

Research article

Factors Related to Stunting in Toddlers in Central Cigugur

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Abstract.

Stunting is a problem associated with chronic malnutrition which can occur in the first 1000 days of life. The causes of stunting can include a history of low birth weight (LBW), non-exclusive breastfeeding, or infectious diseases. Few studies have examined the factors associated with stunting in Indonesia. This study therefore aimed to investigate the relationship between stunting and the history of infection, LBW, and exclusive breastfeeding in Central Cigugur Health Center in Indonesia. This was an observational comparative cross-sectional study. 44 cases and 44 controls were selected using random sampling. Data were collected using a questionnaire and microtoise, and univariate and bivariate analyses were conducted using the Chi-square test. The results showed that 69 children under five (78.4%) did not have a history of LBW, 56 children (63.6%) had a history of non-exclusive breastfeeding, and 64 children under five (72.7%) had a history of frequent infections. There was a relationship between the incidence of stunting and a history of LBW, exclusive breastfeeding and infectious disease (OR = 7.810, $p = 0.002$; OR = 5.400, $p = 0.001$; and OR = 5.928, $p = 0.002$; respectively). Having a history of LBW was associated with the highest risk of stunting in toddlers. These findings can be used to support stunting eradication strategic planning.

Keywords: LBW, infection, exclusive breastfeeding, stunting

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1. Introduction

Stunting is a chronic malnutrition problem that occurs in the First 1000 Days of Life (FTD). Symptoms of stunting appear after children are 2 years old, characterized by slowed growth and are irreversible. This is because during this period the optimal growth and development phase is not repeated again in adulthood [1]. One of the targets for the Sustainable Development Goals (SDGs) is to reduce the rate of stunting to 40% by 2025 [2]. Until now stunting is still one of the nutritional problems that need attention. prevalence data Stunting collected by the World Health Organization (WHO) in 2017, Indonesia is the third country with a high prevalence in the South-East Asia Region (SEAR) (36.4%) followed by India and Timor Leste which are 38% and 50.2% respectively [2].

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Based on data from the West Java Provincial Health Office in 2016 regarding the nutritional status of toddlers, it shows that height according to age is known to be very short by 2.82%, and short by 8.72%. The incidence of under five stunting is a major nutritional problem faced by Indonesia. The prevalence of short toddlers has increased from 2016 which was 27.5% to 29.8% in 2017 [2]. Breast milk is the best food for babies because it contains the most suitable nutrients for growth and development [3]. Exclusive breastfeeding for babies in Cimahi City is around 69.3% (West Java, 2016). Poor nutritional status resulting in impaired immune system and reduced resistance to infection. The frequency of children exposed to infections such as diarrhea and Acute respiratory infections (ARIs) has an important contribution to the incidence of stunting [1]. One of the causes of stunting is infectious diseases such as diarrhea which can cause children to lose fluids and a number of nutrients [3].

This is in line with research conducted by Desyanti and Nindya (2017) which states that there is a significant relationship between a history of diarrheal disease and the incidence of stunting in toddlers aged 24-59 months in the Simolawang Health Center Work Area, Surabaya with a p value of 0.025 ($\alpha < 0.05$) [4]. The frequency of ARIs is related to the nutritional status of toddlers where the more often toddlers experience ARI, the worse the status. Cimahi City Health Office in 2018 regarding monitoring nutritional status and nutritional indicators, Stunting in the Central Cigugur Health Center area ranks first with a percentage of 15.95% cases of all cases stunting and very stunting in the Cimahi City Health Office Area. Based on secondary data obtained from nutrition officers at the Central Cigugur Health Center on January 21, 2019, it was found that Melati and Nusa Indah IHC have the highest incidence of stunting among other IHC. In order to eradicate stunting once and for all, a focused strategic planning are needed which can be done by analyzing the causative factors of stunting.

Stunting is identified as cyclical process which involves the connection between maternal nutrition to intergenerational cycle of growth failure. Therefore, stunting is affected by factors during pregnancy and factors during the First 1000 Days of Life [22]. Since stunting is multifactorial syndrome, analysis of multiple causative factor is necessary. Hence, this study aims to investigate these factors which are the history of infection, low birth weight (LBW), and exclusive breastfeeding in Central Cigugur Health Center. LBW are chosen as the representative of factors during pregnancy which affect the birth weight of the baby. While the other two represent factors during the First 1000 Days of Life.

2. Methods

This research is an analytical survey research with comparative cross sectional study . The data was collected in Cimahi Indonesia, in June 2021. The risk factors in this study were the history of LBW, exclusive breastfeeding, and infectious diseases. The case group in this study are toddlers aged 24-59 months with stunting ($Z\text{-score} \leq 2\text{ SD}$) and controls are toddlers aged 24-29 months who are not stunted. The exclusion criteria of this study are having congenital abnormalities and currently on medication.

The population in this research are 55 toddlers for the case group and 209 toddlers for the control group. The population are from Melati IHC and Nusa Indah IHC which are in the work Area of Central Cigugur Health Center. The sampling technique in this study uses the Purposive Sampling (Non Probability Sampling) technique which is a sampling technique with certain considerations [5]. In this study, the sample was divided into two, namely case samples and control samples, to compare the effect of a history of LBW, the profile of exclusive breastfeeding, and the history of infectious diseases on the two groups.

Based on the calculation of the size of the unpaired categorical analytical research sample, according to Dahlan (2010), 44 samples were found, where this study consisted of 44 case samples and 44 control samples [6]. The primary data collected in this study were a history of low birth weight, a history of exclusive breastfeeding and a history of infectious diseases obtained through a questionnaire. Secondary data in the form of events for stunting toddlers aged 24-59 months were obtained from monthly data on weighing toddlers and measuring height with indicators of short and very short toddlers contained in the annual report book of the Central Cigugur Health Center with case group criteria ($Z\text{-score} < - 2\text{ SD}$) and the control group diagnosed as not experiencing stunting.

The analysis of the determinants of stunting was analyzed using several stages, namely univariate analysis of proportions and percentages and bivariate analysis using the Chi Square Xtest2 with a significance level of 95% or an alpha value of 0.05 (5%) and Odds Ratio (OR) to assess how often the exposure occurred in cases compared to controls [7]

3. Results

Based on table 1, from a total of 88 samples taken, 19 (21.6%) had a history of low birth weight consisting of 16 (36.4%) in the case group and 3 (6.8%) in the control group.

There were 69 children under five (78.4%) who did not have a history of low birth weight, consisting of 28 (63.6%) in the case group and 41 (93.2%) in the control group. From the results of the statistical test Chi Square, it can be concluded that there is a significant relationship between the history of Low Birth Weight (LBW) with the incidence of stunting in toddlers p value = 0.002 ($\alpha < 0.05$) and the RO value (Ratio Odds) is 7.810, which means that toddlers born with a history of low birth weight have a 7,810 times higher risk of experiencing stunting compared to toddlers who do not have a history of low birth weight.

TABLE 1: The association of stunting and the history of breastfeeding, Infection, and low birth weight.

Factors		Stunting Occurrence				Total		RO 95% CI	P Value
		Case		Control		n	%		
		n	%	n	%				
Birth Weight	LBW	16	36.40	3	6.80	19	21.60	7.810	0.002
	Non-LBW	28	63.60	41	93.20	69	78.40	2.079-29.335	
	Total	44	100	44	100				
Breastfeeding	Exclusive	8	18.20	24	54.50	32	36.40	7.810	0.001
	Non-Exclusive	36	81.64	20	45.50	56	63.60	2.079-29.335	
	Total	44	100	44	100				
Frequency of infection	Rarely (≤ 6)	5	11.40	19	43.20	24	27.3	5.928	0.002
	Frequently (> 6)	39	88.60	25	56.80	64	72.7	1.962-17.911	
	Total	44	100	44	100				

TABLE 2: The summary of demographic characteristics of respondent.

Variable	Case Group		Control Group	
	n	%	n	%
Age (Years)				
< 20	28	64	8	18
20-35	6	14	24	55
>35	10	22	12	27
Education (school)				
elementary	24	55	16	37
middle	14	31	18	41
high	6	14	10	22
Parity				
1	26	29	12	20
2-4	6	14	20	46
>4	12	27	12	27

The results of the analysis of the relationship between a history of exclusive breastfeeding and the incidence of stunting in toddlers aged 24-59 months shows that from a total of 88 samples taken, 32 (36.4%) were given exclusive breastfeeding consisting of 8 (18.2%) in the case group and 24 (54.5%) in the control group while the number of children under five who were not exclusively breastfed was 56 (63.6%), consisting of 36 (81.8%) in the case group and 20 (54.5%) in the control group.

From the results of the Chi Square statistical test, it also can be concluded that there is a significant relationship between the history of exclusive breastfeeding with the incidence of stunting in toddlers p value = 0.001 ($\alpha < 0.05$) and the RO value (Odds Ratio is 5.400, which means that toddlers who are not given Exclusive breastfeeding has a 5.4 times higher risk of stunting compared to toddlers who are exclusively breastfed.

The results of the analysis of the relationship between the history of infectious disease and the incidence of 24-59 stunting in toddlers, it shows that from a total of 88 samples taken, 24 (27.3%) had a history of rarely experiencing infectious diseases, which consisted of 5 (11.4%) in the case group and 19 (43.2%) in the control group while children under five who often experience infectious diseases were 64 children (72.7%), consisting of 39 (88.6%) in the case group and 25 (56.8%) in the control group.

The results of the Chi Square statistical test, it can be concluded that there is a significant relationship between a history of infectious diseases and the incidence of stunting in toddlers' p value = 0.002 ($\alpha < 0.05$). And the RO (Odds Ratio) value is 5.928, which means that toddlers who often experience infectious diseases have a 5.928 times higher risk of experiencing stunting compared to toddlers who rarely experience infectious diseases.

4. Discussion

4.1. The Relationship between History of Low Birth Weight and the Incidence of Stunting

Based on the results of the study, it was concluded that from 19 the number of children under five who were born with a history of LBW 16 toddlers experienced stunting and the others did not experience stunting. This occurs because the nutritional intake of each child depends on the parents comprehension of the importance of nutritional intake in FTD. Although the children are born with a history of low birth weight and have a risk of impaired growth and development, the condition can still be improved by fulfilling nutritional intake before the child is 2 years old. According to Hardinsyah & Supariasa

(2017), nutrition is the main factor that supports the occurrence of metabolic processes in the body since every chemical reaction that occurs in the body requires nutrition. Therefore, malnutrition can have an impact on the longest growth and maturation of organs, and body size is much shorter [8].

Factors that can cause low birth weight babies are poor nutritional status of the mother during pregnancy, mothers who smoke, drink alcohol, anemia, bleeding are at high risk of giving birth to babies with LBW. which caused long term problems in growth and development of the child [9]. The results of this study are in line with the results of Nasution's research (2014) in the city of Yogyakarta which also stated that of 121 cases of children suffering from stunting, 31 (25.6%) with a history of (LBW) were 5.6 times more likely to be stunted at the age of 6-24 months compared to babies born with normal birth weight [10].

The anthropometric measure used is height, which is an important parameter for past and present conditions. [11]. If there is no improvement in adequate nutrition and good health services, stunting will continue in the next age, namely short adolescents. A study in China found that adolescents born with a low birth weight of 1200-2499 grams will experience delays in physical growth, cognitive capacity and academic ability compared to adolescents born with a weight of > 2500 grams. If an adult woman grows up with stunting, it will increase the chance of giving birth to a child with low birth weight and a greater risk of dying during childbirth [1].

4.2. The Relationship of History of Exclusive Breastfeeding with Incidence of stunting

Based on the results of the study, data obtained showed that from 56 the number of toddlers who had a history of not being given exclusive breastfeeding, 36 toddlers experienced stunting and 20 did not experience stunting . This can occur due to the cause of stunting, namely chronic malnutrition in FTD. The results of this study are in accordance with research conducted by Fitri (2017), which shows that there is a significant relationship between a history of exclusive breastfeeding and the incidence of stunting $p \text{ value} = 0.021 < (\alpha 0.05)$ [12].

Maryunani (2010) explained that growth and development at the age of infants requires balanced and relatively large nutrients, but the baby's ability to eat is limited by the state of the digestive tract which is still in the maturation stage, the only food that is suitable for the baby's digestive tract. and to meet the needs for the first months is breast milk, children who are not exclusively breastfed are at higher risk for lack of nutrients

needed for the growth process [3]. Fitri's research (2017) said that breast milk is the best food for babies because breast milk contain the most appropriate nutrients for babies compared to other choice of foods [12]. These results are in line with research conducted by Purnamasari (2009) on 72 toddlers showing that non-exclusive breastfeeding is a risk factor for growth faltering [13].

Non-exclusive breastfeeding for infants has a 3.30 times risk of growth faltering. The results of this study are supported by the results of research by Irmawaty Bentian (2015) about exclusive breastfeeding as a risk factor for stunting in Yogyakarta where there is a significant relationship between exclusive breastfeeding and stunting in children aged 6-24 months (P value = 0.003; OR = 1.74) [14]. It can be said that children under five who do not receive exclusive breastfeeding have a 1.74 times risk of experiencing stunting compared to children under five who receive exclusive breastfeeding. Maryunani (2010) explained that exclusive breastfeeding means that babies are only given breast milk without additional fluids, such as formula milk, oranges, honey, water and additional solid foods such as bananas, papaya, milk porridge, biscuits, rice porridge and team [3].

The duration of exclusive breastfeeding for infants is until the baby is 6 months old, after 6 months the baby is started to be given complementary foods, while breast milk can be given for up to 2 years. Breast milk is a natural source that has a major impact on the health, growth and development of children and is recommended for at least the first 2 years of life. Exclusive breastfeeding is important at the age of 0-6 months, because food other than breast milk has not been able to be digested by the enzymes in the intestines, in addition to removing the rest of the burning food cannot be done properly because the kidneys are not perfect [15]. In order for the mother's milk production to meet the needs of her baby, it is necessary to pay attention to the mother's food intake is in sufficient quantities and contain the necessary nutritional elements, namely calories, protein, fat, vitamins and minerals. In addition to food intake, maternal psychological factors greatly affect breast milk production [3].

4.3. The Relationship History Infectious diseases with incidence of stunting in Toddlers (Under Five Years in Central Cigugur Heath Center

Based on the results of data that from 64 the number of infants who have a history of frequent infections, 39 infants suffered stunting and 25 do not experience stunting it can happen because Infectious diseases can worsen nutritional status, related to decreased body immunity which makes children more susceptible to infectious diseases and

environmental factors that can worsen nutritional status, such as a dirty environment, unavailability of clean water will greatly affect health status, history of non-exclusive breastfeeding in the first 365 days of life is a matter that greatly affects the child's immune system, so that children who often experience infections but do not have stunting can be caused by other factors such as a history of not being given exclusive breastfeeding, children stunting who are exclusively breastfed can achieve growth that is in accordance with their age standards.

The results of this study are in line with research conducted by Dewi and Widari (2018) in Maron Village, Probolinggo Regency from the results of the statistical test Chi-Square showing a significant relationship between infectious diseases and the incidence of stunting, the p value = 0.049 and the Odd Ratio of 3.071, which means that children under two years of age who have a history of infectious diseases are 3.071 times more likely to experience stunting compared to under-fives who do not have a history of infectious diseases [16].

Infectious diseases are one of the direct causes of stunting, because infectious diseases will be related to the fulfillment of nutritional intake. Infectious diseases are diseases caused by microorganisms such as bacteria, viruses and parasites. The presence of infectious diseases will worsen the situation if there is malnutrition in toddlers, because during infancy the nutritional needs can be fulfilled optimally so that growth and development at this age can take place optimally. Nutritional problems that often occur in toddlers such as undernutrition, overnutrition and stunting [2].

Stunting can occur due to non-fulfillment of nutrition at First 1000 Day of Life (FTD) that began 270 days during pregnancy and 730 the first day after the baby is born, a period that determines the quality of life, symptoms of stunting emerging at children aged 2 years, characterized by growth that slows down and is irreversible or once changed cannot return to its original state [1]. Toddlers who are malnourished will cause a decrease in their immune system which can make them more susceptible to infectious diseases. Toddlers who suffer from infectious diseases, especially chronic diseases, will affect growth and development including growth in height which can cause toddlers to be lower in height than their age standards [17].

The history of infectious diseases that were found in toddlers during the study were 40 toddlers, mothers of toddlers said that toddlers often had colds and diarrhea in the last 2 years, ARIs stands for Acute Respiratory Infection, symptoms that usually appear in ARI such as cough, runny nose and fever [19]. When a child has a fever, every 1-degree Celsius increase in body temperature increases energy requirements by up to 13% [1]. while children are said to have diarrhea when they have defecated more than 3 times.

Diarrhea is an increase in stool output with a softer or more fluid consistency than usual, and occurs at least 3 times in 24 hours [17].

4.4. The association between low birth weight, infection, and exclusive breastfeeding

Based on the results, the history of low birth weight put toddlers at the highest risk of stunting (OR=7.81), compared with the history of infectious disease and without exclusive breastfeeding (OR=5.9 and OR=5.44). The number of Odds Ratio in this study are higher compared to other studies conducted in another region of Indonesia. For LBW factors and breastfeeding, compared to the study in Yogyakarta (OR = 5.6 and OR=1.74), and infection to those in Probolinggo (OR= 3.071).

Babies with low birth weight are prone to infection. This is might due to immature immune system, small size lymphoid organ, and underdeveloped mucosal surface. Studies have also linked LBW and low T-cell number and lymphocytes proliferation [19]. LBW also linked with poor nutritional intake which is due to reduce small intestine weight, compared to normal birth weight babies. This indicate that LBW babies have a thinner intestine walls and lower intestinal absorptive surface. Furthermore, the expression of protein involved in biological processes such as absorption, digestion and transport of nutrients are affected by birth weight during the first 21 days of life [20]. The difference architecture of LBW babies intestine might reduce the absorption of nutrition needed to grow, fight infections, and nutrition from breastfeeding which are strongly recommended by WHO [21]. With the prevention and correct treatment of LBW, stunting case number in Cigugur health center area can be reduced significantly.

5. Conclusions

Low Birth Weight Based on the results, the history of low birth weight put toddlers at the highest risk of stunting compared with the history of infectious disease and without exclusive breastfeeding. This might be due to the different architecture and metabolic characteristics of intestine in LBW babies which affect the absorption of nutrition. This might cause inadequate nutrition intake which causes the baby prone to infection and have a slow growth rate.

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