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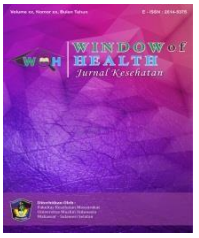

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CONTROLLING MODEL FOR RISK FACTORS OF STUNTING INCIDENTS IN PASAMAN DISTRICT

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ABSTRACT

Stunting is the condition where children have stunted growth and development, as measured by weight/age (TB/U). In 2015-2017, there were 19,4%, 18,9%, and 21,3% cases in West Sumatra. Pasaman district had the highest percentage of stunting from 19 Cities in West Sumatra, which is 21,1%, 25,7%, and 25% cases. The purpose of this study was to analyze the risk factor control model for stunting in toddlers in the Pasaman district. This study was an observational analytic study with an unmatched case-control design. The subject of this study was the 35 families who had children 12-59 months with stunting cases and another 35 group control in the Pasaman district. Data were collected by using a questionnaire to measure stunting risk factors. Data was analyzed by using univariate, bivariate, and multivariate analysis with regression and backward methods. The result of the study showed that "father education level" as a stunting risk factor had a P value of 0.048 and "family income" with P value = 0,015, while history of birth weight had a P value of 0,08. The final result (sixth step) showed that the baby's birth weight variable had the odds ratio e^{β}=31,578 when analyzed simultaneously with another variable (parenting and father's education level). Conclusion: baby birth weight variable simultaneously with parenting and the father's educational level affected the incidence of stunting in toddlers (e^{β}=31,578). It is necessary to increase family empowerment to control the cases of stunting related to the nutrition of pregnant mothers by improved child care, parenting in feeding, and increased family income.

Keywords :Stunting; Risk Factor; Model

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INTRODUCTION

Stunting is a condition of chronic malnutrition in children caused by maternal malnutrition during pregnancy and continues during infancy to toddlerhood, this condition can cause impaired brain development and affect learning ability[1]. Stunting is stunted growth referring to height-for- age (TB/U) caused by inadequate nutritional intake and frequent infections over a long period and is a risk to later life[2].

Based on Basic Health Research in 2013 noted that the national prevalence of stunting reached 37.2%, an increase from 2010 of 35.6% and 2007 to 36.8%, which means that stunted growth is suffered by around 8.9 million Indonesian children or one in three Indonesian children. The prevalence of stunting in Indonesia is higher than in other countries in Southeast Asia such as Myanmar (35%), Vietnam (23%), and Thailand (16%).[3]

Based on the results of PSG (Nutrition Status Monitoring) in 2015, 29% of Indonesian toddlers were categorized as short with the highest percentage in East Nusa There were 19.4% of toddlers who were stunted in West Sumatra. The percentage of stunted toddlers (short) in West Sumatra in 2015-2017 was 19.4%, 18.9%, and 21.3% Pasaman Regency had the highest percentage of stunting (short) from19 districts/cities, namely 21.1%, 25.7%, and 25.1%.[4]

The incidence of stunting children in the Pasaman district is associated with many factors. 70% were caused by drinking water, sanitation, parenting, and socioeconomic problems. The remaining 30% is caused by nutritional problems. After intervening in handling stunting in 10 villages, in 2019 based on the results of the Community-Based Nutrition recording and reporting survey, the Stunting Locus Nagari in Pasaman District increased to 27 villages. This shows that several villages have high stunting prevalence.

A very critical period for child growth and development is influenced by the nutritional status of the mother before pregnancy, pregnancy, and breastfeeding. If there is malnutrition before pregnancy and continues during pregnancy, it will affect the fetus such as Delayed Fetal Growth, Low Birth Weight (LBW), small, short, thin, and low body resistance so that it is prone to infection.[5] This critical period is called 1000 First Days of Life where if a child has nutritional problems experiences during this period it will have permanent consequences.[6] The factors that contribute to impaired growth and development of children under five are poor maternal nutritional status before, during, and after pregnancy, and early complementary feeding.[1]

The results of the preliminary study of the interview with the head of the health department showed that "until now there has been no research that reveals the risk factors that cause stunting in Pasaman district and how it affects children under five. Although research in Indonesia has researched the risk factors, with different cultures there may be specific risk factors. However, research on risk factors that cause stunting is needed." So that this research is expected to be able to provide information to policymakers the following year in choosing the right strategy that is effective and efficient in the Pasaman district in particular, and how it affects the health of children

under five, so that the implementation of effective stunting handling programmes, especially for stakeholders, can be refined in the process. The results of the study are expected to be input for policy makers in determining strategies to reduce the incidence of stunting in Pasaman Regency.

METODE

This research is an analytical observational study with an unmatched case control study design. The research location was in the working area of the Pegang Baru Health Centre considering that the Pegang Baru Health Centre is one of the Community Health Centre that is locus of stunting from 16 Community Health Centre in Pasaman Regency with a stunting prevalence of 18.07%.

The population in this study were all households with children aged 12-36 months in Pasaman district. Case selection was determined by using a patient register and based on inclusion and exclusion criteria. Furthermore, the control group consists of individuals who have potential exposure, which has a risk for the onset of cases.[7] The samples were taken by using non-probability sampling techniques with consecutive sampling methods to get a quick response considering the variety of samples and it is difficult to find samples that match the sample criteria that have been set based on the researcher's consideration. The subjects in this study were families of children aged 24 - 59 months in Pasaman district. with the following criteria:

Inclusion criteria are: households that have children aged 24 - 59 months who have ever checked themselves with TB / U nutritional status and can be contacted, toddlers who have stunting nutritional status as a case group and normal nutritional status as a control group, parents are willing to participate in the study. **Exclusion criteria are**: Currently suffering from infectious or chronic diseases.

The sample size for this study was determined using the Lemeshow formula, 1997. From research conducted by Bappenas, (2018) on the prevalence of stunting in Pasaman district P1=0.301: P2=0.17: OR=2.1.8 By using the sample size calculation formula above, the sample size (n) was obtained as many as 35 people, 35 controls. So the total sample size in this study was 70 people.

Data analysis with univariate, bivariate, and multivariate analysis. Univariate analysis was doing by frequency distribution test. Bivariate analysis was used to determine the extent of the relationship between factors that were thought to be associated with stunting using the chi-square test with a significance level (p-value = 0.05) and a 95% confidence interval (CI). To see the most dominant risk factor, multivariate analysis of the binary logistic backward LR method was carried out on variables from the bivariate analysis that had a p-value <0.05 or were considered important about stunting so that the final model was obtained with a p-value ≤ 0.05.

The appropriate model is generated gradually, one step can be done by selecting the backward method which has the aim of filtering out important variables from a large set of existing research variables.

In principle, the backward method has the same concept, except that this method starts by entering all variables into a multiple model. Then at each stage, the incoming variables are evaluated with the removal criteria. Variables whose significance value is more than 0.1 will be removed one by one from the model and re-evaluated to be included in the model with certain p-entry criteria.

RESULT OF STUDY

Table 1. Respondent Characteristics

Respondent Characteristics	Cases		Control		Total	
	n=35	%	n=35	%	n=70	%
Sex						
Boy	19	48,7	20	57,1	39	55,7
Girl	16	51,6	15	42,9	31	44,3
Birth Weight						
Low Birth Weigt	05	14,2	1	2,9	06	8,6
Normal Birth Weigt	30	85,8	34	97,1	64	91,4
Father Education's level						
Low	09	25,7	17	48,6	26	37,1
High	26	74,3	18	51,4	44	62,9
Mother Education's level						
Low	06	17,1	11	31,4	17	24,3
High	29	82,9	24	68,6	53	75,7
Economic Level						
Low	09	25,7	19	53,3	28	40,0
High	26	74,3	16	45,7	42	60,0
Breastfeeding experience						
Non exclusive breastfeeding	11	31,4	14	40,0	25	35,7
Exclusive breastfeeding	24	68,6	21	60,0	45	64,3

The table above shows that 51,6 % of the case group are girls and 57,1% are boys in the control group. This study showed that the father and mother have a high education level in the case and control group. The percentage of low economic status was higher in the case group, 53.3%. Exclusive breastfeeding experiences were more higher in the case and control group

Bivariable analysis

Bivariable analysis to identify the relationship between the independent variable (pregnancy status) and the dependent variable. This analysis uses the chi-square test and the calculation of the odds ratio with a confidence interval (95%) and a significance level of $p < 0.05$.

Table 2. The relationship between child gender, father's education, mother's education, Experience of exclusive breastfeeding, economic status, parenting style of eating, parenting style of care to stunting.

Variabel	Variabel	Kontrol	*p*	*OR*	*CI* 95%
	n=35	n=35			
Sex					
Boy	19 (48,7)	20 (57,1)	0,8	0, 891	1,00-500

Variabel	Variabel	Kontrol	*p*	*OR*	*CI* 95%
Girl	16 (51,6)	15(42,9)			
Birth Weight					
Low Birth Weigt	05 (14,2)	1(2,9)	0,088	5,667	0,62 – 51,27
Normal Birth Weigt	30 (85,8)	34(97,1)			
Father Education's level					
Low	09 (25,7)	17 (48,6)	0,048	0,367	0,13 – 1,00
High	26 (74,3)	18 (51,4)			
Mother Education's level					
Low	06 (17,1)	11 (31,4)	0,163	0,451	0,145 – 1,401
High	29 (82,9)	24 (68,6)			
Family Income					
Low	09 (25,7)	19 (53,3)	0,015	0, 291	0,106 – 0,799
High	26 (74,3)	16 (45,7)			
Breastfeeding experience					
Nonexclusive breastfeeding	11 (31,4)	14 (40)	0,45	0,688	0,257-1,838
Exclusive breastfeeding	24 (68,6)	21 (60,0)			
Parenting style					
Bad	14 (40,0)	26(74,3)	0,04	0,23	0,08 – 0,64
Good	21(60,0)	9(25,7)			

*p<0.05

Analysis of the relationship between father's education, economic status, income, and Breastfeeding with the incidence of stunting showed a statistically significant relationship with the incidence of stunting.

Analisis Multivariate

Regression is an appropriate statistical approach for this case, the use of logistic regression is more optimal and effective because it produces unbiased estimators.[9] Logistic regression is divided into several types or types including binary, ordinal, and multinomial logistic regression. The binary logistic regression model is one of the logistic regression models used to analyze the relationship between one response variable and several predictor variables. The response variable is dichotomous qualitative data, which means that the dichotomy is a variable with a value of one to indicate the presence of a characteristic and zero to indicate the absence of a characteristic. The advantage of this regression is that it has an odds ratio (indicated by the Exp B value) which explains how much influence the predictor variable of a reference category has on a response/dependent variable.

Simple logistic regression analysis is first performed by entering one independent variable at a time to assess its effect on the dependent variable as a consideration for multiple logistic regression models. A very strong statistical analysis to determine the relationship between exposure and disease can or can be produced by logistic regression. Analyses using logistic regression methods focus on generating the most appropriate, economical, and biologically plausible regression model to describe the relationship between the response (dependent) and predictor (independent) variables in the population.[10]

A suitable model is generated gradually, one of which can be done by selecting the backward method which has the aim of filtering out important variables from a large set of existing research variables.

In principle, the backward method has the same concept, except that this method starts by entering all variables into a multiple model. Then at each stage, the incoming variables are evaluated with the removal criteria. Variables whose significance value is more than 0.1 will be removed one by one from the model and re-evaluated to be included in the model with certain p-entry criteria.

Table 3. Multivariate Result Test

Variable	B	SE	Wald Chi-Sq	P_{Value}	Exp (β)
Sex	-1,213	0,710	2,920	0,087	0,297
Father Education's level	-1,289	0,979	1,732	0,188	0,276
Mother Education's level	-0,371	1,067	0,121	0,728	0,690
Birth Weigt	4,475	1,464	9,347	0,002	87,828
Breastfeeding	-1,353	0,817	2,741	0,098	0,258
Family income	0,808	0,646	1,566	0,211	0,446
feeding Parenting	0,557	0,744	0,559	0,455	1,745
Parenting care	-2,252	0,700	10,359	0,011	1,755

Based on Table 3, it can be seen that the significance test of the effect of each predictor variable on the response variable shows that the variables of birth weight and parenting each have a p- value of less than $\alpha = 0.05$ so the decision is to reject H0. Therefore, all significant predictor variables will continue with multivariate significance testing to obtain the best logistic model. The test continued with the multivariable significance test of predictor variables through the selection of the backward method to evaluate all variables with the removal criteria. The exp (β) value of each variable shows that it is still within the CI value range. The lower and upper values indicate the upper and lower limits of exp (β).

The P entry and P removal criteria in the selection of the backward method is what determine the variables that will be included or excluded from the model. The criterion of P entry = 0.05 which is used to filter the variables to be entered is considered strong enough and in the backward process more stages are passed before producing the right model. Backward, it can be seen that the variables of the father's education, Birth weight, and parenting have a p-value of less than $\alpha = 0.05$, so the decision is to reject H0. Therefore, the following three variables, namely the variables of father's education, birth weight, and parenting care, significantly affect the incidence of stunting.

Based on Table 4 in the final results (step 3) of variable selection using backward selection, it can be seen that the variables of age, age at first marriage, and type of contraception have a PValue of less than $\alpha = 0.05$, so the decision is to reject H0. Therefore, the following three variables, namely age, age at first marriage, and type of contraception, have a significant effect on the diagnosis of stunting cases.

Table 4. Multivariate Significance Test Results

	variable	B	SE	Wald Chi-Sq	P value	Exp (β)	95% CI for EXP (B)	
							Lower	Upper
Step 1	Sex	-1.213	0.710	2.920	0.087	0.297	0.074	1.195
	Father Education's level	-1.289	0.979	1.732	0.188	0.276	0.040	1.879
	Mother Education's level	-0.371	1.067	0.121	0.720	0.690	0.085	5.587
	Birth weight	4.475	1.464	9.347	0.002	87.828	4.984	1557.681
	Breastfeeding	-1.353	0.817	2.741	0.098	0.258	0.052	1.282
	Family Income	-0.808	0.646	1.566	0.211	0.446	0.126	1.580
	Feeding	0.557	0.744	0.559	0.455	1.745	0.406	7.507
	Parenting Parenting care	-2.269	0.704	10.376	0.001	0.103	0.026	0.411
Step 2	sex	-1.200	0.708	2.874	0.90	0.301	0.075	1.206
	Father Education's level	-1.527	0.712	4.594	0.032	0.217	0.054	0.878
	Birth weight	4.432	1.453	9.307	0.002	84.070	4.877	1449.158
	Breastfeeding	-1.371	0.818	2.811	0.094	0.254	0.051	1.261
	Family Income	-0.804	0.644	1.560	0.212	0.448	0.127	1.580
	Feeding	0.562	0.746	0.568	0.451	1.755	0.407	7.574
	Parenting Parenting in care	-2.252	0.700	10.359	0.001	0.105	0.027	0.415
Step 3	sex	-1.041	0.668	2.248	0.119	0.353	0.095	1.308
	Father Education's	-1.510	0.712	4.499	0.034	0.221	0.055	0.892
	Birth weigh	4.391	1.449	9.189	0.002	80.747	4.721	1380.952
	Breast feeding	-1.046	0.689	2.304	0.129	0.351	0.091	1.356
	Family Income	-0.757	0.639	1.402	0.236	0.469	0.134	1.642
	Parenting care	-2.192	0.686	10.213	0.001	0.112	0.029	0.428

The formation of binary logistic regression models uses predictor variables that have been significant both in the independence test, partial test, and simultaneous test. The best regression model based on the variables that significantly influence the incidence of stunting in Table 4 is as follows:

The final result, step 6, shows that the variable of birth weight has an odds ratio value of eβ = 31.578 when the variables of parenting care and father's education are simultaneously included. This shows that the variable birth weight history increases the risk of stunting by 1=31.578 times. Other independent variables do not affect the occurrence of stunting. This indicates that children who have a history of low birth weight increase the risk for stunting by 31.578 times. The three predictor variables that have been proven to have a significant effect on the incidence of stunting cases are the father's education, birth weight, and parenting child care generated through the selection of the backward method. With the smallest precision of 36.8 times, it will affect the risk of stunting. This variable has a significance value (p) that is less than 0.05 so it is still not excluded from the model. The criterion

applied in the backward model is the variable exclusion criterion, which means that the variable will be excluded if the significance value (p) is more than 0.05. In the first stage, all variables were included in the model to be evaluated for significance. The best logistic model was formed from only three predictor variables that had a significant influence on the response variable, namely father's education, birth weight and parenting style.

DISCUSSION

Among all the factors studied, the family income factor showed the greatest value as a risk factor for stunting in under-two-year-olds.

Univariate and Bivariate Analysis

Relationship between gender and the incidence of stunting

The results of bivariate analysis showed a p-value = 0.8; OR = 0.891; CI: 1,00-500. These results indicate that there is no significant relationship between the gender of male toddlers and the incidence of stunting in toddlers in the Pasaman district. Physical and motor growth between girls and boys is different, boys are more active than girls.[11] Boys tend to have larger body proportions and heavier activity patterns than girls. Therefore, their nutritional needs are also higher.[12] Boys require more energy and protein needs so they are more at risk of malnutrition if their needs are not met.[13]

The Relationship Between Fathers and Mothers' Education with the Incidence of Stunting

The results showed that the father's education and the incidence of stunting have a significant relationship (p=0.048), and between the mother's education and the incidence of stunting, there was no significant relationship (p=0.163) in the Pasaman district. This is not in line with research by Ni'mah and Nadhiroh (2015) showing that there is no relationship between a father's education and the incidence of stunting (p=0.32). Maternal education with the incidence of stunting had a relationship (p=0.029) with OR=3.378, which means that mothers with low education have a risk of 3.378 times having stunted children.[14] A high father's education is considered capable of generating income that can meet family needs and fathers are able to provide good parenting patterns for children. Maternal education is associated with the use of salt with vitamin A capsules, child immunization, and parenting.[15] Parents with good education can provide more opportunities to receive information about parenting maintaining child health and educating children well.[11] Mothers and families must have nutrition-conscious family behavior which called “kadarzi” in Indonesia so that toddlers get varied and appropriate ingredients and menus according to their needs.[16]

This may be due to customs and habits that fathers play an important role in childcare. So a low father's education will have an impact on poor eating parenting so that children become stunted.

Relationship between birth weight and the incidence of stunting

In this study, stunted children were not associated with a history of low birth weight (LBW) (p-value = 0.08). This contradicts the results of the research were due to in Banda Aceh City, where

children born with LBW are at risk of stunting. Not in line with the results of research by Rahmad et al,[20] research by Mardani et al,[21] has found that the predictive factor that affects stunting in toddlers is LBW. Children born with LBW are more likely to be stunted than children born with normal weight.[13,17] In addition, according to Lin et al, low birth weight (LBW < 2,500 grams) has been identified as an important risk factor related to subsequent child development. According to Abenhaim's research,[26] a baby called low birth weight is when the baby is born weighing less than 2,500 grams and is four times higher in mortality when compared to a baby born weighing 2,500 - 3,000 grams.[18]

The Relationship between Exclusive Breastfeeding and the Incidence of Stunting

In the bivariate statistical test results, there was no significant relationship between exclusive breastfeeding and the incidence of stunting. This can be caused by the limited variables obtained in secondary data. In this study, the exclusive breastfeeding classification was only based on secondary data which included exclusive breastfeeding for 6 months. Therefore, prolonged exclusive breastfeeding cannot be clearly distinguished from exclusive breastfeeding up to 6 months. Prolonged exclusive breastfeeding is associated with the risk of stunting. This is not in line with research conducted by Padmadas that children exclusively breastfeeding for more than 6 months have a 1.36 times greater risk of becoming stunted than children exclusively breastfed for less than 6 months. Exclusive breastfeeding for too long will delay the provision of complementary foods. As a result, children will receive inadequate nutrient intake for growth and development. After 6 months of age, breastfeeding must be accompanied by complementary foods because breast milk alone is no longer able to meet energy and nutrient needs.

Relationship between Family Income and the Incidence of Stunting

The results of this study indicate that there is a relationship between family income and the incidence of stunting (p=0.015). Low family income gives a 0.291 times tendency to have toddlers who are stunted. This is in line with the research of Al Ahmad, et.al, 2016 that the incidence of stunting in toddlers in the Pasaman district is influenced by low family income, inadequate exclusive breastfeeding, lack of complementary feeding, and incomplete immunization. Low economic status causes low purchasing power so children are vulnerable to nutritional problems due to inadequate fulfillment of nutritional needs.[19]

Relationship between feeding and care parenting

The results of this study are also supported by Waladow et al who say that there is a relationship between diet and nutritional status in children aged 3-5 years in the Tompaso Puskesmas work area, poor diet is at risk for undernutrition. [20–26] Feeding patterns are a person's behavior that can affect nutritional status. The role of the mother in daily care has a major contribution to child growth because with good parenting the child will be well cared for and nutrition is fulfilled.

CONCLUSIONS AND RECOMMENDATIONS

This study shows that birth weight, father's education, and toddler food parenting together affect the stunting of children aged six to 60 months with an odds ratio value of eβ = 31.578. These three variables are the best model chosen in a multivariate analysis with a backward binary regression model. The results of multivariate analysis associated with the UNICEF framework in 1990 and the multilevel promotion model with the MATCH approach proposed a model of controlling risk factors for stunting incidence by empowering families, related to the prevention of child birth weight, father's education, and infant care. Suggestion: It is necessary to increase family empowerment related to nutrition for mothers since pregnancy and through improved feeding and parenting patterns of child care, increase family income to control stunting in toddlers, especially in the 1000 days of life.

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