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Water Sanitation and Hygiene (WASH) and feeding patterns: Linkages with stunting among children aged 6-23 months

Water Sanitation and Hygiene (WASH) dan pola pemberian makan: Hubungannya dengan stunting pada anak usia 6-23 bulan

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Abstract

Stunting is still a significant public health problem in Indonesia. The interaction between the inadequacy of feeding practices and Water, Sanitation, and Hygiene (WASH) are the direct causes of stunting. The study aimed to assess the relationship between WASH and child feeding patterns with stunting among children aged 6-23 months. The study used a cross-sectional design conducted in July-August 2022 in the working area of Simbang Community Health Center, Maros Regency. Samples of 90 children aged 6-23 months were selected by simple random sampling. Data on sociodemographic, WASH and feeding patterns were collected by interview using a questionnaire. Stunting was measured by a height-for-age z-score. Data were analyzed using the Chi-square test and Logistic Regression. The results showed that the prevalence of stunting was 31,1%. Mother's age <20 years, low maternal height, sex of child, non-exclusive breastfeeding, complementary feeding started, the poor sewage management and availability of latrines related to stunting (p<0,05). Multivariate test results showed low maternal height (p=0,005; OR=21,015), sex of child (p=0,001; OR=22,332), poor sewage management (p=0,008; OR=10,992), and non-exclusive breastfeeding (p=0,002; OR=20,509) has a significant effect on stunting. In conclusion, the WASH and inadequacy of feeding practices contribute to stunting.
Keywords: Children, exclusive breastfeeding, stunting, WASH

Abstrak

Stunting masih menjadi masalah utama kesehatan masyarakat di Indonesia. Interaksi *Water, Sanitation, and Hygiene* (WASH) dan pola asuh pemberian makan yang tidak tepat merupakan faktor penyebab langsung terjadinya *stunting*. Penelitian bertujuan untuk mengukur hubungan WASH dan pola pemberian makan anak dengan kejadian *stunting* pada anak usia 6-23 bulan. Penelitian menggunakan rancangan *cross sectional* dilakukan pada bulan Juli-Agustus 2022, di wilayah kerja Puskesmas Simbang, Kabupaten Maros. Sampel sebanyak 90 anak menggunakan teknik *simple random sampling*. Data sosiodemografi, WASH dan pola pemberian makan dikumpulkan dengan wawancara menggunakan kuesioner. Data S*tunting* diukur menggunakan Antropometri berdasarkan indeks Panjang Badan terhadap Umur. Data dianalisis menggunakan uji *Chi-square* dan *Logistik Regression*. Hasil penelitian menunjukkan prevalensi *stunting* sebesar 31,1%. Umur ibu <20 tahun, tinggi badan ibu yang rendah, jenis kelamin, tidak ASI Eksklusif, usia MP-ASI, sarana pembuangan air limbah yang tidak memadai dan ketersediaan jamban berhubungan dengan kejadian *stunting* (p<0,05). Hasil uji multivariat menunjukkan tinggi badan ibu yang rendah (p=0,005; OR=21,015), jenis kelamin (p=0,001; OR=22,332) ketidaktersediaan sarana pembuangan air limbah rumah tangga (p=0,008; OR=10,992), dan tidak ASI Eksklusif (p=0,002; OR=20,509) berpengaruh secara signifikan dengan kejadian

stunting. Kesimpulan, faktor WASH dan pola asuh pemberian makan anak yang tidak tepat berkontribusi terhadap kejadian *stunting*.
Kata Kunci: Anak, ASI eksklusif, stunting, WASH

Introduction

Stunting, long or short, is still a public health problem. Globally, 149,2 million, or 22%, of the total children under the age of five are stunted (Global Nutrition Report, 2021). Stunting that occurs in the period of the First Day of Life from the womb to the age of two years can have consequences in terms of obstacles to physical growth and cognitive development, resulting in lower educational attainment, low productivity and wages in adulthood, and an increased risk of degenerative diseases. An estimated 1 in 4 children under the age of five has growth failure (Black et al., 2013; UNICEF et al., 2018; World Bank, 2020).

The prevalence of stunting in Indonesia has become a serious problem, as its prevalence is still >20%. The Indonesian Nutritional Status Survey (SSGI) reported that the prevalence of stunting in 2021 was 24,4% and decreased to 21,6% in 2022. Over a period of one year, there was a decrease in national stunting of around 2,8%. This figure is almost close to the reduction in stunting in some countries that have been successful, with an annual average of 2,6% (Aguayo et al., 2016). Meanwhile, the prevalence of stunting in South Sulawesi, at 27,2%, is far above the national average. Similarly, the prevalence of stunting in Maros Regency is quite high, namely 30,1 (Kemenkes RI, 2022). This shows that stunting is a serious problem that needs to be addressed appropriately and quickly.

Stunting can be caused by various factors, including infant and child feeding, parenting, biological, social, and environmental factors. Other factors such as birth weight, exclusive breastfeeding, inadequate complementary feeding, and exposure to cigarette smoke also significantly affect growth retardation (Beal et al., 2018; Budiastutik & Rahfiludin, 2019; Rahmad et al., 2022).

Stunting is not only caused by inadequate nutritional intake in the long term, but the factor of access to water, hygiene, and sanitation, or WASH, is the main factor in the incidence of stunting. WHO reports that about 1,7 billion people still lack basic sanitation services such as toilets or private latrines, and one-third of them have the habit of defecating in the open. In addition, about 45% of household wastewater is discharged untreated, and it is estimated that more than 10% of the world's population consumes food fed by wastewater (WHO, 2021). Meanwhile, about 70% of households in Indonesia consume drinking water that has been contaminated by feces, which contributes to the spread of infectious diseases such as diarrhea (BAPPENAS & UNICEF, 2022). Poor sanitation is closely related to the transmission of diseases such as diarrhea and the presence of environmental enteric dysfunction (EED), which causes a decrease in nutrient absorption and has an impact on the incidence of stunting (Bhutta et al., 2013; Waller et al., 2020). Furthermore, infectious diseases can cause low intake, absorption, and utilization of nutrients, resulting in stunting (Geberselassie et al., 2018; Olo et al., 2021; UNICEF et al., 2018).

In addition, poor hygiene behavior, including low hand-washing habits, is also one of the risk factors for stunting (Sinatrya & Muniroh, 2019). Improvement of several conditions in households, especially in the fulfillment of the availability of clean water, sanitation, and good hygiene, can have a positive effect on the growth and development of children, especially for households living in inadequate areas (Ademas et al., 2021). Interventions in WASH, such as improving sanitation facilities, namely the availability of latrines to reduce open defecation, providing clean water, and hand washing behavior, have proven to have an effect on reducing stunting rates (Lechtig et al., 2009; Monteiro et al., 2009; Waller et al., 2020).

Nutritional and environmental problems need immediate attention because both are risk factors for stunting (Beal et al., 2018; Waller et al., 2020). Studies related to the interaction of environmental problems, especially water, sanitation, and hygiene (WASH), and nutritional factors with the incidence of stunting are still limited in Maros Regency. Therefore, this study was conducted to determine the relationship between access to water, hygiene, and sanitation (WASH) and feeding patterns of infants and children in families and the incidence of stunting in children aged 6–23 months.

Methods

This type of research is analytical research with a cross-sectional design. This research was carried out in the working area of the Simbang Health Center, Maros Regency, during July–August 2022. Simbang District is approximately 40 kilometers from downtown Makassar, the capital of South Sulawesi Province.

The population in this study was all children aged 6–23 months in the work area of the Simbang Health Center. The sample is calculated based on the sample size formula according to Lemeshow as follows:

$$n = \frac{\{Z_{1-\alpha/2}\sqrt{2P(1-P)} + Z_{1-\beta}\sqrt{P1(1-P1) + P2(1-P2)}\}^2}{(P1-P2)^2}$$

Determined by Z1- = 95% and Z1- = 80%, the value of the proportion of hygiene access to stunting incidence is based on previous research (P1) = 0,47 (Hasan et al., 2022). Based on this formula, a sample of 82 respondents was obtained. To prevent dropouts and incomplete data, the sample was increased by 10% (8 respondents), so that the total sample was 90 respondents. Sampling using simple random sampling.

The data used in the study are primary and secondary. Primary data were collected through interviews with respondents' mothers using structured questionnaires, direct observation, and anthropometric measurements. The questionnaire consists of household sociodemographic questionnaires, characteristics of children aged 6–23 months in the form of age, gender, weight, and length of birth of children, and parenting style of feeding of infants and toddlers (FIT). Questionnaires in the form of access to drinking water, environmental sanitation, and hygiene were also looked at.

Early Breastfeeding Initiation (EBI) is measured based on the history of the breastfeeding process carried out immediately after giving birth, Exclusive Breastfeeding is measured based on the history of Exclusive Breastfeeding from birth to 6 months old without being given food or other liquids, Complementary Foods (CF) are measured based on the age first given complementary foods and the diversity of complementary foods based on age (diverse if meeting 4 of the 7 food groups, namely cereals and tubers; legumes; milk and its preparations (yogurt, milk, cheese etc.); meat meal (including fish, chicken, meat, liver etc.); egg; vegetables and fruits sources of vitamin A and other vegetables and fruits.

The physical quality of drinking water is categorized into two categories: qualified (tasteless, odorless, colorless, and not turbid) and unqualified (tasteless, smelly, colored, and cloudy). Access to clean household water used as drinking water is categorized into protected (Local Water Company/PDAM water, bottled mineral water, and refill water) and unprotected (wells and rainwater collection). The availability of healthy latrines is categorized as yes (having latrines with upper building construction that protects their users, latrines only used by household members used alone or with certain households, or communal, using gooseneck toilets that are not slippery, and having a fecal landfill in the septic tank) and unhealthy (not having a top building construction that protects its users, not using gooseneck toilets, not having a final drain).

The availability of household wastewater disposal is categorized into two categories: yes, if it has a wastewater disposal channel in the form of a closed pipe or channel used to help wastewater from the source to the disposal site; and no, if it does not have a household wastewater disposal facility. Garbage disposal is categorized based on the availability of temporary trash cans and the way garbage is buried, burned, or thrown onto open land, roads, or rivers. Handwashing habits are categorized into two categories: good if you use running water with soap and do it in accordance with the recommendations for washing hands, and bad if you do not use running water with soap and do it as recommended.

In addition, anthropometric measurements were carried out in the form of measuring body length using a length board with an accuracy of 0,1 cm. Stunting data was obtained by assessing the z-score of body length according to age (HFA) > -2SD in elementary schools based on the median child growth standard (UNICEF et al., 2012). The secondary data in the form of demographic characteristics and health profiles were obtained from the profile of the Simbang Health Center. The entire sample willing to become respondents by signing informed consent was included in the study. Data was

collected by four field personnel with a bachelor's degree in nutrition and two field supervisors from the research team. All field personnel and field supervisors received training for two days on research objectives, questionnaire content, measurement methods, and research ethics. The questionnaire used has gone through the trial stage and is declared valid.

The collected data is then examined and processed using the Statistical Package for Social Science (SPSS) version 25,0. The data is further analyzed in three stages. First, univariate analysis was used to describe the frequency distribution of each variable, namely household sociodemographic characteristics, WASH factors, and infant and child feeding patterns. Second, bivariate analysis with the Chi-Square Test with 5% variables and a value of p 0,25 will be retained and continued in multivariate analysis. Third, multivariate analysis involves looking at the factors that influence the incidence of stunting with binary logistic regression. An adjusted odds ratio (AOR) value with a 95% CI and a ($p < 0,05$) is used to express statistical significance.

This research has undergone an ethical review and is stated to have used scientific principles and received approval from the Health Research Ethics Commission of the Nani Hasanuddin College of Health Sciences Makassar with number 537.a/STIKES-NH/KEPK/VII/2022.

Result and Discussion

This study is a study to assess the prevalence of stunting and determine the factors that influence it in terms of sociodemographic characteristics, infant and child feeding practices, access to clean water, sanitation, and hygiene in children aged 6–23 months. The results of this study showed that the prevalence of stunting was 31,1%. (Fig. 1) There is a significant difference between boys and girls ($p < 0,05$), where boys are more at risk of stunting than girls. The prevalence of stunting also increases with the age of children. The prevalence of stunting is higher than the national average of 24,4% and is no different from the South Sulawesi provincial average of 30,59%. This finding supports the fact that Maros Regency is the district with the second highest prevalence in South Sulawesi.

After controlling for several variables, it was found that maternal factors, namely height <150 cm, sanitation factors, namely the absence of wastewater disposal facilities, and child factors, namely male sex and not exclusive breastfeeding, were risk factors for stunting.

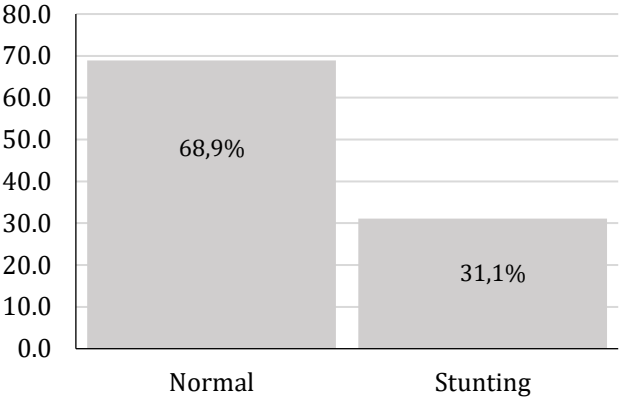

Figure 1. Prevalence of stunting for children aged 6-23 months in Simbang District, Maros Regency

In this study, male sex was a strong finding associated with impaired linear growth. Studies conducted in Mozambique show a strong link between male sex and the incidence of stunting (Cruz et al., 2017). In line with literature studies, a review conducted in Sub-Saharan Africa revealed that age is a consistent factor as a determinant of stunting (Akombi et al., 2017). Men are more likely to experience stunting compared to women due to biological factors, living conditions, and differences in maternal feeding patterns between men and women (Beal et al., 2018).

One of the other dominant factors causing stunting is age. The difference in the proportion of stunting at each age varies; the older you are, the higher the prevalence of stunting. Studies conducted by Titaley et al. (2019) show that the chances of children aged 12–23 months experiencing stunting are much higher compared to children 12 months of age. This is also in line with research conducted in Pangkep Regency showing that the proportion of stunting increases with the age of children (Syahruddin et al., 2022). The increase in stunting can be caused by several factors, including the age of <6 months, which is the period of exclusive breastfeeding, while in children >6 months, complementary foods and morbidity factors play a role in the determinants of stunting (Beal et al., 2018).

It is known that exclusive breastfeeding for 6 months is closely related to improving the nutritional status of children. Several studies have shown that breast milk plays an important role in preventing stunting (Kramer & Kakuma, 2012; Torlesse et al., 2016). In line with the literature review study conducted by Bidastutik and Rahfiludin (2019), it shows that non-exclusive breastfeeding increases the risk of stunting by four times in developing countries. Breast milk plays an important role in disease prevention because it can increase immunity, provide antimicrobials and immunomodulators, and increase the maturity of the intestinal mucosa so as to stimulate immunity (Khan & Islam, 2017).

Table 1. Bivariate analysis of sociodemographic characteristics with the incidence of stunting of children aged 6-23 months in Simbang District, Maros Regency

Variable	Stunting				n	%	COR(95%CI)	p-value
	Yes	%	No	%				
Mother's Age								
< 20 years	4	66,7	2	33,3	6	6,7	8,000 (0,803-19,655)	0,076*
20-29 years	11	32,1	23	67,6	34	37,8	1,913 (0,347-10,556)	0,457
30-39 years	11	27,5	29	72,5	40	44,4	1,517 (0,278-8,287)	0,630
≥ 40 years	2	20,0	8	80,0	10	11,1	1,00	
Mother's Work								
Housewives	7	41,2	10	58,8	73	81,1	0,577(0,194-1,717)	0,323
Work	21	28,8	52	71,2	17	18,9	1,00	
Mother's Education								
Not Finished/Finished Elementary School	6	31,6	23	68,4	19	21,1	1,269 (2,84-5,679)	0,755
Junior High School	6	31,6	13	68,4	19	21,1	1,269 (2,84-5,679)	0,755
Senior High School	12	32,4	25	67,6	37	41,1	1,320 (0,347-5,018)	0,684
College	4	26,7	11	73,3	15	16,7	1,00	
Bylaws Smoking								
Yes	20	31,3	44	68,8	64	71,1	1,023 (0,381-2,742)	0,964
No	8	30,8	18	69,2	26	28,9	1,00	
Number of Household								
≥4	17	27,9	44	72,1	61	67,8	0,632 (0,248-1,612)	0,337
<4	11	37,9	18	62,1	29	32,2	1,00	
Family Income								
Low	23	33,3	46	66,7	21	23,3	1,600 (0,521-4,914)	0,412
High	5	23,8	16	76,2	69	76,7	1,00	
Parity								
Primipara	11	35,5	20	64,5	31	34,4	1,359 (0,538-3,433)	0,517
Multipara	17	28,8	42	71,2	59	65,6	1,00	
Mother's height								
<150cm	11	57,9	8	42,1	19	21,1	4,368 (1,511-12,626)	0,006*
≥150cm	17	23,9	54	76,1	71	78,9	1,00	

The findings of this study show that almost all households already have latrines that meet standards, but this is not supported by the availability of wastewater disposal facilities. Only one-third of 90 households provide wastewater disposal facilities. The wastewater disposal facilities are still not qualified because all of them still use open wastewater sewers, and more than half of them see stagnant wastewater. The results of observations show that wastewater that comes from household waste such as bathrooms, used kitchen laundry, and clothes is wastewater that must be managed.

Vectors and rodents can breed in open wastewater disposal facilities. In addition, it causes puddles, causes odors, and can pollute soil and water because water is directly flowed into the ground (Basyariyah et al., 2022). Poor sanitation can lead to diarrhea and environmental enteropathy. This will inhibit the absorption of nutrients in the small intestine, which has an impact on malnutrition and stunting. The relationship between low-

quality sanitation and the incidence of infectious diseases is a factor in stunting. The mother's low height was also an important finding in the study. Short mothers (150 cm) have a 21-times higher risk of stunting their children than mothers who have a height of <150 cm. Studies conducted in Southeast Minahasa Regency show that maternal height is significantly related to the incidence of stunting, where short mothers have the potential to give birth to short children (Ch Ratu et al., 2018). Another study using demographic survey data in Etopia showed that mothers who are <150 cm tall are 2,5 times more stunted compared to mothers who are 160 cm tall; even an increase in maternal height of 1 cm reduces the likelihood of stunting by 1% (Amaha & Woldeamanuel, 2021). A literature review study conducted in Indonesia shows that maternal factors, namely low maternal height, are closely related to the incidence of stunting (Beal et al., 2018; Miko & Al-Rahmad, 2017). This study shows that stunting can be passed down between generations, where short mothers have the potential to give birth to short children (Amaha & Woldeamanuel, 2021).

Table 2. Bivariate analysis of water, sanitation and hygiene factors with the incidence of stunting of children aged 6-23 months in Simbang District, Maros Regency

Variable	Stunting				n	%	COR(95%CI)	p-value
	Yes	%	No	%				
Physical Quality of Drinking Water								
Not Eligible	1	50,0	1	50,0	2	2,2	2,259(0,136-37,473)	0,570
Qualify	27	30,7	61	69,3	88	97,8	1.00	
Access to Drinking Water								
Unprotected	2	22,2	7	77,8	9	10,0	0,604(0,117-3,113)	0,547
Sheltered	26	32,1	55	67,9	81	90,0	1.00	
Availability of Healthy Latrines								
None	4	80,0	1	20,0	5	5,6	10,167(1,081-95,654)	0,043*
Yes	24	28,2	61	71,8	85	94,4	1.00	
Ownership of wastewater disposal facilities								
No	14	46,7	16	53,3	30	33,3	2,875 (1,130-7,316)	0,027*
Yes	14	23,3	46	76,7	60	66,7	1.00	
Garbage Disposal								
Dumped into open ground	3	30,0	7	70,0	10	11,1	0,943 (0,225-3,951)	0,936
Burned	25	31,3	55	68,8	80	88,9	1.00	
Handwashing habits								
Bad	6	35,3	11	64,7	17	18,9	1,264 (0,415-3,849)	0,680
Good	22	30,1	51	69,9	73	81,1	1.00	

Table 3. Characteristics of children with the incidence of stunting children aged 6-23 months in Simbang District, Maros Regency

Variable	Stunting				n	%	COR (95%CI)	p-value
	Yes	%	No	%				
Gender								
Male	20	43,5	26	56,5	46	51,1	3,462 (1,322-9,065)	0,011*
Female	8	18,2	36	81,8	44	48,9	1.00	
Birth Length								
<48 cm	10	45,5	12	54,5	22	24,4	2,315 (0,854-6,275)	0,099
≥48cm	18	26,5	50	73,5	68	75,6	1.00	
Birth Weight								
<2500 gr	2	100,0	0	0,0	2	2,2	385,7 (0,00-0,001)	1,000
≥2500 gr	26	29,5	62	70,5	88	97,8	1.00	

Variable	Stunting				n	%	COR (95%CI)	p-value
	Yes	%	No	%				
Age								
6-11 bulan	7	21,9	25	78,1	32	35,6	1,00	
12-17 bulan	14	35,9	25	64,1	39	43,3	2,00(0,691-5,791)	0,201
18-23 bulan	7	36,8	12	63,2	19	21,1	2,083 (0,595-7,297)	0,251
Early Breastfeeding Initiation (EBI)								
First 1 hour	15	28,3	38	71,7	53	58,9	1,00	
After the first 1 hour	13	35,1	24	64,9	37	41,1	1,372 (0,557-3,380)	0,491
Exclusive breastfeeding								
Yes	3	10,0	27	90,0	30	33,3	1,00	
No	25	41,7	35	58,3	60	66,7	6,429 (1,755-23,554)	0,005*
Time of Giving CF								
<6 month	11	45,8	13	54,2	24	26,7	2,439 (0,921-6,461)	0,118
≥6 month	17	25,8	49	74,2	66	73,3	1,00	
Food Diversity								
< 4 Food groups	13	29,5	31	70,5	44	48,9	0,867 (0,354-2,119)	0,754
4- 7 Food groups	15	32,6	31	67,4	46	51,1	1,00	

Sanitation aspects such as access to clean water, hygiene behavior, the availability of latrines, and the availability of wastewater disposal facilities are some of the risk factors that indirectly affect nutritional problems. This study shows that poor sanitation and environmental health are determinants of the stunting problem. Studies in Ethiopia show a link between WASH (water, sanitation, and hygiene) factors and the incidence of stunting (Kwami et al., 2019). Studies using data from the Indonesian Family Life Survey (IFLS) in 2007 and 2014 show that the risk of stunting is higher in communities without access to clean water and poor sanitation and hygiene (Mulyaningsih et al., 2021). Another study using 2013 risk data showed that sanitation and hygiene significantly affect the incidence of stunting in children under two years old in Indonesia.

Lack of access to clean water, sanitation, and hygiene can increase a child's risk of diarrhea, soil-transmitted helminths, and environmental enteropathy disorder (Budge et al., 2019; Ulfa Ali et al., 2016). Research conducted in Jepara shows that poor sanitation is a factor in the occurrence of diarrhea, and diarrhea is closely related to the incidence of stunting (Lestari, 2021). Cohort studies in four countries show that the short-term effects of diarrhea in children can be weight loss, while the long-term effects of having recurrent diarrhea can inhibit a child's linear growth (Richard et al., 2013).

The poor quality of wastewater disposal facilities will contaminate wells because water will absorb into the soil or be carried into river water, where it will be polluted and cause infectious disease infections. Discharged wastewater can become a breeding ground for pathogenic microorganisms. Some of the prerequisites for wastewater disposal include not polluting the ground surface, not polluting surface water or groundwater (a minimum distance of 10 meters from the water source), not causing mosquito nests, channels, and flows smoothly, and having special shelters (Ali et al., 2016).

Table 4. Factors that are significantly related to the incidence of stunting in children aged 6-23 months based on multivariate analysis of Logistic Regression

Variabel	COR (95%CI)	AOR (95%CI)	p-value (AOR)
Mother's Age			
< 20 years	8,000 (0,803-19,655)	13,792 (0,693-274,310)	0,085
20-29 years	1,913 (0,347-10,556)	1,755 (0,214-14,383)	0,600
30-39 years	1,517 (0,278-8,287)	1,504 (0,195-11,599)	0,695
≥ 40 years	1,00	1,00	
Mother's height			
<150cm	4,368 (1,511-12,626)	21,015 (2,500-176,636)	0,005

Variabel	COR (95%CI)	AOR (95%CI)	p-value (AOR)
≥150cm	1,00	1,00	
Availability of Healthy Latrines			
None	10,167(1,081-95,654)	4,046 (0,038-428,346)	0,557
Yes	1,00	1,00	
Ownership of Wastewater Disposal Facilities			
No	2,875 (1,130-7,316)	10,922 (1,843-64,718)	0,008
Yes	1,00	1,00	
Gender			
Male	3,462 (1,322-9,065)	22,332 (3,495-142,696)	0,001
Female	1,00	1,00	
Birth Length			
<48 cm	2,315 (0,854-6,275)	0,619 (0,106-3,609)	0,594
≥48cm	1,00	1,00	
Age			
6-11 bulan	1,00	1,00	
12-17 bulan	2,00 (0,691-5,791)	2,344 (0,502-10,940)	0,278
18-23 bulan	2,083 (0,595-7,297)	1,619 (0,279-9,376)	0,591
Exclusive breastfeeding			
No	6,429 (1,755-23,554)	20,509 (3,060-137,467)	0,002
Yes	1,00	1,00	

Information:
*Variables with p<0.25 were included in the multivariate analysis;
**COR= Crude Odds ratio; AOR=Adjusted Odds Ratio*
*Regression Equation
y= -7.671 + 2.624 Maternal Age(1) + 0.563 Maternal Age(2) + 0.408 Maternal Age(3) + 3.045 Mother's Height + 1.398 Healthy Latrines + 2.391 SPAL + 3.106 Gender – 0.480 Birth Length + 0.852 Child Age (1) + 0.482 Child Age (2) + 3.021 Exclusive Breastfeeding
**Overall Percentage of 83.3%*.

The poor quality of wastewater disposal facilities will contaminate wells because water will absorb into the soil or be carried into river water, where it will be polluted and cause infectious disease infections. Discharged wastewater can become a breeding ground for pathogenic microorganisms. Some of the prerequisites for wastewater disposal include not polluting the ground surface, not polluting surface water or groundwater (a minimum distance of 10 meters from the water source), not causing mosquito nests, channels, and flows smoothly, and having special shelters (Ali et al., 2016).

Low-waste management is also an important factor in environmental sanitation. All households have not practiced waste management properly. The absence of landfills is the reason people choose to burn and throw waste onto empty land. Poor waste management can increase pathogens, causing environmental enteropathy (Badriyah & Syafiq, 2017). Poor environments and infectious diseases correlate with the incidence of stunting (Mulyaningsih et al., 2021; Victora, et al., 2013).

Improving sanitation and access to clean water is the key to the success of stunting handling. Several studies of sanitation improvement interventions have shown improvements in nutritional problems. Improvement of water, sanitation, and hygiene (WASH) facilities can reduce stunting rates with an annual average rate of reduction (AARR) value of 3–5% (Lechtig et al., 2009; Smith et al., 2013). Another study in Brazil showed that improved interventions in access to clean water, sanitation, and hygiene (WASH) contributed to an 80% reduction in stunting among children under the age of 5 over two decades (de Lima et al., 2010). The 2018-2019 Special Index for Stunting Management (IKPS) report in Indonesia also shows an increase in the achievement of adequate sanitation (2,81) and adequate drinking water (1,52), which is positively correlated with the decreasing prevalence of stunting in Indonesia (BPS, 2020).

Conclusion

Environmental sanitation factors in the form of inadequate wastewater disposal facilities and children who do not receive exclusive breastfeeding are related to the incidence of stunting in Simbang sub-district, Maros Regency.

Suggestions for the Health Office, especially Puskesmas Simbang, Maros regency, to increase promotion and counseling to mothers and families regarding infant and child feeding practices, including increasing exclusive breastfeeding coverage Apart from efforts to improve nutrition, local governments need to increase efforts to increase the provision and improvement of sanitation facilities, access to clean water, and personal hygiene (WASH), which are part of the sensitive nutrition intervention program. These two efforts are the key to accelerating the reduction of stunting rates today.

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