ORIGINAL RESEARCH ARTICLE

Determinants of Stunting in Children Aged 6-24 Months at Pambusuang Health Centre Working Area, Polewali Mandar Regency, Indonesia

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ABSTRACT

Background: Based on the results of the Indonesian Nutrition Status Survey in 2022, the national prevalence of stunting is 21.6% and in the Pambusuang Health Centre working area it is still above the national average of 26.1%. This study aims to determine the determinants that are risk factors for stunting in children aged 6-24 months.

Methodology: This research uses a case control study design with a total sample size of 144 consisting of 72 cases and 72 controls selected by systematic random sampling method. Data analysis was carried out using Stata version 14 program.

Results: Determinants that are risk factors for stunting are history of LBW (OR=7 with 95% CI=1,453-66,087), pregnancy distance (OR=3.7, with 95% CI=1,698-8,178), knowledge about complementary feeding (OR=4.230 with 95% CI=1,841-10,048) and hand washing with soap habits (OR=5.153 with 95% CI=1,707-18,565). Logistic regression analysis showed that LBW history was the main determinant of stunting in children aged 6-24 months.

Conclusions: Risk factors that determine stunting in children aged 6-24 months, including a history of LBW, pregnancy distance, knowledge about complementary feeding and hand washing with soap habits.

Key-words: Low Birth Weight, Nutrition, Risk Factor, Sanitation, Stunting

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INTRODUCTION

The commitment to accelerate nutrition improvement is realized through the implementation of the Sustainable Development Goals (SDGs). The acceleration of community nutrition improvement is prioritized on accelerating stunting prevention.[1] Stunting is a condition of growth failure in children under five due to chronic malnutrition, especially in the first 1,000 days of life.[2]

Globally, the incidence of stunting is still high. Based on data from UNICEF, WHO and the World Bank Group in 2022, around 148.1 million (22.3%) children under five are stunted.[3] Indonesia itself currently ranks fifth as the country with the highest prevalence of stunting in children under five. Based on the results of the Indonesian Nutrition Status Survey (SSGI) by the Indonesian Ministry of Health in 2022, around 21.6% of toddlers in Indonesia experienced stunting.[4]

West Sulawesi Province ranks second with the highest prevalence of stunting in Indonesia at 35%.[4] The results of the SSGI at the district/city level in 2021 showed that the highest prevalence of stunting among all districts in the West Sulawesi region was Polewali Mandar District at 36%.[5] Then in 2022, the prevalence rate of stunting in Polewali Mandar Regency actually increased to 39.26%.[4] Furthermore, the Polewali Mandar District Health Profile reports that the prevalence of stunting in the Pambusuang Health Centre working area is 26.1% or around 677 children.[6]

Based on WHO theory, one of the direct factors that influence stunting is family and household factors, especially mothers. Some of the determinants of stunting in family and household aspects are a history of low birth weight (LBW), maternal age during pregnancy, pregnancy distance and maternal knowledge about complementary feeding.[7]

In addition to household and family aspects, the incidence of stunting in toddlers is also influenced by environmental factors, in this case environmental sanitation. Environmental sanitation consists of five pillars, namely access to clean water, access to healthy latrines, the habit of washing hands with soap, household waste management and household liquid waste management. Inadequate environmental sanitation correlates with the incidence of infectious diseases that can affect the nutritional status of toddlers and increase the risk of stunting.[8]

Malnutrition and stunting are two interrelated problems. Child stunting is the result of nutrient deficiencies during the first 1,000 days of life. This leads to irreversible impairment of the child's physical development, resulting in decreased cognitive and motor skills and decreased work performance. Growth and development disorders in children due to malnutrition if not intervened early will continue into adulthood.[9]

Seeing the impact of stunting on toddlers and the potential for future health, the determinants of the incidence of stunting in toddlers need to be known. The results of this study are expected to be taken into consideration in determining activity programs and policies in the context of preventing and handling stunting.

This study aims to determine the determinants that are risk factors for stunting in children aged 6-24 months in the working area of the Pambusuang Health Centre, Polewali Mandar Regency.

METHODOLOGY

Population and Sample

This study was conducted in the working area of Pambusuang Health Centre, Balanipa District, Polewali Mandar Regency, West Sulawesi Province in August-September 2023. This research uses a case control study design to determine the determinants that are risk factors for stunting in children aged 6-24 months.

The population in this study was all children aged 6-24 months who resided in the study location. Data on children aged 6-24 months were collected from body length or height measurements recorded in the electronic community-based nutrition recording and reporting report of the Pambusuang Health Centre in 2023.

The sample in this study were some children aged 6-24 months in the working area of the Pambusuang Health Centre, Polewali Mandar Regency. The minimum sample of cases in determined using the Lemeshow formula.

$$n = \frac{[Z_{1-\alpha/2}\sqrt{2P(1-P)} + Z_{1-\beta}\sqrt{P_1(1-P_1) + P_2(1-P_2)}]^2}{(P_1-P_2)^2}$$

Where, n was Minimum sample size; $Z_{1-\alpha/2}$ was Z value at the upper limit for the 95% confidence level (1.96); $Z_{1-\beta}$ was Standard normal distribution value of 80% (0.842); P1 was Proportion in the case group; and P2 was Proportion in the control group (Library) (0.3926).

$$P1 = \frac{(OR)\ P_2)}{(OR)P_2+(1-P_2)}$$

The OR used was 2.71 based on previous research. The research displays Odds Ratio analysis. The selected OR value is the OR that produces the largest number of samples. The calculated P1 was 0.634.

So, using the formula mentioned earlier, the calculated sample size (n) = 65. The sample was increased by 10%, which is 14 samples from the total population as a reserve if there are samples that drop out. Therefore, the total sample required in this study was 144 people (72 cases and 72 controls). The respondents of this study were the mothers of the sampled children.

The case samples are children aged 6-24 months who are stunted based on height or length measurements recorded in the electronic community-based nutrition recording and reporting report. The control samples are children aged 6-24 months who had height or length measurements and were recorded in the electronic community-based nutrition recording and reporting report.

Research Variable

LBW history which was categorised in to Low birth weight (body weight at birth <2500 grams) and Normal birth weight (Body weight at birth ≥ 2500 grams)

Maternal age at pregnancy which was categorised in to High risk (age at pregnancy <20 years old or >35 years old) and Low risk (pregnancy age 20-35 years old)

Pregnancy distance which was categorised in to High risk (pregnancy distance <2 years), Low risk (pregnancy distance ≥2 years). The first child was excluded in the study.

Maternal knowledge about complementary feeding which was categorised in to High knowledge (the mother answered correctly ≤50%) and Low knowledge (the mother answered correctly >50%).

Access to clean water which was categorised in to Poor (the water used daily comes from uncovered water sources), and Good (the water used daily comes from a covered water source).

Access to healthy latrines which was categorised in to Poor (the household does not have access to and use a facility for defecation), and Good (the household have access to and use a facility for defecation)

Hand washing with soap habit which was categorised in to Poor (the respondent does not make a habit of washing hands using soap and clean running water before eating, before processing and serving food, before breastfeeding or feeding children and after defecating or urinating) and Good (the respondent makes a habit of washing hands using soap and clean running water before eating, before processing and serving food, before breastfeeding or feeding children and after defecating or urinating).

Household waste management which was categorised in to Poor (rubbish bins are not closed tightly, waste is not sorted according to its type and unsafe waste processing is carried out) and Good (rubbish bins are tightly closed, waste is sorted according to its type and safe waste processing is carried out).

Household liquid waste management which was categorised in to Poor (the final sewerage is stagnant, causes odour and is not connected to the public sewerage/absorption wells) and Good (if the final sewerage is not flooded, does not cause odour and is connected to a public sewerage channel/absorption well)

Data Collection: Data collection was conducted through the interview method by visiting each respondent's home. Researchers took about 15-20 minutes to interview each respondent. The measuring instrument used at the time of data collection was a questionnaire. The data on children's height or length used is secondary data on the results of measuring children's height or length recorded on electronic community-based nutrition recording and reporting report.

Data Analysis: Data were processed using Stata version 14 program. The association and magnitude of risk factors between dependent and independent variables were analysed with the chi-square test. The multivariate analysis used was the logistic regression test with a confidence level of 95% ($\alpha = 0.05$).

Ethical Approval: This study was approved by the Health Research Ethics Committee of Hasanuddin University with ethical approval recommendation number 4633/UN4.14.1/TP.01.02/2023. Informed consent was obtained from all research respondents, data confidentiality was maintained and privacy was guaranteed.

RESULTS

Table 1 shows that the proportion of respondents in the age group < 20 years had more stunted children (1.39%), the age group 20-35 years also had more stunted children (86.11%) while the age group > 35 years had more children with normal nutritional status (16.67%). More respondents who married for the first time at the age of < 19 years and had stunted children (34.72%) while respondents who married for the first time at the age of ≥ 19 years had more children with normal nutritional status (76.39%).

Based on the type of respondent's occupation, more respondents who are housewives have stunted children (81.94%), respondents who work as Civil Servants/Army/Police have more children with normal nutritional status (2.78%). Respondents who worked as private employees, self-employed and others had the same number of stunted children and normal nutritional status (1.39%), (4.17%) and (15.28%) respectively.

In education characteristics, most respondents who did not go to school or did not finish elementary school had stunted children (12.50%), respondents with the last education graduated from elementary school and graduated from junior high school also had more stunted children (36.11%) and (23.61%) respectively. Then respondents with a high school education level had more children with normal nutritional status (34.72%). Furthermore, respondents with completed diploma education level had more stunted children (4.17%) and respondents with completed bachelor's degree education level had children with a more dominant normal nutritional status (6.94%).

Then the distribution of child characteristics based on gender shows that children with male and female gender in the stunting group and normal nutritional status have an equal number (51.39%) and (48.61%) respectively. Then according to age groups, samples in 6-11 month and 12–17-month age groups had more normal nutritional status (11.11%) (38.89%) respectively, while the 18–24-month age group had more stunting (59.72%).

Table 2 shows that based on maternal factors, LBW is a significant risk factor for stunting with an OR of 7 and 95% CI of 1.453-66.087. The results of the analysis also found that maternal age during pregnancy was a non-meaningful risk factor for stunting with an OR of 1.366 and 95% CI of 0.507-3.764. Based on the pregnancy spacing determinant, it was found that pregnancy spacing was a significant risk factor for stunting with an OR of 3.7 and 95% CI of 1.698-8.178. The determinant of knowledge is also a significant risk factor for stunting with an OR of 4.230 and CI 95% 1.841-10.048.

Table 3 shows that based on home environment factors, access to clean water is a non-meaningful risk factor for stunting with OR 1.442 and 95% CI 0.489-4.422. Access to healthy latrines also showed a similar result, with an OR of 1.218 and 95% CI of 0.293-5.299. The analysis also found that handwashing with soap habit was a significant risk factor for stunting with OR 5.153 and 95% CI 1.707-18.565.

Table 1 Distribution of Respondents Characteristics

Respondent Characteristics	Stunting (n=72) (%)	Normal (n=72) (%)
Mother's Characteristics		
Age group, years		
<20	1 (1.39)	0 (0)
20-35	62 (86.11)	60 (83.33)
>35	9 (12.50)	12 (16.67)
Age at marriage		
<19 years old	25 (34.72)	17 (23.61)
≥ 19 years old	47 (65.28)	55 (76.39)
Occupation		
Housewife	57 (79.17)	55 (76.39)
Civil Servants/Army/Police	0 (0)	2 (2.78)
Private employee	1 (1.39)	1 (1.39)
Self-employed	3 (4.17)	3 (4.17)
Others	11 (15.28)	11 (15.28)
Education		
Not in school/Not completed primary school	9 (12.50)	6 (8.33)
Completed primary school		
Completed secondary	26 (36.11)	19 (26.39)
Completed tertiary	17 (23.61)	16 (22.22)
Completed diploma	14 (19.44)	25 (34.72)
Completed bachelor's degree	3 (4.17)	1 (1.39)
Completed master's degree	3 (4.17)	5 (6.94)
Child Characteristics		
Gender		
Male	37 (51.39)	37 (51.39)
Female	35 (48.61)	35 (48.61)
Age group		
6-11 months	4 (5.56)	8 (11.11)
12-17 months	25 (34.72)	28 (38.89)
18-24 months	43 (59.72)	36 (50)

Table 2 Bivariate Analysis of Maternal Factors and Stunting

Determinants of Stunting	Stunting (n=72) (%)	Normal (n=72) (%)	OR (CI 95% LL-UL)	p-value
LBW history				
Yes	12 (16.67)	2 (2.78)	7 (1,453-66,087)	0,005
No	60 (83.33)	70 (97.22)		
Maternal age during pregnancy				
<20 years old or >35 years old	13 (18.06)	10 (13.89)	1,366 (0,507-3,764)	0,495
20-35 years old	59 (81.94)	62 (86.11)		
Pregnancy distance				
<2 years	37 (51.39)	16 (22.22)	3,7 (1,698-8,178)	0,000
≥2 years	35 (48.61)	56 (77.78)		
Knowledge about complementary feeding				
Low	33 (45.83)	12 (16.67)	4,230 (1,841-10,048)	0,000
High	39 (54.17)	60 (83.33)		

Table 3 Bivariate Analysis of Home Environmental Factors and Stunting

Determinants of Stunting	Stunting (n=72) (%)	Normal (n=72) (%)	OR (CI 95% LL-UL)	p-value
Access to clean water				
Poor	11 (15.28)	8 (11.11)	1.442 (0.489-4.422)	0.460
Good	61 (84.72)	64 (88.89)		
Access to healthy latrines				
Poor	6 (8.33)	5 (6.94)	1.218 (0.293-5.299)	0.753
Good	66 (91.67)	67 (93.06)		
Handwashing with soap habit				
Poor	67 (93.06)	52 (72.22)	5.153 (1.707-18.565)	0.001
Good	5 (6.94)	20 (27.78)		

Table 4 Logistic Regression Analysis of Determinants of Stunting Incidence

Variable	p-value	OR	CI 95%	
			LL	UL
LBW history	0.034	6.075	1.145	32.219
Pregnancy distance	0.003	3.336	1.526	7.293
Knowledge about complementary feeding	0.010	3.027	1.310	6.995
Handwashing with soap habit	0.036	3.316	1.083	10.154

Determinants of household waste management and household liquid waste management were not subjected to bivariate analysis because the available data were homogeneous so that the odd ratio value could not be calculated.

Table 4 shows the results of multivariate logistic regression analysis. Any independent variable that showed a p-value <0.25 in the bivariate analysis could be included in the multivariate analysis. In this multivariate analysis, it was found that LBW history, pregnancy spacing, knowledge about complementary feeding, and handwashing with soap habits were associated with stunting in children aged 6-24 months. Based on the OR value, it shows that LBW history is the main determinant of stunting in children aged 6-24 months with OR 6.075 and 95% CI value 1.145-32.219. This shows that children who have a history of LBW have a risk of 6.075 times to experience stunting compared to children who have normal birth weight.

DISCUSSION

The results showed that LBW history is a significant risk factor for stunting. Based on the results of multivariate analysis, it was found that LBW history is a risk factor that is the main determinant of stunting in children aged 6-24 months.

This study is in line with research conducted by Miranti et al who found that a history of LBW is a risk factor for stunting, where a history of LBW contributes to stunting 5.294 times compared to children with normal birth weight.[10] However, based on the research of Hidayati et al, it shows different results that there is no significant relationship between LBW history and stunting in toddlers.[11]

Infants with a history of LBW are a picture of maternal health with long-term malnutrition, poor health and poor pregnancy care. Malnutrition in infants early in pregnancy can affect their birth weight and length which will result in a short and thin body posture.[12]

Based on the results of the analysis, the age of the mother during pregnancy is a risk factor that is not significant for stunting in children aged 6-24 months. The same research results were found by Nurhidayati et al that pregnant women aged <20 years or >35 years were not associated with stunting in toddlers.[13] However, different results were shown in a study conducted by Rahman et al who found that maternal age during pregnancy had a significant impact on stunting in children aged 6-24 months with an OR value of 3.05.[14]

Physiologically, the group of mothers aged <20 years is still in the process of growing both height and body. This condition is not supportive for someone to enter pregnancy because they are still in the growth period of their own body while supporting foetus growth.[13] Meanwhile, pregnancies that are too old (>35 years) tend to be risky because the mother's health begins to decline and has a greater chance of experiencing complications during childbirth.[15]

The results showed that pregnancy distance is a significant risk factor for stunting. This finding is in line with research conducted by Prastiwi et al and shows that pregnancy distance correlates with stunting in toddlers with an OR of 3.105.[16] In contrast to the research of Hafid et al who found that pregnancy distance did not have a significant relationship with stunting in toddlers.[17]

According to Indonesia's National Population and Family Planning Agency, the ideal pregnancy spacing for a mother is 2 years because pregnancy spacing that is too close risks causing complications in the mother such as bleeding during pregnancy to childbirth and babies born are at risk of having low health quality. In addition, mothers who have a pregnancy

spacing of <2 years are also unable to recover their physical condition optimally after childbirth and will have difficulty in dividing their time to care for 2 toddlers.[18]

Based on the results of the study, respondents with a low level of knowledge about complementary feeding had more stunted children. These results indicate that knowledge about complementary feeding is a significant risk factor for stunting.

The same results were found in Isnaningsih and Setyaningsih's research which showed that maternal knowledge related to complementary foods affects stunting in children aged 6-24 months with an OR of 10.00.[19] Another study conducted by Setiawati et al showed that there was no relationship between maternal knowledge about complementary foods and stunting in toddlers.[20]

Maternal knowledge about complementary feeding is related to the accuracy of complementary feeding. Mothers with a good level of knowledge about complementary foods tend to be accurate in providing complementary foods in terms of time, quantity and texture, while mothers with low knowledge often feed their children without fulfilling their nutritional needs.[21]

The results showed that access to clean water is a risk factor that is not significant for stunting in children aged 6-24 months. In this study, most respondents already had access to a good source of clean water and had fulfilled the physical requirements of water which were not cloudy, tasteless and odourless.

The results of this study are in line with Sugianti and Putri's research which showed that access to clean water was not associated with stunting in children aged 6-24 months[22]. However, different results were found by Hasan and Kadarusman that access to clean water sources was associated with stunting in children aged 6-59 months with an OR of 5.99.[23]

Clean water is used in daily life such as drinking, cooking, bathing and washing. Water contaminated with pathogenic bacteria if consumed and used in daily life can cause digestive system disorders such as diarrhoea, typhoid, cholera, dysentery and so on. Toddlers who are in their growth period if consuming or using the water repeatedly can inhibit their growth and development, because the energy from food intake is diverted to fight infection so that the growth and development of toddlers is not optimal and can cause stunting.[24]

Based on the results of the analysis, it is known that access to healthy latrines is not a significant risk factor for stunting in children aged 6-24 months. In this study, the majority of respondents already had their own family latrines. The latrines used were sanitary and faeces were drained into septic tanks.

This study is in line with a study conducted by Kuewa et al and found that access to healthy latrines is not associated with stunting in toddlers.[25] In contrast to research conducted by Oktarizal et al who found that the risk of stunting decreased with the availability of access to healthy latrines with an OR value of 9.[26]

Inadequate access to healthy latrines has the potential to trigger infectious diseases caused by parasitic worms that are spread through faeces and can interfere with the absorption of nutrients in the digestive process. This can lead to multiple complex health problems in children including anaemia and stunting.[27]

The results of the analysis show that handwashing with soap is a significant risk factor for stunting in children aged 6-24 months. These results are in line with Pradana et al's research which found that the habit of washing hands with soap correlates with stunting in toddlers with an OR value of 10.535.[28] However, different results were found by Kamila and Salami that there was no significant relationship between the habit of washing hands using soap and running water with stunting in toddlers.[29]

The habit of washing hands with soap and running water before interacting with children is often associated with stunting. This is because children can swallow food or drinks containing pathogens that come from dirty hands. These ingested pathogens can cause digestive disorders which will later have an impact on child growth and development.[30]

Conclusion

Risk factors that determine stunting in children aged 6-24 months, including a history of LBW, pregnancy distance, knowledge about complementary feeding and hand washing with soap habits. LBW history is the main determinant of stunting in children aged 6-24 months. Increased health promotion, especially related to the determinants of stunting, is needed to reduce the incidence of stunting in children aged 6-24 months.

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