



Birth Length, Diarrheal and Acute Respiratory Infection Risk of Stunting in Toddlers

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Abstract

Stunting is a linear growth disorder that is indicated by length / age Z score less than minus 2 SD, and categorized as low nutritional status. Short birth length, Infectious diseases such as diarrhea, and Acute Respiratory Infection are indicated to be factors that cause stunting. Objectives The study aimed to analyze the risk factors of short birth length, diarrheal disease, and acute respiratory infection of stunting among children 12-59 months. Methods The study used is quantitative with a designed case-control study. The subjects were children between 12-59 months. The sample in this study was 120 consisting of 40 stunted and 80 normal. Subjects were chosen by purposive sampling methods. instrument of this research is microtonal, weight scale, and questionnaire. The results of the study were analyzed by chi-square statistics, odds ratio, and logistic regression. The results showed that birth length (PBL) ($P = 0.001$), diarrhea ($P = 0.000$), and ARI ($P = 0.030$) were associated with stunting in children under five. However, after multiple logistic regression analyses, ARI was not significantly associated ($P = 0.126$). The risk factors for stunting in children under five are diarrhea (OR = 58.134) and short birth length (OR = 9.625). Conclusion: The risk factors for stunting were short birth length and diarrheal disease.

Introduction

Stunting become a problem of malnutrition and is one of the common causes of morbidity and mortality in children, which is characterized by children who are smaller than their age (Mutmainnah & Musni, 2023). Stunting is a growth and development disorder experienced by children due malnutrition, recurrent infections, and lack of adequate psychosocial stimulation. Stunting in children if their height for age is more than two standard deviations below the median of the WHO child growth standards (World Health Organization, 2015). The prevalence of stunting in toddlers in Indonesia is 37.2% in 2013 and 30.8% in 2018. Prevalence toddler very short (*severe stunting*) in 2013, namely 18% and 11.5% in 2018, while proportion toddler short 19.2% in 2013 and 19.3% in 2018(Kementerian Kesehatan RI, 2018).

South Sulawesi is in the ranking fourth the highest stunting toddler in Indonesia in 2018 with prevalence as much as 35.7% consisting from toddler short 23.2% and very short 12.5% temporarily For stunting clowns in South Sulawesi by 33.9% namely very short 13.3% and short 20.6%(Dinas Kesehatan Prof Sul-Sel, 2018). Disease infection is factor reason direct stunting incident. Disease infection resulted lust Eat become reduce so that intake food become reduce. Beside that, substance nutrition consumed No used For growth body, however will diverted by the body For overcome infection. When sick, body will need amount substance

more nutrition big For oppose the disease (Djafaar, 2013) and (Mediani, 2020) reveal that disease infection is a predictor of stunting in toddlers.

Children who own history infection risk 9 times more big experiencing stunting compared with child without history infection (Syabandini & Siti, 2018). Disease infection including disease diarrhea and ISPA. Disease diarrhea relates positively and significantly with stunting. Diarrhea is one of the disease-infection reasons for infant mortality worldwide. Toddlers at the age of 13-48 months range experience diarrhea and have a prevalence of more diarrhea tall than age other (P2PTM, 2016). Diarrhea can caused by factors environment like hygiene sanitation in family (Ri *et al.*, 2015). Likewise with children suffering from ISPA, ISPA is one of them factor 4 times more risk big to stunting in toddlers (Adila, 2021) .

Toddler body length moment born describe toddler linear growth during in content. Low linear size usually show circumstances deficient nutrition consequence lack energy and protein in suffer time the past that started with slowdown or retardation growth jan in (I Dewa, 2012). Study (Andini *et al.*, 2020) show that birth length own significant relationship with incidence of stunting in toddlers $P=0.0001$. Bone Regency is regency which has prevalence stunting toddlers in South Sulawesi. In 2017 the stunting rate in Bone District was 40.1% and in 2018 it decreased to 37.3%, p This exceed prevalence stunting national and provincial (Dinas Kesehatan Bone, 2020). Bone Regency entered in the priority treatment of stage 2 stunting in 2019. Based on matter the necessity done study about stunting in Bone District for know things to be factor risk stunting occurs.

At the time of newborn babies, the focus of attention is the birth weight of the baby, while the length of the baby's birth has not received the attention of the community, while one of the causes of stunting in toddlers is short birth length. Diarrhea and acute respiratory infections are diseases that receive less attention. community attention. Treatment of diarrhea is usually traditional and less than optimal so it can affect the growth of toddlers. It is necessary to conduct research on birth length, diarrheal disease and acute respiratory infections with the incidence of stunting in toddlers to prevent stunting earlier.

Methods

Research used is study observational analytic with design *Case Control Study* , is a study in which risk factors are studied using a retrospective approach , namely the effects of the disease are identified at this time, then risk factors are identified in the past. *Case control* design is used to determine how big the risk factors are in the disease. This research was conducted in May-June 2020. The locations for this research were the Kading Health Center, the USA Health Center, and the Bajoe Health Center.

The population in this study were all toddlers in the Kading Health Center, USA Health Center and Bajoe Health Center. There are two samples in this study, namely case samples and control samples case is toddler ages 12-59 months with $TB/U < -2 SD$ and a control sample of toddlers ages 12-59 months with $TB/U \geq 2 SD$. The sample in this study were 120 toddlers consisting of 40 cases (stunted toddlers) and 80 controls (normal/non-stunted toddlers). case and control 1 : 2 . The ratio is 1 : 2 because the number of stunting cases is less and control samples are easier to obtain during the Covid-19 pandemic.

The sampling method used is *purposive sampling* . Instruments used in this study were *Microtoice* to measure height, scales to measure body weight and questionnaires to guide interviews know identity respondent, identity toddler, birth length, disease diarrhea and infection channel Respiratory acute (ARI) . In Data processing was carried out by editing, coding and tabulation. The overall data was analyzed using SPSS Version 24.0 including univariate analysis and bivariate analysis. As for analysis statistics used that is *Chi Square* with error rate ($\alpha=0.05$) , OR (*Odds Ratio*) and Regression Dual Logistics.

Result and Discussion

Characteristics of Respondents

Table 1. Distribution of Respondents Based on Characteristics Respondents

Characteristic	Stunting (%) n=40	Normal (%) n=80	Total (%) n=120
Toddler Gender			
Man	22 (18,3)	44 (36,7)	66 (55)
Woman	18 (15,0)	36 (30)	54 (45)
Mother's Education			
SD	16(13,3)	32 (26,7)	47 (40,0)
Junior High School	10 (8,3)	10 (8,3)	20 (16,7)
Senior High School	11 (9,2)	22 (18,3)	33 (27,5)
PT	3 (2,5)	16 (13,3)	19 (15,8)
Mother's Job			
Work	2 (1,7)	12 (10,0)	14 (11,7)
Doesn't Work	38 (31,7)	68 (56,7)	106 (88,3)
Mother's age			
< 20 tahun	2 (1,7)	2 (1,7)	4 (3,3)
20-35 tahun	33 (27,5)	59 (49,2)	92 (76,7)
>35 tahun	5 (4,2)	19 (15,8)	24 (20,0)
Current mother's age pregnant			
< 20 tahun	10 (8,3)	5 (4,2)	15 (12,5)
≥ 20 tahun	30 (25,0)	75 (62,5)	105 (87,5)
LILA			
< 23,5	6 (5)	8 (6,7)	14 (11,7)
≥23,5	34 (28,3)	72 (60)	106 (88,3)

Based on table 1. Respondents toddler with type sex man more Lots ie 66 (55%) compared with toddler female 54 (45%). Level of education the most respondents at the SD level 47 (40%) and the fewest level education Universities (PT) as many as 19 (15.8%). Based on work mother who doesn't work 106 (88.3%) more Lots than those who work namely 14 (11.7%). At Mother's Age the most namely at the age of 20-35 years 92 (76.7%) and the lowest was <20 years namely 4 (3.3%). Age Mother moment 10 (8.3%) pregnant children with stunting <20 and aged ≥ 20 years with normal nutritional status as much as 75 (62.5%). Based on circumference arm above (LILA) the most mothers are at LILA ≥ 23.5 (not KEK) as many as 72 (60%) and at least ML < 23.5 as many as 6 (5%).

Univariate analysis

Table 2. Distribution of Respondents Based on PBL, Diarrhea and ISPA

Variable	Case (%) n=40	Control (%) n=80	Total (%) n=120
PBL			
< 48 cm	19 (15,8)	14 (11,7)	33 (27,5)
≥ 48cm	21 (17,1)	66 (55,5)	87 (72,5)
Disease Diarrhea			
Yes	12 (10,0)	1 (0,8)	13 (10,8)
No	28 (23,4)	79 (65,8)	107 (89,2)
ISPA			
Yes	10 (8,3)	8 (6,7)	18 (15)
No	30 (25)	72 (60)	102,5)

Based on Table 2. Most respondents are respondents with birth length (PBL) ≥ 48 cm in control respondents, namely 66 (55.5%), and the lowest in PBL < 48 cm in control respondents, namely 14 toddlers (11.7%). Incident diarrhea on respondents more many of the respondent's cases ie 12 (10%) and in control 1 (0.8%). Infection channel Respiratory acute infection (ARI)

occurred in the most respondents' group case namely 10 (8.3%) while in the group control 8 (6.7%).

Bivariate Analysis

Table 3 . Factor Risk of Stunting in Toddlers

Variable	Case (%) n=40	Control (%) n=80	P value	OR (95%CI)
PBL				
< 48 cm	19 (15, 8)	14 (11 , 7)	0.001	4,265 (1,828 – 9,951)
≥ 48cm	21 (17, 1)	66 (55,5)		
Disease Diarrhea				
Yes	12 (10.0)	1 (0.8)	0.000	33,857
No	28 (23,4)	79 (65.8)		(4.20 – 272.37)
ISPA				
Yes	10 (8, 3)	8 (6, 7)	0.030	3.00
No	30 (25)	72 (60)		(1.079 – 8.341)

Based on table 3. Birth length (PBL) <48 cm is associated with stunting in toddlers with a value of P = 0.001 and OR = 4.265 which means birth length < 48 cm has a risk of 4.65 times the occurrence stunting in toddlers. Incident diarrhea in toddlers related to stunting in toddlers with a value of P = 0.000 and OR = 33.857 which means diarrhea in toddlers has a risk of 33.857 times the occurrence of stunting in toddlers . Infection channel Respiratory acute respiratory infection (ARI) in respondents related to stunting in toddlers with a value of P = 0.030 and OR = 3.00 , which means ARI in toddlers has a risk of 3 times the occurrence of stunting in toddlers.

Table 4. Analysis Regression Dual Logistics

Variable Name	P Value	OR	95 % CI
Birth Length	0.000	9,625	3.514 – 26.360
Disease Diarrhea	0.000	58,134	6,641 – 508,857
Infection Channel Respiration Acute (ARI)	0.126	2,938	0.740 – 11.664

Based on table 4, Body length at birth (PBL) and disease Diarrhea is a risk factor for stunting in toddlers with value of P=0.000 (P < 0.05), meanwhile infection channel Respiratory I (ARI) no relate P value = 0.126 (P > 0.05). Factor the risk of stunting in toddlers is the most dominant is disease diarrhea with OR = 58.134 which means experienced toddler diarrhea are at risk of 58.134 times experiencing stunting compared to toddlers who are not experience diarrhea. Body length at birth in children can influential to stunting incident, because experiencing babies disturbance growing (*growth failing*) since age early show risk For experience *growth failing* in the period age next so that No capable For reach optimal growth. Besides it is also related with incident malnutrition that occurs in content Keep going continues to infancy and if intake nutrition No fulfil need as effort grow Chase so child No can grow in accordance with his age (Wellina et al., 2016). Stunting or growth and development disorders in toddlers aged 24 to 59 months is related to parenting patterns and nutritional intake of toddlers (Sukmawati & Adriyani, 2023). According to (Unicef, 2013) More stunted children early, that is age before six month, will experienced more stunting heavy ahead of you two year. Severe stunting in children resulted happening decline where mrs _ development physically and mentally so He No capable optimal learning in schools, compared with child who has normal height (Maharani et al., 2018). Age Mother < 20 years moment pregnant (pregnant age early) more high on group case (stunting) that is compared group control. Study This in accordance with study (Rahmawati et al, 2018). According to research (Nur, 2018) Short birth length is factor risk dominant stuntings. Research (Islam, 2018) Shows There is significant relationship between birth length with stunted toddler.

According (Subagyo, 2012) One of factor reason stunting is disease diarrhea. Diarrhea is closely related to malnutrition. Each episode of diarrhea can result in malnutrition due to anorexia and reduced ability to absorb nutrients, so that if the episodes are prolonged it will have an impact on the growth and health of children (Taliwongso et al., 2017). Disease accompanying infection diarrhea and vomiting can cause child lost fluid as well as a number substance nutrition. A experienced child diarrhea will happen mall absorption of substances nutrition and loss substance nutrition and when No quick be dealt with follow and balance with appropriate intake so happen fail growth which can lead to stunting in toddlers.

A affected child diarrhea will experience the mall absorption of substances nutrition and duration persistent diarrhea (more from four day) will make child the more experience lost substance nutrition, if No quick be dealt with follow and balance with appropriate intake so happen fail grow (Weisz, 2011). Less child nutrition will own Power stand body to low disease so that easy caught disease infection and impact disease infection This can influence development cognitive child and hinder body growth (Walker, 2011). diarrhea that occurs in long period at a time toddler aged two year First life can influential to happening retardation growth (Sujendran et al., 2015).

Research result This in line with research (Desyanti & Nindy, 2017), which shows connection significant between history diarrhea with stunting in toddlers age 24 – 59 months. History diarrhea in toddlers increase risk of 3.619 against incidence of stunting in toddlers . When diarrhea occurs repeatedly and chronic diarrhea that occurs for a long time can cause stunting because during diarrhea, a lot of fluids and micro-nutrients are wasted in the body, so that the damaged intestinal villi cannot be regenerated due to lack of micro-nutrients so they can stunting occurs. Research result this is also in line with study (Batiro, 2017). Disease diarrhea relate in a manner significant with incidence of stunting in toddlers (Ilma et al., 2019).

Incident infection cause exists disturbances in metabolism body and system immune Because happen inflammation. Besides Because intake nutrition No sister u at consequence lust Eat reduced, relatedness history infection with disturbance growth related with mechanism inflammation that occurs. When happen inflammation or inflammation, the hsRC protein (High-sensitivity Creactive Protein) is secreted by the body and has an impact on resistance hormones growth GH (Growth Hormone)(N et al., 2017).

The link between ISPA and stunting is caused by enhancement need metabolism and food intake disorders during child get sick. ISPA as disease frequent infections experienced by children become factor biggest influence stunting in children by 83% and risky experiencing stunting by 8.8 times more high (Kusumawati, 2013). Children with ARI will experience metabolic disorders in their bodies due to inflammation that occurs. The regulatory system of *proinflammatory cytokines* can affect chondrocytes directly, so that it will affect the process of bone formation, so that in children who have a history of ARI, their growth and development processes will be disrupted. Research (Batiro, 2017) Suffered ARI in two Sunday final influential to stunting incident. Disease diarrhea relate in a manner significant with incidence of stunting in toddlers. Research result This in line with study (Hilmawati, 2020). That ARI incidents related by stunting. However after analysis regression ISPA logistics does not relate meaning with stunting ($p=0.182$). Study grunts(Gerungan et al., 2013) that No there is connection between history disease infection with incidence of stunting $P = 0.392$.

Conclusion

Based on the results of the research, it can be concluded that short birth length (PBL) and disease diarrhea is a risk factor stunting in toddlers ages 12-59 months with . Factor risk dominant is disease diarrhea OR = 58.134, that experienced toddler diarrhea risky experiencing stunting 58.134 times compared to toddlers who are not have a history of disease diarrhea. Associated history of ARI significant with previous stunting incident controlled with covariate

variables. Expected to Mother toddler guard cleanliness food , body hygiene , and environmental hygiene For prevent diarrhea and ARI in toddlers who can cause stunting occurs. It is important for health workers to provide education about the proper handling of diarrhea so that diarrhea does not last long and recur. Health workers must also pay special attention to babies who have a birth length of <48 cm so that nutritional intake is maintained and can prevent failure to thrive in toddlers.

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