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Research Article

Risk Factors of Stunting in Children Aged 0-23 Months in Katumbangan Health Center, Indonesia

Nurul Iffa Safitri[1,2]*, Nur Nasry Noor[3], Wahiduddin[3], Ridwan Amiruddin[3], Nurhaedar Jafar[4], Balqis[5], Anwar Mallongi[6]

ABSTRACT

The results of Indonesian nutritional status study at the regency level in 2021 showed that Polewali Mandar Regency had the highest prevalence of stunting in West Sulawesi Province at 36% with the highest percentage of stunted toddlers being reported by Katumbangan Health Center (42.6%). This study aims to determine the most dominant risk factors for stunting in children aged 0-23 months. This study was conducted in the working area of Katumbangan Health Center with a case-control study. The number of samples was 236 infants (0-23 months) with a ratio of cases and controls of 1:1. This study used secondary data sourced form e-PPGBM application, then analyzed by odd ratio test and logistic regression on Stata. The results showed that CED in pregnancy (OR=3.142 with 95% CI, 1.122-10.072), LBW history (OR=5.963 with 95% CI, 1.251-56.216) and exclusive breastfeeding (OR=2.099 with 95% CI, 0.984-4.613). The dominant risk factor for stunting in children aged 0-23 months, namely LBW history (OR=5.092 with 95% CI, 1.08-23.94). It is recommended for mothers to put more attention to the fulfillment of nutrition during in order to reduce the risk of LBW and also to assure that children nutritionl intake are adequate to their needs during the golden period of growth, especially infants with LBW.

Key words: Stunting, Infant, Risk Factors.

Nurul Iffa Safitri[1,2]*, Nur Nasry Noor[3], Wahiduddin[3], Ridwan Amiruddin[3], Nurhaedar Jafar[4], Balqis[5], Anwar Mallongi[6]

[1]FETP student, Public Health Study Program, Faculty of Public Health, Hasanuddin University, Makassar, INDONESIA.

[2]West Sulawesi Provincial Health Office, INDONESIA.

[3]Department of Epidemiology, Faculty of Public Health, Hasanuddin University, Makassar, INDONESIA.

[4]Nutrition Science Study Program, Faculty of Public Health, Hasanuddin University, Makassar, INDONESIA.

[5]Department of Health Administration and Policy, Faculty of Public Health, Hasanuddin University, Makassar, INDONESIA.

[6]Department of Environmental Health, Faculty of Public Health, Hasanuddin University, Makassar, INDONESIA.

Correspondence

Nurul Iffa Safitri

FETP student, Public Health Study Program, Faculty of Public Health, Hasanuddin University, Makassar, INDONESIA; West Sulawesi Provincial Health Office, INDONESIA.

E-mail: anwar_envi@yahoo.com

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INTRODUCTION

The nutritional problem that is often faced by young children is stunting, which adversely affects the quality of life of children in achieving optimal growth and development in accordance with their genetic potential.[1] Stunting or often called dwarfism or shortness is a condition of growth failure in children under five years of age (toddlers) due to chronic malnutrition and recurrent infections, particularly in the period of the first 1000 days of life (1000 HPK), namely from a fetus to a child aged 23 months.[2] Stunting is a nutritional status based on the height-for-age index (TB/U) with a z score <-2 SD (deviation standard).[3]

Globally, stunting prevalence was reported to have decrased from 151 million (22.2%) in 2017 to 144 million (21.3%0 in 2019, then increased again to 149.2 million (22%) in 2020. More than half of the stunted children under five years of age live in Asia and two in five children live in Africa in 2020. Data reported at WHO also showed that all stunted children, 25% live in low-income countries, 59% live in lower-middle income countries and 14% in upper-middle income countries and 2% live in high-income countries.[4-7]

Indonesia ranked fifth as a country with the largest prevalence of stunting in children under five years. The results of the Integrated Toddler Nutrition Status Survey (SSGBI) by Research and Development Center of the Ministry of Health of Indonesia in 2019 showed that the highest prevalence of stunting was in East Nusa Tenggara, West Sulawesi and West Nusa Tenggara, respectively 43.82%, 40.38%, and 37.85%.[8] The prevalence rate of stunting in West Sulawesi Province was still very high when compared to the national prevalence rate (27.67%). Indonesian Health Profile in 2021 showed that based the data of Electronic-Community-Based Nutrition Recording and Reporting (e-PPGBM), West Sulawesi Province was the province with the highest stunted percentage for under two with 2.7% very short and 5.6% short, and of 2.5% very short and 7% short for under-five. Meanwhile, in toddlers, 2.5% fell into the very short category and 7% were categorized as short.[9] The results of Indonesian nutritional status study (SSGI) at the regency/city level in 2021 showed that of the six regencies in West Sulawesi Province, Polewali Mandar had the highest stunting prevalence of 36%. This prevalence rate was still above the stunting prevalence threshold set by WHO at 20%. This showed that stunting was still a major public health problem in the regency.

Based on the *conceptual framework of the determinants of child undernutrition and the underlying drivers of malnutrition,* stunting prevention needs to focus on addressing aspects of the direct and indirect causes of nutritional problems. Direct causes include malnutrition and infectious diseases. As for the indirect causes, namely food security (access to nutritious food), social environment (feeding infants and children, education and workplace hygiene), health environment (access to health services) and residential environment (access to clean water, drinking water and sanitation facilities).[10] The effectiveness of stunting prevention program policies depends on program targets that prioritize pregnant women, nursing mothers and children aged 0-23 months or in the golden period (1,000 days of life). A very critical period for the growth and development of children is influenced by their nutritional status in that period.[11] It is estimated that 48.9% of pregnant

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women in Indonesia experience anemia and some others experienced chronic energy deficiency (CED).[10] The results of research conducted by Ruaida and Soumokil (2018) showed that there was a significant correlation between pregnant women with a history of CED and the incidence of stunting in toddlers in the working area of the Tawiri Health Center, Ambon City.[12] However, research conducted by Fitraniar *et al.*, (2022) showed different results, namely there was no correlation between the history of CED pregnancies and the incidence of stunting in Pidie Regency.[13]

Pregnant women who experience CED could increase the risk of giving birth to babies with low birth weight (LBW). LBW is one of the main cause of stunting, around 6.2% [10]. Research conducted by Supriyanto, Paramashanti and Astiti, (2017) showed that children with a history of LBW have a 6.16 times greater risk of being stunted than children with a history of normal births in Sedayu District, Bantul Regency.[14] However, the results of a different study were obtained by Nofai and Abdullah (2021) which showed that statistically there was no significant correlation between birth weight history and the incidence of stunting in toddlers at Pekauman Health Center, Banjarmasin ciy.[15] Another stunting risk factor is based on the conceptual framework of the causes and effects of stunting developed by WHO, namely exclusive breastfeeding. Exclusive breastfeeding is essential to meet the nutritional needs of children from birth. Research conducted by Wardita, Suprayitno and Kurniyati (2021) found that parenting and exclusive breastfeeding had an effect on the incidence of stunting in toddlers in Saronggi District, Sumenep Regency.[16] However, research conducted by Susanti, Sulistyani and Rohmawati (2021) showed that there is no correlation between exclusive breastfeeding and the incidence of stunting in toddlers aged 24-59 months in Pujer District, Bondowoso Regency.[17]

Reducing the prevalence of stunting is one of the priorities for health development in Polman Regency. An initial survey conducted by Polman District Health Office, the percentage of stunting based on e-PPGBM data in 2019 was 24.1%, decreased to 21.6% in 2020 and in 2021 increased again to 23.8%. Based on the Health Profile of Polman Regency in 2021, the health center which reported the highest percentage of short toddlers (TB/U) aged 0-59 months in Polman Regency was the Katumbangan Health Center with 42.6%. The Polman Regency e-PPGBM data as of August 2022 showed that out of 37.9% of stunting cases aged 0-59 months at the Katumbangan Health Center, there were 24.3% of stunting cases occurring at the age of 0-23 months. Therefore, it is necessary to research to determine the most dominant risk factors for stunting in children aged 0-23 months in the region, so that prevention and treatment can be carried out quickly and appropriately to avoid stunting in children.

METHODS

This study used a case control research design. The study was conducted from December 2022 to February 2023 in the working area of Katumbangan Health Center, Campalagian District, Polewali Mandar Regency, West Sulawesi Province. The population in this study were all children aged 0-23 months who carried out body length/age measurements and were recorded in the e-PPGBM report as of August 2022, as many as 530 children. Sampling for cases was carried out by using total sampling and for control samples using simple random sampling with a ratio of 1: 1, with a total of 236 childrens who met the inclusion and exclusion criteria (118 cases and 118 controls). The inclusion criteria for this study, namely children aged 0-23 months with stunting nutritional status (cases) and normal nutritional status (controls) based on anthropometric measurements of Body Length/Age, were recorded in the August weighing report in the e-PPGBM in 2022 and matched gender and age group. While the exclusion criteria, namely children aged 0-23 months with stunted or normal nutritional status (based on Body Length/Age), have incomplete data in the e-PPGBM report.

This study uses secondary data, namely data by name by addreess contained in the e-PPGBM application obtained from nutritionist of the Katumbangan Health Center. Available data include child identity data, child nutritional status measurement results (PB/U), birth weight, exclusive breastfeeding, and pregnancy history. The data was analyzed using the Stata Version 14 application and presented in tabular accompanied by narrative. The test used, namely the odds ratio test to see the risk of CED pregnancies history, history of LBW, exclusive breastfeeding on the incidence of stunting. Then multivariate analysis was performed using the logistic regression test to determine the most dominant risk factor of stunting.

RESULTS

Table 1 showed that based on the characteristics of children aged 0-23 months, according to gender, more males (62.7%) and according to age group, more in the age group 12-17 months (39%). The number of samples who experienced stunting and normal nutritional status had the same number because gender and age group matching were carried out.

Table 2 shows that the proportion of children who had mothers with CED pregnancies history, LBW history and did not receive exclusive breastfeeding in stunted children was higher than normal nutritional status, with 14.4%, 9.3% and 22% respectively. The table showed that a history of CED pregnancies and LBW were significant risk factors for stunting because the CI value of 95% lower limit-upper limit did not include the number 1. While the variable of exclusive breastfeeding was a non-significant risk factor. The results of the OR test showed that children who had mothers with history of CED pregnancies had a risk of 3.142 times, mothers with history of LBW had a risk of 5.963 times and those who did not get exclusive breastfeeding had a risk of 2.099 times greater for experiencing stunting than those with normal nutritional status in children aged 0-23 months in the working area of Katumbangan Health Center, Polewali Mandar Regency in 2022.

Based on the results of multivariate analysis in table 3, it was found that the most dominant risk factor for stunting was history of LBW (p=0.039). From the results of the analysis, it was found that the risk

Table 1: Distribution of characteristics of samples.

Characteristics	n	%
Gender		
Male	148	62.7
Female	88	37.3
Age group		
6-11 months	56	23.7
12-17 months	92	39
18-23 months	88	37.3
Total	236	100

Table 2: Bivariate analysis result for stunting risk factor.

Risk Factors	Stunting		Normal		OR (CI 95%, LL-UL)	p-value
	n	%	n	%		
History of pregnancy						
CED pregnancies	17	14.4	6	5.1	3.142	0.015
Normal Pregnancies	101	85.6	112	94.9	(1.122-10.072)	
LBW history						
LBW	11	9.3	2	1.7	5.963	0.010
Normal birth weight	107	90.7	116	98.3	(1.251-56.216)	
Exclusive breastfeeding						
Not exclusively breastfed	26	22	14	11.9	2.099	0.037
Exclusively breastfed	92	78	104	88.1	(0.984-4.613)	

Table 3: Results of logistic regression analysis for stunting risk factors.

Risk Factors	Model I			Model II		
	p-value	OR	95% CI (LL-UL)	p-value	OR	95% CI (LL-UL)
CED pregnancies history	0.058	2.617	0.97-7.09	0.045	2.754	1.02-7.40
LBW history	0.042	5.028	1.06-23.79	0.039	5.092	1.08-23.94
Exclusive breastfeeding	0.062	0.734	0.96-4.10	-	-	-

of stunting with history of LBW with an OR value = 5.092> 1 and a CI value of 95% *lower limit-upper limit* (1.08-23.94) did not include the number 1, hence the OR was significant. This meant that children with history of LBW were 5.092 times more likely to experience stunting than children with normal birth weight.

DISCUSSION

The results of the analysis show that children who are stunted are more likely to be male than female. The results of research conducted (Das *et al*., 2020) found that boys have a higher risk of being stunted than girls (AOR 1.33 95% CI 1.14-1.54).[18] Research conducted (Dwi *et al*., 2022) also obtained the same results, namely boys have a 1.352 times greater risk of being stunted than girls.[19] Gender has a relationship with nutritional status because gender determines the amount of a person's nutritional needs. There are differences in body composition between men and women so that the amount of nutritional needs is also different. Men have more muscle tissue than women who have more fat tissue. Metabolically, muscle is more active than fat so proportionally muscle requires more energy. Men and women with the same height, weight and age have different body composition, so their energy and nutritional needs will also differ.[2]

Based on age group, the results of this study show that children who are stunted are more in the 12-17-month age group. Research conducted by Das *et al*. (2020) shows that stunting occurs mostly in the first 5 months of life and increases when children reach 18-23 months of age. During this period, proper care or parenting determines the child's further growth and development.[18] Children born stunted still have the opportunity to grow and develop well including brain development with nutritional improvement through the fulfillment of proper nutrition in the remaining golden period (730 days).[20] To prevent early stunting, especially at birth, the mother's macro and micronutrient needs must be sufficient, because the nutritional status at birth greatly affects the baby's subsequent growth, especially during the first 2 years of life (golden period).[21]

The results of the analysis showed that the proportion of children who had mothers with CED pregnancies in stunted children was higher than normal nutritional status. The results of bivariate analysis found that history of CED pregnancies was a significant risk factor for the incidence of stunting in children aged 0-23 months in the working area of Katumbangan Health Center, Polewali Mandar Regency in 2022. This research was in line with the results of research conducted by Sukmawati *et al*., (2018) which found that there was a significant correlation between nutritional status of pregnant women based on their upper arm diameter (LILA) and the incidence of stunting in toddlers (aged 6-36 months) in the work area of the Bontoa Health Center, Maros Regency.[22] Research conducted by Setia *et al*., (2021) obtained the same results that there was a correlation between the nutritional status of mothers with CED during pregnancy and the nutritional status of children based on height-for-age in the working area of Oepoi Health Center, Kupang.[23] However, different research results were obtained by Pratama, Marwati and Hidayat (2021), namely that there was no correlation between pregnant women with CED and the incidence of stunting in children aged 0-59 months in Argodadi Sedayu Village, Bantul.[24] The results of this study were in line with research by M.Qurani *et al*., (2022) which found that there was no-significant correlation between pregnant women with CED and the incidence of stunting in children aged 6-12 months in Central Lombok.[25]

Mother's nutritional status during pregnancy determines the growth and development of children, adolescent even until they become a mother and give birth to a baby, whivh is known as the cycle of malnutrition between generations. Fulfillment of nutrition during pregnancy is very important in supporting the quality of life both the mother and the fetus.[26] Mothers who experience CED pregnancies are caused by a lack of intake of macronutrients, namely energy and protein in long term. Mothers who are lacking of nutrition will interfere with the formation of the placenta. The size of the placenta will be relatively smaller compared to mothers with good nutritional status. The placenta is the access path for transferring nutrients and oxygen from the mother to the fetus. Less optimum nutrients from mother to fetus, plus abnormal size of the placenta, will exacerbate the insufficiency of nutrients needed by the fetus to grow.[27] Inadequate nutrition can be caused by lack of knowledge of the mother in dealing with the symptoms of nausea or vomiting during pregnancy.[23] Suboptimal fetal growth often results LBW, which contributes to cases of stunting in early childhood.[28] Problems of nutritional status in pregnancy are associated with *antenatal care* services. Mothers who routinely carry out prenatal checks can find out the health conditions of themselves and their babies, therefore they can determine the right course of action to fulfill their nutritional status. Research conducted by Arsin and Syafar (2020) found that pregnancy checks were a determining factor in the incidence of stunting in the working area of Palakka Kahu Health Center. In that study, many mothers were found who had never done USG in order to see the development of the fetus in their womb. For this reason, the use of antenatal care services for pregnant women is very important as an effort to ensure that the nutritional needs of mothers and their babies are properly met.[29]

Based on the history of LBW, this study found that the proportion of children who had a history of LBW in stunted children was higher than normal nutritional status. The results of multivariate analysis showed that LBW was the most dominant significant risk factor for stunting in children aged 0-23 months in the working area of Katumbangan Health Center, Polewali Mandar Regency in 2022. This research was in line with research by Mistry *et al*., (2018) which showed that there was a significant correlation between LBW and the incidence of stunting in children aged 0-23 months in rural and urban slums areas of Bangladesh.[28] A similar study was conducted by Jeyakumar, Nikam and Nayak, (2019) in the urban area of Pune City, India which obtained the same results that children under two years (0-23 months) with LBW could increase the risk of three nutritional health problems, namely 1.8 times experienced *stunting*, 1.7 times experienced *wasting* and was underweight 2.5 times.[30] The same research results were also obtained by Riba *et al*. (2022) in Isan Mbias, Tanah Miring district, Merauke Regency, namely toddlers with LBW were at risk of 9.33 times to experience stunting compared to toddlers with normal birth weight.[31] However, research conducted by Febriana and Nurhaeni, (2019) obtained different results that there was no correlation between LBW and the incidence of stunting in children aged 6-23 months in East Jakarta.[32] The research results of Farid, Yanti and Jannah, (2020) also

obtained different results, namely that there was no correlation between LBW and the incidence of stunting in children aged 6-23 months in the working area of Biromaru Health Center, Sigi Regency.[33]

Babies with LBW are a picture of the mother's health with long-term malnutrition, poor health, hard work and poor pregnancy care. Malnutrition in early pregnancy can affect birth weight and length as well as short and thin stature.[19] In addition, babies with LBW are at high risk of morbidity, mortality, infectious diseases, underweight and stunting in the early neonatal period to childhood.[34] Babies born with LBW also experience digestive disorders because their digestive tract cannot function normally like babies born with normal weight. This has impact on the lack of reserves of nutrients in the body.[35] If the fulfillment of the baby's nutrition is not optimum according to their needs, then the growth and development of the child becomes stunted.

Another factor studied, namely exclusive breastfeeding. The results of the analysis showed that the proportion of children who did not get exclusive breastfeeding in stunted children was higher than normal nutritional status. The results of bivariate analysis found that exclusive breastfeeding was a risk factor that was not significant for the incidence of stunting in children aged 0-23 months in the working area of Katumbangan Health Center, Polewali Mandar Regency in 2022. The results of this study were in line with research conducted by Parenreng *et al.*, (2020) which obtained the same results as this study that exclusive breastfeeding was the most dominant variable for the incidence of stunting in children aged 6-23 months in stunting locus and non-locus areas of East Luwu.[33] In line with research by Abdul, *et al*, (2020) which showed that there was a significant correlation between exclusive breastfeeding and the incidence of stunting in children aged 0-59 in Jaya Bakti Village, Banggai, Central Sulawesi. Setia *et al.'s* research, (2021) obtained the same results that there was a correlation between exclusive breastfeeding and the nutritional status of children (6-23 months) based on height-for-age in the working area of the Oepoi Community Health Center, Kupang.[23] However, research conducted by Dwi *et al.*, (2020) obtained different results, namely that there was no correlation between exclusive breastfeeding and the incidence of stunting in children aged 6-60 months in Makassar.[19] Research conducted by Rohmayanti and Pujonarti, (2022) also obtained different results, namely that there was no correlation between exclusive breastfeeding and the incidence of stunting in children (0-59 months) in East Lombok Regency.[37]

Based on WHO and UNICEF recommendations, the practices of breastfeeding in children begin within the first hour of birth and exclusively breastfeeds for the first six months. After six months, children are only given breast milk complementary foods (MP ASI) and continue to be breastfeed for up to two years and over.[38] Breastfeeding is very important for children breast milk contains many nutrients that can reduce baby's risk of suffering from infectious diseases that can increase malnutrition. If this condition occurs for a long time, it can interfere with the absorption of nutrients, which can increase the risk of stunting in children.[36] Breast milk also contains immunological substances that are not found in formula milk such as immunoglobins which can prevent disease, secretory substances which can neutralize pathogenic E.coli and lactoferrin which plays a role in binding iron from the digestive tract, tracking and having bactericidal properties.[39] The whey protein content in breast milk is more easily digested by the baby's intestines than the casein content in formula milk. Another ingredient found in breast milk is lactose, which plays a role in calcium absorption for bone growth and development.[23] In addition, the content of lactose, AADHA, iron, zinc, selenium and iodine found in breast milk is the main raw material for the formation of brain nerve cells.[40]

CONCLUSIONS

History of LBW was the most dominant risk factor for stunting in children aged (0-23 months). Children with a history of LBW are 5.092 times more likely to experience stunting than normal birth weight. It is recommended for mothers to put more attention to the fulfillment of nutrition during in order to reduce the risk of LBW and also to assure that children nutritionl intake are adequate to their needs during the golden period of growth, especially infants with LBW hence risk of stunting might be avoided. The limitations of the study are that the variables studied are still limited because the data available in the e-PPGBM application is not fully complete. Other variables that need to be studied are parenting patterns in terms of feeding children under-five and socio-cultural factors.

STATEMENT OF ETHICS

This study has received approval from the Health Research Ethics Commission (HREC) of the Faculty of Public Health, Hasanuddin University, with protocol number: 261222032383 and letter number: 103/UN4.14.1/TP.01.02/ 2023.

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