Jurnal Aisyah: Jurnal Ilmu Kesehatan

Volume 9, Issue 2, 09 2024, p. 1105-1114
ISSN 2502-4825 (print), ISSN 2502-9495 (online)

The Prediction Model for Wasting in Toddlers within The Gisting Sub-district Lampung

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ABSTRACT

*Wasting is one of the acute malnutrition that has a major impact on the growth and development of toddlers, increased cognitive impairment, and increased risk of death in toddlers. The results of Indonesia's 2018 Riskesdas showed that the prevalence of toddler wasting reached 10.2%. Data obtained from the EPPGBM application at Gisting Public Health Center indicate that the prevalence of wasting in toddlers from January to December 2021 was 11.9%. This study aims to understand the prediction model for the incidence of wasting in toddlers within the Gisting Sub-district, Tanggamus Regency. This type of research is quantitative with a case-control design. The population in this study were all toddlers in the Gisting Sub-district, Tanggamus Regency Lampung Year 2022. The sample in this study amounted to 356 respondents who were divided into two groups, namely 178 case groups and 178 control groups. Sampling using a simple random sampling technique. The analysis conducted involved a chi-square test and binary logistic regression. The study's findings revealed that infectious diseases, mother's education, exclusive breastfeeding history, and family income were associated with the incidence of wasting. The prediction model of wasting in Gisting Sub-district was obtained Z= -2.338 + 1, 974 * infectious disease + 0.542 * mother's education + 1.022 * exclusive breastfeeding + 0.752 * family income.*

Keywords**:** prediction, wasting, toddler

ABSTRAK

*Wasting merupakan salah satu kekurangan gizi akut yang berdampak besar bagi pertumbuhan dan perkembangan balita, peningkatan gangguan kognitif, serta peningkatan resiko kematian pada balita. Hasil Riskesdas tahun 2018 Indonesia menunjukkan prevalensi balita wasting mencapai 10,2 Data yang diperoleh dari aplikasi EPPGBM Puskesmas Gisting menunjukkan bahwa prevalensi wasting pada balita dari Januari hingga Desember 2021 sebesar 11,9%. Tujuan dari penelitian ini adalah untuk mengetahui model prediksi kejadian wasting pada balita di Kecamatan Gisting Kabupaten Tanggamus. Jenis penelitian ini adalah kuantitatif dengan rancangan case control. Populasi dalam penelitian ini adalah semua balita di Kecamatan Gisting Kabupaten Tanggamus Lampung Tahun 2022. Sampel pada penelitian ini berjumlah 356 responden yang dibagi menjadi dua kelompok yaitu 178 kelompok kasus dan 178 kelompok kontrol. Pengambilan sampel menggunakan teknik simple random sampling. Analisis yang digunakan adalah uji chi square dan regresi logistic ganda. Hasil dari penelitian menunjukan bahwa penyakit infeksi, pendidikan ibu, riwayat ASI Eksklusif, dan pendapatan keluarga berhubungan dengan kejadian wasting. Didapatkan model prediksi kejadian wasting di Kecamatan Gisting Z= -2,338+1, 974*penyakit infeksi + 0,542*pendidikan ibu+1,022*ASI eksklusif + 0,752*pendapatan keluarga.*

Kata kunci : prediksi, wasting, balita

INTRODUCTION

Toddlers are a highly vulnerable group when it comes to nutritional issues. Since they are in a critical stage of growth and development, their nutritional needs are higher than those of other age groups, making them more susceptible to nutritional deficiencies. If toddlers are not fulfilled according to the nutritional adequacy rate, then the growth and development of toddlers will be hampered. One of the growth and development disorders in toddlers is wasting (Supriasa, 2016). In 2019, the number of wasting (thin) worldwide reached 47 million people and 14.3 million of them were very thin (severe waste). In addition, according to Global Nutrition Reports 2018, there are three countries with the highest incidence of wasting: India (25.5 million), Nigeria (3.4 million) and Indonesia (3.3 million). Indonesia's 2018 Riskesdas results showed that the prevalence of

wasting among children under five reached 10.2% (Fanzo, 2019). In Lampung province alone, the prevalence of wasting is 10.64% with a division of the category of very thin 3.89% and thin toddlers 6.75% (DinkesProv, 2020). In Tanggamus Regency, according to the 2018 Riskesdes, the prevalence of wasting was 9.5%, with 2.8% of very thin toddlers and 6.7% of thin toddlers. Based on the survey results at Gisting Public Health Center, data from the EPPGBM application showed that the prevalence of wasting in toddlers from January to December 2021 was 11.9%. The prevalence of wasting still exceeds the WHO target for 2025 which is <5%.

The short-term impacts of wasting include reduced exploration of the environment, less social interaction, a lack of feelings of joy, and a tendency towards apathy. In contrast, the long-term effects can disrupt physical growth, lead to cognitive impairments, lower academic performance, behavioral issues, and, more severely, an increased risk of mortality. Additionally, wasting also contributes to potential economic losses. Nationally, it is estimated that the economic potential lost due to reduced productivity from wasting in toddlers ranges from approximately Rp 1,042 billion to Rp 4,687 billion (Renyoet, 2019).

Malnutrition during the fetal and toddler years can affect brain growth, as brain cells cannot develop. The brain experiences optimal growth during 2-3 years. And will experience a decline after that and end in adolescence. Thus, if nutritional problems cannot be overcome quickly, it will result in permanently impaired brain function. Resulting in a lack of thinking ability (Par'I, 2017). Research indicates that nutritional deficiencies during childhood, such as stunting, wasting, and lack of essential micronutrients, are linked to poor developmental outcomes. These can lead to low academic performance, mental health issues, and reduced earning potential later in life (Black, 2018). With the various impacts of wasting, the Government of Indonesia through the Sustainable Development Goals (SDGs) program has a target by 2030 to end all forms of malnutrition, and reduce stunting and wasting in children under five.

The high prevalence of wasting is driven by numerous risk factors, both direct and indirect. Direct factors include poor nutritional intake and infectious diseases in toddlers, which often lead to a loss of appetite and, consequently, weight loss. Meanwhile, indirect factors such as mother's education, family income, immunization completeness status, exclusive breastfeeding, complementary feeding, and environmental sanitation conditions (Prawesti, 2018).

Nutrient intake needs to be sufficient in both quantity and quality, and nutrients should be consumed in combinations that allow the body to properly absorb them. Nutrients are substances obtained from foodstuffs consumed and have a very important value in children to maintain body processes in growth and development. (Prawesti, 2018). Children who lack energy and protein intake will have a higher risk of wasting (Putri & Wahyono, 2013). Infections lead to deficiencies in energy, protein, and other nutrients by suppressing appetite, which in turn reduces food intake. Childhood illness has a negative effect on child growth (Supriasa, 2016). Infections can lead to malnutrition. So children are undernourished, have low resistance to disease, get sick, and will become increasingly malnourished, reducing their capacity to fight disease. This is also called infection malnutrition (Prawesti, 2018). The level of education can also influence a person to understand information and receive information. Parents with low education will maintain traditions such as abstaining from certain foods. Meanwhile, parents with higher education will understand how to take good care of their children, use healthcare facilities, and maintain hygiene (Septikasari, 2018). (Septikasari, 2018). Mothers who do not work are considered to have plenty of time to care for and pay attention to their children. The nutritional intake of their children will also be considered. The level of family income greatly affects whether or not primary and

secondary needs are met, as well as the attention and affection that children will receive (Suparyanto, 2014). Breast milk supports both the brain and physical development of infants and helps protect them from various illnesses that could pose a threat to their health. Breast milk contains immune-building antibodies. Breast milk fulfills all nutritional needs, and breast milk is the best food for babies. Breast milk fulfills the energy and nutrient requirements needed by the child during early life. Based on the above problems, this study aims to determine the prediction model for the incidence of wasting in toddlers in the Gisting Sub-district, Tanggamus Regency Lampung.

METHOD

Participant characteristics and research design

The population for this study consisted of all toddlers in the Gisting Sub-district in Tanggamus Regency, Lampung, totaling 2,676 toddlers in 2022. The sample included infants and toddlers aged 12 to 59 months residing in the Gisting sub-district. This research employed a quantitative approach, utilizing an analytic survey method with a case-control design. Data collection involved primary data and secondary data. The instrument used was an observation checklist developed by the researcher. This research took place from August 8 to September 15, 2022, within the Gisting Sub-district in Tanggamus Regency.

Sampling procedures

Sampling in this study used a simple random sampling technique. Sampling of cases and controls was carried out in a ratio of 1: 1.

Sample size, power, and precision

The sample size in this study was calculated in 2 ways, namely utilizing (Dahlan, 2016)

The sample size of the estimated proportion $n = \frac{z^2_{1-\alpha/2} P(1-P)}{d^2}$

P (prevalence of toddler wasting in Gisting Subdistrict in 2021) is 11.9%, d (precision / absolute deviation) 0.05. Z (z value at 1-α confidence level) is 95%. So, a sample size of 162 respondents was obtained.

Sample size for hypothesis testing $n1 = n2 = \frac{\{Z\alpha\sqrt{2P(1-P)} + Z\beta\sqrt{P1Q1 + P1Q1}\}^2}{P1 - P2}$

n1 is the number of subjects with wasting, n 2 is the number of subjects with no wasting (control). Zα is the standard alpha value of 5%, which is 1.96, Zβ is the standard beta value of 10%, which is 1.28. P1 is the proportion of cases based on literature, Q1 = 1 - P1, P1 - P2 is the difference in proportion between cases and controls, P2 is the proportion of research subjects in controls, and Q2 is 1 - P2. The results of the sample calculation in the hypothesis test of the relationship between infectious diseases and wasting were 47 respondents, and the sample calculation in the hypothesis test of the relationship between mother's education and wasting was 36 respondents. The sample calculation in the hypothesis test of the relationship between exclusive breastfeeding and wasting was 42 respondents. The sample calculation in the hypothesis test of the relationship between family income and wasting was 67 respondents. Based on the sample calculation, the number of samples with the largest sample calculation is 178 respondents for each case and control. So, the total sample amounted to 356 respondents.

Data Analysis

The analysis conducted included bivariate analysis using the chi-square test and multivariate analysis with binary logistic regression, with a significance level set at a P value of 0.05.

RESULTS AND DISCUSSION

Univariate analysis was conducted to describe the variables.

Table 1
Univariate Analysis of Respondent Frequency Distribution

Variables	*Frekuency*	*Percentage*
Incident of Wasting		
Wasting	178	50%
No wasting	178	50%
Total	356	100%
Infectious Disease		
Infectious Diseases	240	67,4%
No Infectious Disease	116	32,6%
Total	356	100%
Mother's education		
Low Education	163	45,8%
Higher Education	193	54,2%
Total	356	100%
Exclusive breastfeeding history		
Exclusive breastfeeding	271	76,1%
Not exclusively breastfed	85	23,9%
Total	356	100%
Family Income		
Low Income	225	63,2%
High Income	131	36,8%
Total	356	100%

To determine the relationship between the independent and dependent variables and obtain the p-value, bivariate analysis was conducted using the chi-square test. The results of the analysis are as follows:

Table 2
Bivariate Analysis of the Correlation between Several Factors and the Wasting

Variable	Incidence of Wasting				Total		P-*Value*	OR	95%CI
	No Wasting		Wasting						
	n	%	n	%	n	%			
Infectious Disease							0,000	6,401	3,825 -10,713
Infectious Diseases	91	78,4	25	21,6	116	100			
No Infectious Disease	87	36,3	153	63,8	240	100			
Mother's education							0,043	1,540	1,012 – 2,342
Low Education	106	54,9	87	45,1	193	100			
Higher Education	72	44,2	91	55,8	163	100			
Total	**178**	**50**	**178**	**50**	**356**	**100**			

Variable	Incidence of Wasting				Total		P-*Value*	OR	95%CI
	No Wasting		Wasting						
	n	%	n	%	n	%			
Exclusive breastfeeding history							0,004	2,065	1,250 – 3,412
Exclusive breastfeeding	147	54,2	124	45,8	271	100			
Not exclusively breastfed	31	36,5	54	63,5	85	100			
Family Income							0,003	1,934	1,248 – 2,996
Low Income	79	60,3	52	39,7	131	100			
High Income	99	44,0	126	56	225	100			
Total	**178**	**50**	**178**	**50**	**356**	**100**			

Next, a multivariate analysis was conducted. At this stage, the independent variables (including infectious diseases such as diarrhea and fever, history of exclusive breastfeeding, mother's education level, and family income) were individually analyzed in relation to the dependent variable (wasting). Variables with a P value of less than 0.25 were considered for inclusion in the multivariate analysis, which was then performed using a binary logistic regression test.

Table 3
Multivariate Analysis of Wasting Incidence Prediction Model in the Gisting Sub-district

No	Variable	β	*p-value*	Exp(B) /OR	95% CI	
					Lower	Upper
1	Infectious Diseases	1.974	0.000	7.196	4.172	12.411
2	Mother's education	0.542	0.028	1.719	1.059	2.789
3	Exclusive breastfeeding	1.022	0.001	2.779	1.550	4.981
4	Family Income	0.752	0.004	2.120	1.278	3.517
	Constant	-2.338	0.000	0.96		

Table 3 indicates a significant association (p-value = 0.000) between infectious diseases and the incidence of wasting. The analysis revealed that toddlers with infectious diseases are at a risk of wasting which is 7.196 times higher compared to those without such diseases. This study suggests that toddlers with a history of infections like fever, diarrhea, and cough are at a greater risk of wasting. This finding aligns with the research by Rochmawati et al. (2016), which also found a significant relationship between infectious diseases and wasting. Infectious diseases have a major role in the problem of malnutrition because they increase the need and expenditure of considerable energy. Infectious diseases seen in the last three months include fever, ARI, and diarrhea. Malnutrition or *wasting* can increase the risk of infection, while infectious diseases can cause malnutrition or *wasting*.

Infectious diseases and nutritional problems are a circle of problems. ARI is one of the diseases that is closely related to nutritional problems (*wasting*). Children with malnutrition have low resistance to fight infectious diseases, so toddlers can easily get sick and toddlers will increasingly experience malnutrition. This reduces the capacity of the body to fight the infectious disease. This is referred to as infectious malnutrition (Prawestin, 2018).

The findings of this study are consistent with the research conducted by Erika et al. (2020), in which toddlers who experienced infectious diseases had an 11.897 times chance of experiencing *wasting*. Children who are attacked by contagious diseases will make toddlers not have a good appetite, which results in toddlers lacking the required food and nutrient intake, thus making their

nutritional status in less category (*wasting*). This appetite disorder causes the need for food intake not to be fulfilled optimally. Likewise, toddlers who experience wasting will easily experience infectious diseases because wasting toddlers have a low immune system.

Infection is a direct factor that leads to deficiencies in energy, protein, and other nutrients by causing a loss of appetite, which results in decreased food consumption. Infectious diseases are caused by the growth of parasitic organisms in the body (germs). Infections also deplete calories and protein that would otherwise be used for growth. Infectious diseases can hinder food absorption, infectious diseases that can worsen nutritional conditions are diarrhea, upper respiratory tract infections, tuberculosis, and measles (Billi, 2020).

Infectious diseases are also caused by poor health services in the community, unhealthy environmental conditions, unhygienic feeding, early complementary feeding, and poor parenting (Par'i, 2017). From this study, the results of toddlers who experienced *wasting* and suffered from infectious diseases amounted to 153 toddlers (63.8%). This is because when the study was conducted, the covid 19 case was still a pandemic. Many parents experience coughs, colds, fever, and diarrhea, so they can easily transmit to toddlers who still have a body condition that is vulnerable to infectious diseases.

Another cause of wasting is inadequate food intake or lack of dietary diversity. This can be linked to the mother's level of education. The study found a significant relationship between a mother's education and the wasting. The results indicated that toddlers with less educated mothers are at a 1.719 times higher risk of wasting compared to those with more educated mothers. Low mother's education is one of the causes of nutritional problems (*wasting*). Low-educated mothers are less able to understand and apply the overall knowledge conveyed by health workers and social media (Novitasari, Destriatania, and Febry, 2016). Mothers who have higher education will make good decisions to improve nutrition and health for their toddlers. So that various strategies will be carried out to increase the life capacity of their children, such as breastfeeding, immunization, balanced nutrition, and family planning. A mother's level of education is connected to how easily she can access information about nutrition and health from external sources.

Exclusive breastfeeding history was also associated with wasting. Toddlers who were not exclusively breastfed faced a 2.779 times greater risk of wasting compared to those who were exclusively breastfed. Colostrum contains more protein and 10-17 times more antibodies than mature breast milkn(Supriasa. et al, 2016). Early feeding is associated with an increased risk of infectious diseases such as respiratory infections and diarrhea. This is because toddlers who are weaned too early will lose immunity from non-exclusive breastfeeding. In addition, the introduction of food that is too early and less hygienic causes infectious diseases. Infectious diseases in toddlers are one of the problems for the growth of toddlers. For this reason, mothers are encouraged to give their babies exclusive breastfeeding for 6 months because it is very important and there are many benefits of breast milk for toddlers (Proverawati & Asfuah, 2017).

Family income is associated with wasting. The results of this study show that toddlers with low family income are at risk of wasting 2.12 times more than toddlers with high family income. Low family income makes it difficult for families to obtain highly nutritious and diverse food. Low-income families are less able to meet the food needs of their family members, resulting in the purchase of foodstuffs with low nutritional value. This affects the nutrition of toddlers who are at risk of *wasting* (Mkhize & Sibanda, 2020).

Based on Table 3 above, the variables that are significantly associated with the incidence of wasting are infectious diseases, mother's education, exclusive breastfeeding, and family income. The dominant factor is the one that has a p-value of less than 0.05 and the highest odds ratio (Exp B) value. It was found that the variable of infectious disease was the factor most associated with the incidence of wasting in toddlers in the Gisting Sub-distric. From the results of this multivariate analysis, a logistic regression model equation was obtained that could explain the probability of wasting incidence in the Gisting Sub-district, namely :

Z= 2.338 + 1.974 * Infectious Disease + 0.542 * Mother's education + 1.022 * Exclusive Breastfeeding + 0.752 * Family Income

$$P(Y = 1|X) = \frac{1}{1 + e^{-z}}$$

P (Y = 1|X) is Probability of Outcome Variable
Y is equal to 1 given Values of Independent Variables X
e is Base of Natural Logarithm
z is Linear Combination of Independent Variables and their Coefficients
(School Guide, 2024)

Thus, the interpretation of the multivariate analysis results is as follows:

1. Children with infectious diseases will have a 7.196 times higher risk of wasting compared to children without infectious diseases after controlling for the mother's education, exclusive breastfeeding, and family income.
2. Toddlers with a low mother's education are at risk of wasting 1.719 times higher than those with a high mother's education.
3. Toddlers with a history of not being exclusively breastfed will have a 2.279 times higher risk of wasting than toddlers with a history of exclusive breastfeeding.
4. Toddlers with low family income will be at risk of wasting 2.120.

The overall percentage value in the multiple logistic regression final model was 72.0%, indicating that 72% of the variation in the incidence of wasting can be explained by the regression line equation. Given that the multiple logistic regression model's predictive performance is greater than 60%, it is considered to be of excellent quality.

LIMITATION OF THE STUDY

The limitation of this study is that the independent variables studied did not cover all variables related to wasting. The research area only covers one sub-district. The analysis used was not compared with linear regression.

CONCLUSIONS AND SUGGESTIONS

The conclusion of the study shows that there is an association between infectious diseases, mother's education with wasting, exclusive breastfeeding history, and family income with the incidence of wasting. Infectious disease is the dominant factor most associated with the incidence of wasting. A prediction model for the incidence of wasting at the Gisting Sub-district was obtained. Z = 2.338 + 1.974 * Infectious Disease + 0.542 * Mother's education + 1.022 * Exclusive Breastfeeding + 0.752 * Family Income

$$P = \frac{1}{1 + e^{-z}}$$

Based on this study, to reduce the incidence of wasting, it is necessary to pay attention to the factors associated with wasting, especially those factors which are possible to be intervened by the local government. Interventions include raising children's immunity through education, encouraging exclusive breastfeeding, strengthening family skills—particularly those related to entrepreneurship—to boost income, and developing instructional materials that even the least educated can understand. Research ideas for the future look at every factor influencing waste in a larger variety of contexts.

ETHICAL CONSIDERATIONS

Funding Statement.
No funding was received to assist with the preparation of this manuscript.

Conflict of Interest Statement
The authors declare that there is no conflict of interest.

REFERENCE

Bili, A., Jutomo, L., & Boeky, D. L. A. (2020). Faktor Risiko Kejadian Gizi Kurang pada Anak Balita di Puskesmas Palla Kabupaten Sumba Barat Daya. *Media Kesehatan Masyarakat*, *2*(2), 33–41.doi: https://doi.org/10.35508/mkm.v2i2.2929.

Black, M. M. (2018). Impact of nutrition on growth, brain, and cognition. *Nestle Nutrition Institute Workshop Series*, *89*, 185–195.doi: https://doi.org/10.1159/000486502.

DinkesProv. (2020). *Profil Kesehatan Lampung*. Dinas Kesehatan Provinsi Lampung.

Erika, E., Sari, Y., & Hajrah, W. O. (2020). Kejadian Wasting pada Balita Usia 6-59 Bulan. *Jurnal Bidan Cerdas*, *2*(3), 154–162.doi: https://doi.org/10.33860/jbc.v2i3.110.

Fanzo, J., Hawkes, C., Udomkesmalee, E., Afshin, A., Allemandi, L., Assery, O., & Schofield, D. (2019). 2018 Global Nutrition Report. Retrieve from: https://www.semanticscholar.org/paper/2018-Global-Nutrition-Report-Fanzo-Hawkes/a3a4a1dc242ec87353ff61708a07c7fa59f6507c

Mkhize, M., & Sibanda, M. (2020). A review of selected studies on the factors associated with the nutrition status of children under the age of five years in South Africa. International Journal of Environmental Research and Public Health, 17(21), 7973 doi: 10.3390/ijerph17217973

Novitasari, Destriatania, S dan Febry F. (2016). Determinan kejadian Anak Balita di Bawah Garis Merah di Puskesmas Awal Terusan. Jurnal Ilmu Kesehatan Masyarakat, 7 (1), pp. 48-63. doi:https://doi.org/10.26553/jikm.2016.7.1.48-63

Par'i, H. M. (2017). Penilaian Status Gizi. Jakarta: EGC.

Prawesti, K. (2018). Faktor-Faktor yang Mempengaruhi Wasting Pada Balita Usia 6-59 Bulan Di Wilayah Kerja Puskesmas Piyungan. *Jogja: Poltekes*. Retrieve from: http://eprints.poltekkesjogja.ac.id/1449/

Proverawati, A., & Asfuah, S. (2017). *Gizi untuk Kebidanan*. Yogyakarta: Nuha Medika.

Putri, & Wahyono. (2013). Yang Berhubungan Dengan Kejadian Wasting Pada Anak Umur 6 – 59 Bulan Di Indonesia Tahun 2010. *Media Litbangkes*, *23*(3), 110–121.

Renyoet, B. S., & Nai, H. M. E., 2019, Estimasi potensi kerugian ekonomi akibat wasting pada

balita di indonesia, Jurnal Gizi Indonesia (The Indonesian Journal of Nutrition), 7(2), 127–132.doi: https://doi.org/10.14710/jgi.7.2.127-132

Riskesdas. (2018). *Riset Kesehatan Dasar*. Badan Penelitian dan Pengembangan Kesehatan Kementrian RI. Retrieve from: www.depkes.go.id/resources/download/info-terkini/hasil-riskesdas-2018.pdf

Rochmawati, Marlenywati, & Waliyo, E. (2016). Gizi Kurus (Wasting) Pada Balita Di Wilayah Kerja Puskesmas Kota Pontianak. *Vokasi Kesehatan*, *II*(2), 132–138. Retrieve from: https://ejournal.poltekkes-pontianak.ac.id/index.php/JVK/article/view/68/60

School Guide: Learning Roadmap For Young Geek (2024). Binary Regression Logistic, Retrieve from: https://www.geeksforgeeks.org/binary-logistic-regression/

Septikasari, M. (2018). *Status Gizi Anak dan Faktor yang Mempengaruhi* (A. Shendy (ed.)). Yogyakarta: UNY Press.

Dahlan, Sopiyudin. (2016). *Besar Sampel Dalam Penelitian Kedokteran Dan Kesehatan*. Jakarta: Epidemiologi Indonesia.

Suparyanto, M. K. (2014). *Konsep Dasar Pendapatan Keluarga*. Diunduh dari http://dr-suparyanto/2014/03/konsep-dasar-Pendapata-keluarga.html tanggal 20 Mei 2022

Supriasa. (2016). *Penilaian Status Gizi*. Jakarta: EGC.