 cm (p=0,044; OR=2,3; 95% CI). Meanwhile, other maternal factors, such as BMI, weight gain during pregnancy, upper arm circumference, frequency of ANC, gestational age at delivery, mode of delivery, and childbirth complications, showed no significant association with the incidence of stunting (table 3). Bivariate analysis for each village showed that there is a significant association between maternal height and stunting in children in Sukadana and Teratak villages (p=0.010 and p=0.045) (table 4).

Table 3. Comparison of Stunting Incidence Based on Maternal Factors

Parameter				**Stunting**	**Normal**	***p* value**
Pregnancy Factor	Mother's Nutritional Status	BMI	Underweight	2(8,7%)	21(91,3%)	*p*= 0,256[a]
			Normal	26(25,7%)	75(74,3%)	
			Overweight	5(20,8%)	19(79,2%)	
			Obese	0	3(100%)	
		Weight Gain during Pregnancy	Low	20(21,7%)	72(78,3%)	*p*=0,223[a]
			Normal	13(26%)	37(74%)	
			High	0	9(100%)	
		Upper Arm Circumference	<23,5 cm	9(22%)	32(78%)	*p*=0,986[b]
			≥23,5 cm	24(21,8%)	86(78,2%)	
	Frequency of Antenatal Care		1-3 times	3(23%)	10(77%)	*p*=0,911[b]
			≥4 times	30(21,7%)	108(78,3%)	
	Gestational Age at Delivery		<37 weeks	5(31,2%)	11(68,8%)	*p*=0,338[a]
			37-42 weeks	28(20,7%)	107(79,3%)	
			>42 weeks	0	0	
Childbirth Factor	Mode of Delivery		Vaginal Birth	32(23,2%)	106(76,8%)	*p*=0,196[b]
			Cesarean Section	1(7,7%)	12(92,3%)	
	Childbirth Complication		Yes	5(17,9%)	23(82,1%)	*p*=0,571[b]
			No	28(22,8%)	95(77,2%)	
Genetic Factor	Mother's Height		<150 cm	13(33,3%)	26(66,7%)	***p*=0,044[b*]**
			≥150 cm	20(17,9%)	92(82,1%)	

Notes:

a. Kruskal Wallis
b. Chi square
***p* value <0,05

Table 4. Comparison of Stunting Incidence Based on Mother's Height in Each Village

Parameter		**N (%)**					
		Sukadana		Teratak		Mantang	
		Stunting	Normal	Stunting	Normal	Stunting	Normal
Mother's Height	< 150 cm	4(44,4%)	5(55,6%)	6(42,9%)	8(57,1%)	3(18,8%)	13(81,2%)
	≥ 150 cm	5(10,4%)	43(89,6%)	6(16,2%)	31(83,8%)	9(33,3%)	18(66,7%)
p value		**0,010***		**0,045***		0,303	

Notes:

***p* value <0,05

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DISCUSSION

Stunting was influenced by several factors, one of them are maternal factors during pregnancy and childbirth. Related to this topic, several maternal factors that have been analyzed in this research namely mother's nutritional status during pregnancy (consist of BMI (body mass index), pregnancy weight gain, and upper arm circumference), frequency of ANC, gestational age at delivery, mode of delivery, childbirth complication, and mother's height. This study showed that there was no significant association between maternal BMI and stunting incidence (p=0,256).

These results are in line with the bivariate analysis by Amini (2016) which showed that there is no significant association between mother's BMI and stunting incidence stunting (p = 1.00). Moreover, it proved that stunting was more influenced by other factors such as maternal age during pregnancy, socio-economic factors, birth weight, and birth length. These results are different from a study by Pusparini et al (2016) which showed that mother's BMI in early pregnancy had a significant association (p = 0.032) with stunting incidence in newborn babies, therefore pregnant women with BMI <18.5 have 2.3 times higher risk tendency of having a stunting baby. In early pregnancy, BMI reflects maternal nutritional status before pregnancy, which has some effects on mother's health and fetal growth during pregnancy. Another study conducted by Ningrum and Cahyaningrum (2018) also showed resemblant results, which showed a significant association between maternal BMI before pregnancy and body length of the newborn (p <0.01).

Apart from BMI, chronic energy deficiency (KEK) is also associated with stunting. However, there was no significant relationship between upper arm conference and stunting incidence (p= 0.986). The same result occurred in Warsini et al (2016) which showed that there was no significant relationship between upper arm conference and stunting incidence (p = 0.23). The study showed that the research subjects had a high awareness of routine antenatal care so that chronic energy deficiency could be immediately intervened with supplementary feeding (PMT). These results are also in line with Zaif et al (2017) and Prabandari et al (2016) which showed that there is no significant association between pregnant women and chronic energy deficiency with stunting (p = 0.218 and p = 0.376). Otherwise, a study conducted by Sukmawati et al (2018) showed a significant relationship (p= 0.01) between maternal nutritional status based on upper arm conference and stunting incidence, which happens because mothers with chronic energy deficiency had malnutrition state for a long time. If this condition continues then the nutritional needs of the fetus will be disrupted and lead to Intrauterine Growth Retardation (IUGR). Newborns with low body weight are at risk of becoming stunted in the future. Some studies conducted by Fajrina (2016) and Susilowati (2018) also showed resemblant results.

Weight gain during pregnancy is also an important factor that influences fetal growth. Based on BMI before pregnancy, the recommended weight gain during pregnancy is 14-20 kg for underweight; 12.5-17.5 kg for normal BMI; 7.5-12.5 kg for overweight; and 5.5-10 kg for obese (Cunningham, 2013). However, this study showed that there is no significant association between weight gain during pregnancy and stunting incidence. This research had similar results with some studies conducted by Zaif et al (2017) and Pusparini et al (2016) which also showed that there is no significant association between weight gain during pregnancy and stunting incidence (p values were 0.678 and 0.284, respectively). Differ from our result, Yudianti et al (2017) found that maternal weight gain during pregnancy and stunting incidence in children aged under five years was significantly associated (p= 0.031). A consistent result was also showed in other study conducted by Destiadi et al (2015) which stated that a significant association was found between weight gain during pregnancy and stunting incidence (p value= 0,023). One of several factors that are directly related to the growth of toddlers years are absorption of micronutrients and macronutrients by the fetus during the gestational period. If maternal nutrition during pregnancy is inadequate, it will have a direct impact on the intrauterine fetus. However, there are some indirect factors such as cultural factors, environmental sanitation and socio-economic factors that can also affect the relationship between weight gain during pregnancy and stunting incidence (Yudianti et al, 2017; Zaif et al, 2017).

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One of several risk factors for stunting is the antenatal care factor. However, the study showed that the frequency of ANC and stunting incidence do not have a significant association (p = 0.911). In contrast with our result, some studies conducted by Najahah et al (2012), Amini (2016), and Susilowati (2018) found that frequency of ANC and stunting incidence was significantly associated (p value= 0.01, 0.021, and 0.004, respectively). Regular ANC visits during pregnancy can detect pregnancy risk earlier, especially several risks related to maternal nutrition problems. Therefore, standardized ANC must be undertaken regularly to obtain good quality antenatal care. Pregnant women who receive at least four times antenatal care during their pregnancy have some advantages, such as early detection of pregnancy risk, having good preparation for the delivery process, and having good maternal health until the lactation and postpartum period (Amini et al, 2016).

A study that was conducted in three different countries, namely Colombia, Peru, and Bolivia, analyzed the relationship between ANC during pregnancy and stunting. That study showed a significant result in Colombia and insignificant results in both Peru and Bolivia. Those different results were related to the antenatal care quality in those countries. The study stated that the antenatal care quality in Colombia has better quality (more accessible, giving additional vitamin supplements, the existence of other additional measurements, and having a longer duration of ANC for each mother (Forero-Ramirez et al, 2014). However, Nadiyah et al (2014) and Warsini et al (2016) found that the association between frequency of ANC and stunting incidence was not significant. The lack of influence of frequency of ANC is caused by the poor quality of ANC, even though the frequency of ANC has met WHO recommendation, which is at least four times (Nadiyah et al, 2016).

The occurrence of gestational age at delivery is another factor that influences stunting incidence. A study in Banjarmasin showed a significant association between gestational age at delivery and stunting incidence in toddlers. In that study, gestational age at delivery was divided into two categories, namely preterm and term. That study showed that preterm babies had 3.7 times higher risk tendency of experiencing short stature. The growth in preterm toddlers can be hampered due to preterm birth and the occurrence of linear growth retardation in the uterus (Sari et al, 2017). However, our study found a different result, namely gestational age at delivery and stunting incidence has no significant association (p = 0.338). Some studies conducted by Manggala et al (2018) and Warsini et al (2016) also show similar results.

e also evaluated the association of mode of delivery to stunting incidence. Our result showed that there was no significant association between mode of delivery and stunting incidence (p = 0.196). Another study also showed a consistent result. Ramos et al (2015) stated that the association between those variables was not significant. In that study, factors that significantly play a role in stunting incidence are younger maternal age, low level of maternal education, lower socioeconomic status, and frequency of prenatal consultations (Ramos et al, 2015). They conclude that the incidence of stunting is influenced by several factors, not only by mode of delivery.

However, a study conducted by Tiwari et al (2014) showed a different result. It showed that children aged 0-59 months who were born with cesarean section in health facilities were significantly seemed to be less stunted than those who born at home. A similar result was found in several studies performed by Chirande et al (2015) and Akombi et al (2017), which are located in Tanzania and Nigeria, respectively. Those studies found that mothers who gave birth in health facilities were receiving better health information from health workers professionals. Such information includes exclusive breastfeeding, initiation of complementary feeding, and comprehensive care for newborns during antenatal and postpartum periods.

Another maternal factor that can influence the incidence of stunting is the mother's height. This study found that there is a significant association between them (p= 0.044). This result complies with Amin (2014) in Yogyakarta among children aged 6-23 months, which showed that maternal height has a significant association with the incidence of stunting. Another study by Utami et al (2018) also showed that children aged 0-23 months who have a shorter mother (<150 cm tall) have a 1.4 times higher risk tendency of

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experiencing stunting compared to children who have a taller mother (≥150 cm tall).

The correlation between maternal height and linear children's growth is caused by a combination of genetic factors and maternal environmental factors. Short mothers have lower protein and energy reserve, smaller reproductive organs, and narrower space for fetal development, affecting fetal growth through the placenta and infant growth through the quantity and quality of breast milk. This condition can cause intrauterine growth restriction, which is also related to short stature in children (Addo et al, 2013; Manggala et al, 2018). There is a cycle of intergenerational malnutrition in the future, in which stunted children will become short mothers who will also give birth to stunted children (Utami et al, 2018).

This result was different from a study by Hanum (2014) among children under five years old (6-59 months) in Cianjur, which showed that there was no association ($p > 0.05$, $r = 0.562$) between maternal height and children nutritional status (height/age). This result presumably occurred because the majority of short mothers in the study were having nutritional and pathological problems, so that stunting did not necessarily happen to their children. However, that study did not examine factors that influence maternal height, so it was impossible to distinguish whether the mother's current height was genetic or due to pathological reasons or malnutrition.

Different results could occur since stunting is not only influenced by one single factor but multi-factorial. The other component that contributes to the incidence of stunting that we did not analyze in this study were inadequate nutrition (exclusive breastfeeding and complementary breastfeeding), history of infection, history of low birth weight, and socioeconomic factors (income, education, employment, and parenting type) (WHO, 2014; Wahdah et al, 2015; Rakhmahayu et al, 2019).

CONCLUSION

There was a significant association between maternal height and stunting incidence among children aged 6-12 months. Meanwhile, other maternal factors, such as pregnancy factor and childbirth factor, did not have a significant association with stunting incidence.

RECOMMENDATION

Further research on other risk factors for stunting in West Nusa Tenggara is needed. In further research, it is also suggested to explore the correlation between maternal knowledge and the incidence of stunting.

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