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Exclusive breastfeeding and low birth weight as risk factors of stunting in under-five children: A case-control study in Darul Imarah Sub-District, Aceh Besar, Indonesia

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Abstract

Stunting refers to children's growth and development disorders and is affected by chronic nutrient deficiency, repeated infections, and a lack of stimulation during the first 1000 days of their life. This study aimed to examine the effects of breastfeeding and birth weight on the incidence of stunting in under-five children. This case-control study design involved 116 under-five children: 53 children in the case group and 53 children in the control group. This study was conducted in Darul Imarah Community Health Center, Aceh Besar. The data on characteristics, early breastfeeding initiation, exclusive breastfeeding, and breastfeeding duration were collected using the interview method. Meanwhile, the data on birth weight was collected from birth records in the MCH book. Finally, the data on stunting were collected using the anthropometric measurements determined by the HAZ index based on the z-score. A child would have categorized as stunted if the z-score value had been <-2 SD. The collected data were then analyzed using the bivariate and multivariate analyses and the binary logistic regression test at a 95% confidence level. The results showed that exclusive breastfeeding and LBW were risk factors of stunting in under-five children. Children without exclusive breastfeeding had 4.57 times as great risk of stunting as those with exclusive breastfeeding (OR = 4.57; 95% CI; 1.57-13.27). Moreover, children born with low birth weight had 9.43 times as great risk of stunting as those born with normal weight (OR = 9.43; 95% CI; 3.54-25.12). Education and promotion are needed to increase exclusive breastfeeding and improve pregnant women's health to prevent a low birth weight of babies and reduce the incidence of stunting since the early stage.
Keywords: Exclusive breastfeeding, low birth weight, stunting, under-five children

Introduction

Stunting refers to a condition of failure to thrive and is caused by a lack of nutritional intake in a long time. If this condition occurs during the golden period, it will decline intellectual abilities, affect productivity in a long term, and increase the risk of degenerative diseases (Caulfield LE. Et al., 2010). Stunting is also a linear growth disorder caused by chronic nutrient intake, malnutrition, chronic infectious diseases, or recurrent infectious diseases as indicated by the z-score for height for age (TB/U) less than -2 SD (Nasikhah, 2014).

The prevalence of stunting in Aceh is very high. Basic Health Research (Riskesdas) reported the fluctuating stunting occurrence in Aceh for several years: 44.6% of under-five children suffered from stunting in 2007, 39.8% in 2010, 41.5% in 2013, 37.3% in 2018, and 34.18% in 2019 (Kemenkes RI, 2020). Referring to the category limit, the prevalence of

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stunting in Aceh is in the high category (WHO, 2010). Aceh Besar District is the eighth-highest prevalence of stunting in Aceh because it has a high category of stunting problems by 38.7% (Kemenkes RI, 2018).

Stunting is influenced by multi factors, such as genetic factors, environment, and health services. Environmental factors very dominantly influence linear growth in under-five children because at this age they have more contact with environmental factors, including diet (Almatsier, 2011). In most families, children generally have a similar diet that of adults; in fact, children need higher nutrition to support their growth and development (Nasikhah, 2012).

Broadly speaking, the causes of stunting can be grouped into three; community, household, and individual levels (Wiyogowati, 2012). The community level refers to economic, education, health, sanitation, and clean water systems. The household level refers to inadequate quality and quantity of food, income levels, and structures of family members. Meanwhile, the individual level comprises poor parenting, children's age, unbalanced food intake, low birth weight (LBW), and poor health status.

Stunting is closely related to the community's behavior and utilization of health services. Some important behaviors associated with early childhood are early initiation of breastfeeding (EBI), exclusive breastfeeding from birth to 6 months of age, complementary feeding from 6 to 24 months of age, and breastfeeding until children aged 24 months or older (Engle PL. et al., 1997). The high stunting problems triggered this research to determine the factors causing the high stunting in Aceh Besar. This study aimed to analyze factors that caused stunting in under-five children in Darul Imarah Health Center, Aceh Besar.

Methods

This study employed a case-control study design and was conducted in Darul Imarah Community Health Center, Aceh Besar in May-June 2019. The research sample was 116 under-five children: 53 children were in the case group, and 53 children were in the control group. The inclusion criteria of the sampled were (short) stunted children with z-score <-2 SD based on the PB/U and TB/U indices, children aged 12-59 months, without growth disorders due to congenital abnormalities, and willingness to participate in the research. This study collected data on characteristics of the samples and their family, including children's age, gender, birth order, mothers' education, and family's income. The data on risk factors included exclusive breastfeeding, early initiation of breastfeeding (IMD), and duration of breastfeeding; these data were collected using an interview method and a structured questionnaire. Meanwhile, data on birth weight and length were collected from birth records and Maternal and Child Health Books (*Buku-KIA*). The data on exclusive breastfeeding were categorized into exclusive and not exclusive breastfeeding. Meanwhile, data on the duration of breastfeeding were categorized into 2 years and <2 years. The data on early initiation of breastfeeding were categorized as yes and no. Furthermore, data on birth weight were grouped into low birth weight (LBW) if the birth weight had been <2500g and were grouped into normal if the birth weight had been ≥2500 g. Meanwhile, the birth length of <46 cm was categorized into short, and 46 cm was categorized as normal. The data on stunting were collected by anthropometrically measuring body length or height using a baby length board or microtoise with an accuracy of 0.1 cm. Stunting was determined based on the HAZ index for children and categorized based on the WHO-2007 standard z-score value. A child was categorized stunted if the HAZ had been <-2SD and normal if HAZ had been ≥-2SD (WHO, 2007). The univariate analysis determined the mean and frequency distribution of each variable. Bivariate and multivariate analyses used a logistic regression test. The multivariate

test determined the risk factors of stunting and was conducted in three stages. The first was to test all variables on stunting. The second was to test all variables using a multivariate analysis with a p-value <0.25. The third stage was to test all variables with a p-value <0.05. All statistical tests were carried out at the 95% confidence level (α =0.05).

Results

The samples of this study were 116 under-five children: 53 stunted children in the case group, and 53 children with normal nutritional status in the control group. The results of data collection showed that the overall sample had been complete and could be analyzed. The results (Table 1) showed that the majority of the samples (84.9% in the case group and 73.6% in the control group) were 24 months old or over. Moreover, 60.4% of cases and 58.5% of controls were male. The data also show that 56.6% of cases and 52.8% of control) were the third child in their family. The data on maternal age indicate that more than half of the mothers in the case group (52.8%) were above 36 years old. In contrast, more than half of the control group (56.6%) were less than 36 years old. The data on mothers' education denotes that most of the mothers in the case group (52.8%) earned higher education (Diploma's and bachelor's degrees). On the contrary, more than half of mothers in the control group had secondary education (junior and senior high schools). Finally, the data showed that most families in both groups had an income of IDR < 3 million: 86.8% in the case group and 67.9% in the control group.

Table 1. Characteristics of samples and socio-demographic status of family

Characteristics of samples and	Stunting		Normal	
Socio-demographic status of family	n	%	n	%
Sample Age				
- <24 months	8	15.1	14	26.4
- 24 months	45	84.9	39	73.6
Gender				
- Female	21	39.6	22	41.5
- Male	32	60.4	31	58.5
Birth order of the child				
- 1st to 2nd child	23	43.4	25	47.2
- 3rd or more child	30	56.6	28	52.8
Age of mothers				
- 36 years old	25	47.2	3 0	56.6
- < 36 years old	28	52.8	2 3	43.4
Education of mothers				
- Diploma or bachelor	28	52.8	19	35.8
- Junior and senior high school	25	47.2	34	64.2
Family income (IDR)				
- ≥ 3,000,000	7	13.2	1 7	32.1
- < 3,000,000	46	86.8	37	67.9

IDR= Indonesian rupiah; *p<0.05

Analysis of bivariate risk factors of stunting in children under five

The data on risk factors constituted children's factors after birth, such as birth weight, exclusive breastfeeding, and duration of breastfeeding. This study (Table 2) revealed that

children without exclusive breastfeeding were more likely to suffer from stunting (84.9%) than normal children (54.7%). Moreover, this study found there was a significant relationship between exclusive breastfeeding practices and the incidence of stunting (p = 0.001). Children without exclusive breastfeeding were 4.6 times more likely to suffer from stunting than ones with exclusive breastfeeding (OR = 4.65; 95% CI: 1.84-11.75). The results also showed that the children with two-year breastfeeding were more likely to suffer from stunting (90.6%) than normal children (81.1%). However, there was no significant relationship between the weaning age and the incidence of stunting (p>0.05). The results showed that children born with LBW were more likely to suffer from stunting (64.2%) than those with normal nutritional status (15.1%). Finally, the statistical test results showed that there was a significant relationship between LBW and stunting (p=0.000). Children born with LBW were 10 times as great risk of stunting as ones born with normal birth weight (OR = 10.07, 95% CI: 3.93-25.73).

Table 2. Analysis of bivariate risk factors of stunting in under-five children

Risk factors of stunting	Stunting		Normal		*AOR (95%CI)*	*p-values*
	n	%	n	%		
Exclusive breastfeeding						
- Yes	8	15.1	24	45.3	1	
- No	45	84.9	29	54.7	4.65 (1.84-11.75)	0.001*
Early initiation of breastfeeding (EBI)						
- Yes	48	90.6	43	81.1	1	
- No	5	9.4	10	18.9	0.44 (0.14-1.41)	0.171
Weaning age						
- ≥2 years	25	47.2	39	73.6	1	
- <2 years	28	52.8	14	26.4	3.12 (1.38-7.04)	0.006*
Birth weight						
- 2500 g	19	35.8	45	84.9		
- <2500 g	34	64.2	8	15.1	10.07 (3.93-25.73)	0.000*

**) Significant p<0.05*; *OR = Odd ratio*; *CI = Confident interval*

Multivariate analysis of stunting risk factors in under-five children

The first stage of the multivariate analysis (Table 3) revealed that there was a significant relationship between exclusive breastfeeding and stunting (p = 0.010), and there was a relationship between birth weight and stunting (0.001). However, the results showed that the early initiation of breastfeeding and duration of breastfeeding were not significantly related to stunting (p > 0.05). Meanwhile, the multivariate analysis showed that three variables, exclusive breastfeeding, early initiation of breastfeeding, and low birth weight, had a p-value of < 0.25. Therefore, they were included in the second stage of the multivariate test. The results of the multivariate test (Table 4) described that exclusive breastfeeding and LBW were significantly associated with stunting (p = 0.005 and p = 0.001). Therefore, these two variables were tested in the third stage, the multivariate test. This test included all variables, namely exclusive breastfeeding and LBW, with a p-value < 0.05. The results of the analysis (Table 5) indicated exclusive breastfeeding and LBW were significantly associated with stunting (p<0.01). Children without exclusive breastfeeding were 4.57 times as great risk of

stunting as those with exclusive breastfed (OR = 4.57; 95% CI; 1.57-13.27). Moreover, children born with low birth weight had 9.43 times as great risks of stunting as those born with normal weight (OR = 9.43: 95% CI; 3.54-25.12).

Table 3. Multivariate analysis of determinant factors of stunting in under-five children (Stage 1)

Risk factors of stunting	Stunting		Normal		*AOR (95%CI)*	*p-values*
	N	%	n	%		
Exclusive breastfeeding						
- Yes	8	15.1	24	45.3	1	
- No	45	84.9	29	54.7	4.11 (1.39-12.10)	0.010*
Early initiation of breastfeeding (EBI)						
- Yes	48	90.6	43	81.1	1	
- No	5	9.4	10	18.9	0.36 (0.09-1.44)	0.150
Weaning aged						
- ≥2 years	25	47.2	39	73.6	1	
- <2 years	28	52.8	14	26.4	1.71 (0.65-4.53)	0.275
Birth weight						
- 2500 g	19	35.8	45	84.9		
- <2500 g	34	64.2	8	15.1	8.81 (3.22-24.10)	0.001*

**) Significant p<0.05*; *OR = Odd ratio*; *CI = Confident interval*

The results of this study indicate that exclusive breastfeeding and low birth weight were risk factors of stunting in under-five children. Moreover, children who are not exclusively breastfed had 4.57 times as great risks of stunting as those with exclusive breastfeeding (OR = 4.57; 95% CI; 1.57-13.27). Moreover, children born with low birth weight had 9.43 times as great risks of stunting as children born with normal weight (OR = 9.43: 95% CI; 3.54-25.12).

Table 4. Multivariate analysis of determinant factors of stunting in under-five children (Stage 2)

Risk factors of stunting	Stunting		Normal		AOR (95% CI)	*p-values*
	n	%	n	%		
Exclusive Breastfeeding						
- Yes	8	15.1	24	45.3	1	
- No	45	84.9	29	54.7	4.57 (1.57-13.27)	0.005*
Early initiation of breastfeeding (EBI)						
- Yes	48	90.6	43	81.1	1	
- No	5	9.4	10	18.9	0.339 (0.87-1.31)	0 119
Birth weight						
- ≥ 2500 g	19	35.8	45	84.9		
- < 2500 g	34	64.2	8	15.1	9.54 (3.52 - 25.89)	0.00 0 *

**) Significant p<0.05*; *OR=Odd ratio*; *CI= Confident interval*

Table 5. Multivariate analysis of determinant factors of stunting among under-five children (Stage 3)

Risk factors of stunting	Stunting		Normal		*AO R (95%CI)*	*p-values*
	n	%	n	%		
Exclusive Breastfeeding						
- Yes	8	15.1	24	45.3	1	
- No	45	84.9	29	54.7	4.17 (1.45-11.93)	0.008*
Birth weight						
- ≥ 2500 g	19	35.8	45	84.9		
- < 2500 g	34	64.2	8	15.1	9.43 (3.54 - 25.12)	0.00 0 *

**) Significant p<0.05; OR = Odd ratio; CI = Confident interval*

The results of this study indicated that children's birth weight was associated with stunting. Children born with low birth weight had 9.43 times as great risk of stunting as children born with normal weight (OR = 9.43: 95% CI; 3.54-25.12).

Discussion

The results of this study are similar to those of previous studies, which discovered that exclusive breastfeeding was a risk factor of stunting. Swathma et al. (2012) found that children without exclusive breastfeeding had 6.54 times as high risk of stunting as children with exclusive breastfed. Meanwhile, Amsalu (2008) discovered that children without exclusive breastfeeding were 3.2 times as high risk of malnutrition and 6.9 times as high risk of stunting as children with exclusive breastfeeding. Another study in Banjar Margo District, Tulang Bawang Regency, showed that children without exclusive breastfeeding were 3.1 times as high risk of stunting as those with exclusive breastfeeding (Sari et al., 2021). A study in Mexico also showed that breastfeeding was a consistently protective factor against child stunting (Campos et al., 2020). Another study in Jambi Indonesia proved that delaying breastfeeding could increase 1.3 times risk of stunting (Muldiasman et al., 2018). Finally, a study in Lawe Alas, Aceh discovered that children without exclusive breastfeeding had 3.64 times as high risk of stunting as children with exclusive breastfeeding (Wicaksono et al., 2021).

Mother's milk is the most complete and safe food for infants because it contains energy and nutrients and can meet the nutritional needs of children for up to 6 months old. Children who are exclusively breastfed up to 6 months get the best food as needed (WHO, 2021). Breastfeeding also protects them from various diseases, such as diarrhea and pneumonia. Consequently, they can grow optimally with sufficient energy and nutrients and avoid various contaminations and germs from food if given early. In addition, breastfeeding can reduce the risk of overweight and obesity in children. A study conducted in Bandung deployed that

exclusive breastfeeding was one of the factors influencing linear growth and enabled children to grow 2.4 times as good as children with formula milk (Giugliani, 2019).

The results of this study are identical to those of previous studies. A study demonstrated that under-five children with low birth weight had an 8.7 times as high risks of stunting as normal children (Susilowati et al., 2019). A study in Banten showed that children with LBW were 3.12 times as much likely to suffer from stunting as children with normal LBW Kusumawati RD, et al., 2019). Meanwhile, a study in Lampung proved that there was a relationship between LBW and the incidence of stunting in toddlers (Nurmalasari et al., 2019). Another study discovered that children with less than 2500 grams of birth weight had 3.26 times as high risks of stunting as normal children (Abuya et al., 2012), Hafid (2016) explains that children born with LBW are four times as high risk of stunting as normal children. Meanwhile, Oktarina et al. (2013) state that children with LBW have 1.31 times as high risks of stunting as normal children. This condition occurs because infants with Intra-Uterine Growth Retardation (IUGR) cannot catch up with growth to their normal form during childhood.

Birth weight is also a potential indicator for infant growth, response to stimuli, the environment, and infant survival. Birth weight has a major impact on a child's growth, development, and height as an adult. Babies born with LBW will be at high risk of morbidity, mortality, infectious diseases, underweight, and stunting in the early neonatal period to childhood (Wigoyowati, 2012). Children can experience stunting because while in the womb, their growth is retarded or stunted (Intra Uterine Growth Retardation/IUGR). The IUGR is caused by poverty, disease, and nutritional deficiency. This means that mothers with less nutrition from the first trimester to the end of pregnancy will deliver a child with LBW. Consequently, a newborn baby is at risk of stunting and is threatened to the risk in the future (Zaenab, 2006)

In addition to breastfeeding and LBW, several studies have proposed other factors that can cause stunting, such as family income, education, and environmental factors in stunting. Other studies show that maternal education is a risk factor for stunting in under-five children because mothers with low education are 2.94 times more likely to have stunted children than mothers with high education. A study in Cianjur Regency proved that mothers' low education level is a risk factor of stunting (Susilowati et al., 2019). Another study also showed that maternal education and socioeconomic factors are strong predictors of stunting in children (Abuya et al., 2012). This result is supported by Makoka and Masibo (2015) proved that high maternal education reduced the risk of stunting, underweight, and wasting in children. A study in Pakistan showed that maternal education significantly affected children's growth (Javid & Pu, 2020). A study in North Sumatra deployed that one of the risk factors of stunting was low maternal education (Handayani et al., 2017). Meanwhile, studies conducted in three countries, Malawi, Zimbabwe, and Tanzania, showed that maternal education drastically decreased the prevalence of malnutrition (Makoka, 2013). However, several studies proved that mothers' education levels were not related to the incidence of stunting (Mita A. A., & Rina, 2019). Mothers' education is related to knowledge and information of health and nutrition. Therefore, education tends to influence their behavior, including breastfeeding behavior, food consumption behavior, and health during pregnancy. These things can affect a baby's birth weight.

This study only examined factors occurring after childbirth, such as birth weight and breastfeeding behavior, that cause stunting. Meanwhile, other factors, such as nutritional intake, environmental health, and health services, were not investigated. Therefore, further studies necessarily investigate these factors. This research was also limited its investigation in one Community Health Center located between urban and rural areas. Therefore, other regions with different socio-demographics and geography will provide different results. A prominent result of this research shows that low exclusive breastfeeding behavior and LBW are risk factors of stunting. In fact, LBW cases in Aceh are still high.

Conclusion

Exclusive breastfeeding and LBW are risk factors of stunting in toddlers in the working area of the Darul Imarah Health Center Aceh Besar. For this reason, efforts are needed to increase the coverage of exclusive breastfeeding through education and promotion of breastfeeding, as well as improve the health of pregnant women to prevent low birth weight babies, to reduce the incidence of stunting from an early age.

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