Relationship between Low Birth Weight (LBW), Birth Length, and Basic Immunization History with Stunting in Children Age 9 - 60 Months in Kabupaten Purwakarta

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Abstract: Childhood stunting has considerable human and economic costs. Three main factors that cause stunting are birth weight, birth length, caregiving methods including infant immunization. There are three sub-districts in Purwakarta have > 20% prevalence of under-five stunting; Bungursari (20.9%), Sukasari (24.1%), and Darangdan (23.6%). The study aims to discover the relationship between Low Birth Weight (LBW), birth length, basic immunization history, and stunting in children age 9 - 60 Months in Depok Village, Kecamatan Darangdan, Kabupaten Purwakarta. This is a community-based cross-sectional study established in Kabupaten Purwakarta from Aprilto May 2019. Data was collected by interviewing 54 mothers of 9 to 60 months children in Depok Village, Kecamatan Darangdan, Kabupaten Purwakarta, followed by measurement of length/height. Data wereanalyzed using the Chi-Square test with $\alpha = 0.05$ using SPSS. Bivariate analysis showed that low birth weight(OR=3.178; p value=0.042), birth length (OR=3.067; p=0.050), and history of immunization (OR=0.25; p value=0.042) are associated with the incidence of stunting in Depok Village, Kecamatan Darangdan,Kabupaten Purwakarta ($p < 0.05$). Conclusion: There was a relationship between low birth weight, birth length,and basic immunization history and stunting in Kabupaten Purwakarta.

1 INTRODUCTION

Stunting is a condition in which children have less length or height compared to age. This conditionis measured by a length or height that is below minus two standard deviations from the WHO median growth standard for children. (WHO, 2019). Stunting results from the exposure of the fetus and/or young child to nutritional deficiency and infectious disease. Maternal undernutrition results in fetal growth restriction, whereas infectious disease in pregnancy can result in preterm delivery. Both of these conditions are important contributors to early childhood stunting. Stunting is a form of malnutrition that makes a major global public health concern. An estimated 155 million children under 5 years of age are stunted around the world. Three regions had very high rates of stunting with approximately one-third of children affected: (1) South Asia; (2) Eastern and Southern Africa; and (3) West and Central Africa. Of the 83.6 million stunted children under five in Asia, the highest proportion came from South Asia (58.7%) and the lowest proportion was in Central Asia (0.9%). (Badan Pusat Statistik, 2018) The prevalence of stunting has increased from 27.5% (2016) to 29.6% (2017). There are 3 sub-districts in Purwakarta that have a prevalence of under-five stunting > 20%; Bungursari 20.9%, Sukasari 24.1%, and Darangdan 23.6%. (Arifin DZ, Irdasari SY & Sukandar H, 2012).

Stunting has its origins from conception to the first 2 years of life, referred to as the 1000 days. It is called the windows critical period because the brain or intelligence grows rapidly during that time. As the consequence, inadequate nutritional intake (breastfeeding or complementary feeding) during the first 2 years of life can lead to stunting. Failure of growth due to undernutrition during this golden period will cause a long-term permanent effect on the

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individual growth.

The WHO conceptual framework on child stunting classified the causes of stunting in terms of several factors. Household and family factors, inadequate complementary feeding, breastfeeding, and infection are all factors related to stunting in children (Beal *et al.*, 2018). Those factors can be the potential causes of stunting in Indonesia. Nutritional status at birth (weight and length of birth) is the dominant risk factor that affects stunting. Chronic energy and micronutrient deficiency in pregnancywill increase the risk of low-birth-weight babies(Svefors *et al*., 2016). Mothers with this kind ofcondition may have reduced protein and energy stores, a smaller reproductive organ system, and limited room for fetal development (Addo *et al*.,2013). Mothers with chronic energy andmicronutrient deficiency may not provide sufficient breast milk to their baby which may further affect the child's growth. (Utami, 2018). Another factor that increases the risk of stunting in children under five is immunization. Recurrent infection in children can affect their growth and development, which can lead to stunting. Disease gives negative feedback to the nutritional status and if it happens over a long time, itcan increase the risk of stunting (Permatasari, 2018). Children with incomplete immunization status are 1.78 more times at risk of stunting than children with complete immunization status. Vaccinations have a role in reducing child mortality and children who receive vaccination have a lower risk. Early vaccination can reduce the odds of stunting in children, while delayed vaccination can increase the odds of stunting (Berendsen, 2016).

The number of cases of stunting patients in the Depok Village at Puskesmas Darangdan was still high, hence the researchers were interested in conducting a study on the relationship between LBW, birth length, and basic Immunization history with stunting in children age 9 - 60 months in Kabupaten Purwakarta.

2 METHODS

This research was conducted with a descriptive-analytic research type and a cross-sectional research design. Camry scales and stature meters (microtoise) were used to measure the weight and height of the subjects. Data were collected through interviews with 54 mothers with children aged 9 to 60 months in Depok Village, Kecamatan Darangdan, Kabupaten Purwakarta using the incidental sampling technique. The research was conducted on 23 April - 7 May 2019, at the Posyandu in Depok Village, Kecamatan Darangdan, Kabupaten Purwakarta.

Data were analyzed using the Chi-Square test with $\alpha = 0.05$ and the calculations were done using SPSS.

The research ethics included informed consent, anonymity, confidentiality, and ethical clearance. The ethical clearance in this study was obtained from the Research Ethics Committee Maranatha Christian University Number 010/KEP/II/2019.

3 RESULTS AND DISCUSSION

It Table 1 can be seen that of the 32 respondentswho have children with stunting, 22 (68.8%) of respondents have children with LBW, and 10 (31.1%) of respondents have children with normal birth weight. Chi-square test for birth weight showed a p-value of 0.042.

Table 1: The relationship between low birth weight with stunting.

	Stunting Status		Total	OR	*p*
Birth Weight(g)	Stunting (%)	Not Stunting(%)			
< 2500	22 (68.8)	9 (40.9)	31	3.178	0.042
≥2500	10 (31.1)	13 (59.1)	23		
	32	22	54		

According to WHO, low birth weight is defined as birth weight < 2500 g. Birth weight is determined by the pregnancy age and the growth rate of the fetus. (Fitri, 2012) Birth weight has a vital role in determining newborns' survival in vulnerable conditions. Low birth weight is associated with fetal and neonatal morbidity and mortality, impairment of growth and development and also chronic disease later in life (Lake, 2018).

Based on the analysis of the risk of LBW on the incidence of stunting, an OR of 3.178 was obtained; that means respondents who had children with low birth weight had a 3.178 times greater risk of experiencing stunting compared to respondents who had children with normal birth weight (p-value = 0.042). This is in line with previous research in Aceh which also showed that infants with LBW had a risk of stunting up to 3.26 times greater than infants without a history of LBW. (Lestari, Margawati, & Rahfiludin, 2014). Research in 2015 showed that stunted children were associated with a history of

LBW (p-value = 0.015; OR = 1.555), which means that children who had a history of LBW had a risk of stunting 1.555 times compared to children who did not experience LBW. (Rahayu, Yulidasari, Putri, & Rahman, 2015). Another study stated that a baby's weight at birth affected the growth of the baby (Fekadu et al., (2015). Toddlers with a history of low birth weight were more likely to experience stunting. Babies who were born with LBW experience difficulties in early growth. The problem of growth could lead to stunting.

Table 2: Relationship between birth length with stunting.

	Stunting Status				
Birth length(cm)	Stunting (%)	Not Stunting (%)	Total	OR	*p*
< 48	23 (71.9)	10 (45.5)	33	3.067	0.005
≥ 48	9 (28.1)	14 (54.5)	21		
	32	22	54		

Table 2 showed that of 32 respondents who had children with stunting, 23 (71.9%) respondents had children with low birth length, and 9 (28.1%) respondents had children with normal birth length. The results of statistical tests with Chi-square for the variable history of birth length showed a probability value p-value = 0.050, so a significant difference was found.

The length of the baby's body at birth describes the linear growth of the baby during pregnancy. A low linear measure usually indicates a state of undernutrition due to a lack of energy and protein suffered in the past which begins with a slowdown or retardation of fetal growth (Lukman, Anwar, Riyadi, Harjomidjojo, & Martianto, 2021). Inadequate maternal nutritional intake before pregnancy causes growth problems in the fetus, which can cause babies to be born with low birth lengths (KEMENKES, 2020).

Based on the results the risk of birth length on the incidence of stunting, an OR of 3.067 was obtained, meaning that respondents who had children with a low birth length had a risk of being stunted 3.067 times greater than those who had children with normal birth length with a p-value = 0.005.

According to De Onis and Branca (2016), birth length was one of the main factors affecting the incidence of stunting. Stunting started from the first 1000 days of life due to in-uterine growth disorder. Short birth length reflects the history of protein-energy malnutrition during pregnancy, causing fetal growth retardation (FGR). This is in line with Khoirun and Siti Rahayu's research in 2015 in Surabaya which stated that low birth length has a higher risk of stunting among children. (Khoirun, 2015). This is also in line with the research conducted by Dandara in Kediri, which said that the results of a large risk analysis of the length of a baby at birth to the incidence of stunting, obtained an OR of 4.078 with a p-value of 0.000 (Swathma, Hariati, & Ardiansyah, 2016). This study was in accordance with a study by Ayuningrum, Salimo, and Dewi (2017) which was done in Purworejo, Central Java, Indonesia. It stated that there was a meaningful relationship between birth length and the incidence of stunting in toddlers.

Table 3: Relationship between basic immunization history with stunting.

	Stunting Status		Total	OR	*p*
Basic immunization	Stunting (%)	Not Stunting (%)			
Complete	28 (87.5)	14 (63.6)	42	0.25	0.042
Incomplete	4 (12.5)	8 (36.4)	12		
	32	22	54		

It can be seen in table 3 that of the 32 respondents who experienced stunting, 28 (87.5%) of respondents received complete basic immunization and 4 (12.5%) respondents did not get complete basic immunization.

Stunting directly affected by infectious diseases and immunizations is a way to boost a person's immunity so as not to get the disease. It has been recognized for decades and highlighted by UNICEF that infectious diseases contribute to child undernutrition. An infectious disease can cause: (i) reduced dietary intake (e.g. appetite loss, reduced feeding by parents as an attempt to end diarrhea); (ii) increased nutrient loss (e.g. vomiting, malabsorption) and (iii) elevated nutrient requirements caused by increases in metabolism such as those due to fever. (Anekwe & Kumar, 2012)

Based on the results of a large analysis of the risk of basic immunization history on the incidence of stunting, an OR of 0.250 was obtained, meaning that respondents who had children with incomplete basic immunization had a risk of stunting 0.250 times

greater than respondents who had children with complete basic immunization with p-value = 0.042.

This is also in line with research conducted by Fajariah (2020), which shows that immunization status has a significant relationship with the nutritional status index of TB/U. (Fajariyah & Hidajah, 2020). Swathma (2016) states that immunization status is the underlying factor in the incidence of stunting in children. (Swathma, 2016). Another study from Chandra Dewi & Tresna Adhi (2016) states that toddlers who have a history of infection are more at risk for stunting. Infected toddlers (Acute Respiratory Infection or diarrhea) have a 5.41 times greater risk of experiencing stunting (Chandra Dewi & Tresna Adhi, 2016). Vaccination is the most effective public health intervention against vaccine-preventable disease and has saved millions of children's lives.

4 CONCLUSIONS

- There is a relationship between LBW with stunting
- There is a relationship between birth lengthwith stunting
- There is a relationship between basic immunization history with stunting

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