ORIGINAL ARTICLE

Scoring Model Using Stunting Cards for Toddlers

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ABSTRACT

Background: The problem of short children or stunting is one of the nutritional problem encountered in the world, especially in poor and developing countries. Stunting can provide long-term and short-term impacts. Early stunting detection requiring detailed assessment of various aspects needs to be packaged in a simple, accurate and inexpensive method. Until now no model that can help in the simple stunting screening. For this, a stunting models with Stunting prediction cards can be one of the methods that can be used as an assistive device to detect stunting.
Aim: To develop and evaluate scoring models with stunting predictive cards
Method: This research is quantitative research with diagnostic test design and using consecutive sampling. The Total samples in this study were 179 case groups and 178 control groups. The Instrument used in this study is a stunting scoring card and a stunting cause questionnaire. Data analysis used in the processing of questionnaires is a Chi square analysis and a regression analysis of logistic with an accuracy rate of 95%. As for testing the scorers using fit modelling and ROC test with sensitivity and spasticity view.
Result: Based on the results of logistic regression analysis, it is known that the most dominant factor in stunting is gender, birth weight, maternal knowledge, diet, and the history of maternal anemia. The result of the ROC test are known that the area under the curve is 0816, with 100% sensitivity and 98.9% specificity. This indicates that the scoring model in the predictive card is accurate and good in detecting stunting.
Conclusion: This study shows that there is a meaningful link between factors causing stunting to stunting events, and it can be known that the predictive card scoring model is accurate and can be used to detect stunting early.
Keywords: Relationships, stunting, scoring

INTRODUCTION

The decrease in maternal and infant mortality, decreased prevalence of short infants (stunting), infectious disease Control and untransmitted disease Control are four priority programs in health development in the period of 2015-2019[1]. Efforts to improve the nutritional status of the public including the decreasing prevalence of short toddlers become one of the national development priorities listed in the main target of the medium-term development plan (RPJM) of the decree number HK. 02.02/MENKES/52/2015[2].

The problem of short children or stunting is one of the nutritional problems encountered in the world, especially in poor and developing countries. Stunting can provide long-term and short-term impacts. In the year 2017 22.2% or about 150.8 million toddlers in the world were stunted. More than half of the world's stunting toddlers come from Asia (55%). From the average prevalence of short babies in 11 Southeast Asian countries, Indonesia ranks 3 with a prevalence of 36.4% (WHO, 2018)[2].

The prevalence of short infants rise back in 2013 to 37.2%, then a decline in 2018 to 30.8%. Despite a decline, but the decline is not significant so that the stunting rate remains still relatively high. Based on data from the DIY Province Health Service 2018, there were 2017% of stunting data at 13.8%. In Sleman Regency, stunting prevalence in the last 4 years (2015-2018) is 12.86%, 11.81%, 11.99%, 11.00%[3].

Many factors can cause stunting. Research conducted by Wahdah et al in 2015 said that in Indonesia stunting events are significantly related to the work of mothers, the height of the father, mother's height, family income, the number of household members, foster patterns, and Exclusive BREAST-feeding. Meanwhile, stunting is unrelated to, Father's work, diet, prolonged feeding, infectious diseases, and maternal education[4].

Based on regulation of the Minister of Health No. 39 year 2016 on guidelines for implementation of healthy Indonesia Program with family approach, efforts to reduce the prevalence of stunting among children in monitoring efforts Additional feeding activities (PMT), conducting early stimulation of child development, providing optimum health services[5].

Early stunting detection requiring detailed assessment of various aspects needs to be packaged in a simple, accurate and inexpensive method. As of now there has been no model that can aid in simple stunting screening. Therefore, a stunting model with a Stunting prediction card can be one of the methods that can be used as aids in detecting stunting

Based on the background, researchers want to develop and evaluate the effectiveness of the scoring model with the stunting factor prediction card. So from this research researchers can find out if the scoring model with the Stunting Prediction Card is effective in early detecting the risk factors of Stunting in infants.

METHOD

This research was conducted in the working area of Puskesmas using quantitative research with the design of diagnostic test studies. Sampling uses Consecutive Sampling. The number of samples in this study was 179 case groups and 178 control groups. The cases group in this study was toddlers with aged 0-2 years of stunting and the control groups was children aged 0-2 years who did not experience stunting. The criteria of inclusion in this

research is life, not experiencing congenital abnormalities, not multiple from birth, willing to be a respondent, while the exclusion criteria is that the toddler was not found during the study, not willing to be a respondent.

The study used primary data, the results of the studies obtained directly from interviews and measurements in toddlers using questionnaires and scoring cards. The instruments used in this research are the risk factor stunting survey, and scoring cards to predict stunting events.

Data analysis using univariate analysis, bivariate, and multivariate. Bivariate analysis was conducted to determine the relationship between variable factors with stunting events carried out with the Chi Square test and multivariate analysis conducted by logistics regression analysis testing. While in knowing the accuracy of the model scoring researchers use the ROC test by looking at the sensitivity level and specificity of the model.

RESULT

Univariat Analysis: According to table 1, it is known that the characteristics of the respondents who are stunted and not stunting have almost the same characteristics.

Based on table 2, it can be known that there is a meaningful relationship (P < 0.005) between the gender (P = 0.034), BB born (p = 0.000), Mother's height (p = 0.003), Mother's work (P = 0.000), amount to work (P = 0.001), length of birth (p = 0.000), birth history (P = 0.000), feeding dietary (0048), History of ISPA (0.023), History of diarrhea (P = 0.000), History of KEK (P = 0.000), History of anemia (P = 0.000), smoking habit (p = 0.001), a

Table 1. Variable frequency distribution factors

Characteristics	Cases		Control	
	n=179	%	n=178	%
Gender				
Male	105	59,0	85	47,8
Female	73	41	93	52,2
Birth Weight				
<2500 gram	54	30,1	5	2,8
2500-3000 gram	113	63,1	90	50,6
>3000 gram	12	6,8	83	46,6
Aged Mom				
20-35 years old	151	84,5	160	89,9
>35 years old	28	15,5	18	10,1
Mother's Height				
<145 cm	4	2,2	1	0,6
145-150 cm	72	40,2	3	9,6
>150 cm	103	57,6	174	89,9
Mother's Education				
SD	1	0,6	1	0,6
SMP	22	12,3	50	28,1
SMA	128	71,5	105	59,0
Diploma / PT	28	15,6	22	12,4
Mother's Work				
Not working	126	70,4	131	73,6
PNS	3	1,7	7	3,9
Private	5	2,8	21	11,8
Self Employed	21	11,7	9	5,1
Others	24	13,4	10	5,6
The Amount to work				
1	124	69,3	113	63,5
>2	55	30,7	65	36,5
Long Birth				
<47 cm	88	49,1	23	12,9
>47 cm	91	50,9	155	87,1
Birth History				
Aterm	154	86	173	97,2
Preterm	25	14	5	2,8
Breast Feeding				
Exclusive	142	79,3	156	87,6
Not exclusive	37	20,7	22	12,4
ISPA History				
Yes	42	23,5	25	14
No	137	76,5	153	86
Diarrhea History				
Yes	40	22,3	12	6,7
No	139	77,7	166	93,3
KEK History				
KEK	79	44,1	19	10,7
Not KEK	100	55,9	159	89,3

History of Pregnancy Complication				
Yes	14	7,8	10	5,6
No	165	92,2	168	94,4
History of Anemia				
Yes	144	80,4	26	14,6
No	35	19,6	152	86,4
Smoking Habit				
Yes	140	78,2	110	61,8
No	39	21,8	68	38,2
Clean Water Availability				
Yes	141	78,8	166	93,3
No	38	21,2	12	6,7
Mother's Knowledge				
Good	163	91,1	157	88,2
Enough	13	7,3	17	9,6
Less	3	1,6	4	2,2
Dietary Feeding				
Good	34	19,0	18	10,1
Enough	84	47,0	29	16,3
Less	61	34,0	131	73,6

Table 2: Relationship stunting with emotional behavior problem child development

Characteristics	Stunted				Total		OR	CI (95%)		P
	Cases n	%	Control n	%	N	%		Lower	Upper	
Gender										
Male	105	55,3	85	44,7	190	100				
Female	73	44,0	93	56,0	166	100	1,574	1,035	2,393	0,034
Birth Weight										
<2500 gram	54	91,5	5	8,5	59	100				
2500-3000 gram	113	55,7	90	44,3	203	100				
>3000 gram	12	14,0	83	86,0	86	100				0,000
Aged Mom										
20-35 years old	151	48,6	160	51,4	311	100	0,607	0,322	1,142	0,119
>35 years old	28	60,9	18	39,1	46	100				
Mother's Height										
<145 cm	4	80	1	20,0	5	100				
145-150 cm	72	96	3	4,0	75	100				
>150 cm	103	37,2	174	62,8	277	100				0,003
Mother's Education										
SD	1	50,0	1	50,0	1	100				
SMP	22	30,6	50	69,4	54	100				0,085
SMA	128	54,9	105	45,1	244	100				
Diploma / PT	28	56,0	22	44,0	58	100				
Mother's Work										
Not working	126	49,0	131	51,0	257	100				
PNS	3	30,0	7	70,0	10	100				0,000
Private	5	19,2	21	80,8	26	100				
Self Employed	21	70,0	9	30,0	30	100				
Others	24	70,6	10	29,4	34	100				
The Amount to work										
1	124	52,3	113	47,7	237	100				0,001
>2	55	51,9	65	48,1	120	100				
Long Birth										
<47 cm	88	79,2	23	20,8	111	100				0,000
>47 cm	91	36,9	155	23,1	246	100				
Birth History										
Aterm	154	47,1	173	52,9	327	100	0,178	0,067	0,476	0,000
Preterm	25	83,3	5	16,7	30	100				
Breast Feeding										
Exclusive	142	47,7	156	52,3	298	100				0,048
Not exclusive	37	63,8	22	37,2	59	100				
ISPA History										
Yes	42	62,7	25	37,3	67	100	1,876	1,087	3,239	0,023
No	137	47,2	153	52,8	290	100				
Diarrhea History										
Yes	40	76,9	12	23,1	52	100	3,981	2,010	7,884	0,000
No	139	45,6	166	54,4	305	100				

KEK History										
KEK	79	80,6	19	19,4	98	100	6,611	3,777	11,572	0,000
Not KEK	100	38,6	159	61,4	259	100				
History of Pregnancy Complication										
Yes	14	58,3	10	41,7	24	100	1,425	0,616	3,300	0,406
No	165	49,5	168	50,5	333	100				
History of Anemia										
Yes	144	84,7	26	15,3	170	100		13,790	41,952	0,000
No	35	18,7	152	81,3	187	100	4,053			
Smoking Habit										
Yes	140	56,0	110	44,0	250	100	2,219	1,392	3,537	0,001
No	39	36,4	68	63,6	107	100				
Clean Water Availability										
Yes	141	45,9	166	54,1	307	100				0,000
No	38	76	12	24	50	100				
Mother's Knowledge										
Good	163	50,9	157	49,1	320	100				
Enough	13	43,3	17	56,7	30	100				0,000
Less	3	42,8	4	57,2	7	100				
Dietary Feeding										
Good	34	65,4	18	34,6	52	100				0,000
Enough	84	74,3	29	25,7	113	100				
Less	61	31,8	131	68,2	192	100				

Table 3: Logistics Regression table Phase II multivariate analysis

Variable	OR	p value	(95% CI)
Gender	0.020	0.000	0.003 – 0.140
Weight born	0.099	0.000	0.061 – 0.161
History of Anemia	0.003	0.000	0.001 – 0.018
Mother's Education	15.969	0.000	9.349 – 27.277
Feeding Pattern	0.330	0.022	0.128 – 0.851

Table 4: Table of Stunting prediction scoring system

Variable	Skor
Gender	2
Weight Born	2
Mother's Age	0.5
Mother's Height	1
Mother's Education	0.5
Mother's Work	1
Number of Family Working	1
Long Born Baby	1
Birth History	1
Breast Feeding History	1
History of ISPA	1
History of Diarrhea	1
History of KEK	1
History of Pregnancy Complication	1
History of Anemia	2
Smoking Habit	1
Clean Water Availability	1
Mother's Education	2
Dietary Provision	2
Imunization History	0.5

According to table 3, it can be seen that there are some dominant factors that affect the stunting event among other sexes (P= 0.000; OR 0.020). Infants who have male gender will be more risky 0.02 times more stunting than those with female genders. Birth weight also has a significant relationship with stunting events (P = 0.000; OR = 0.099) which means a toddler who has a low birth weight of 0.09 times more risky to have stunting compared to toddlers with normal birth weight. In addition to the history factor anemia (P=0.000; OR=0.003), Mother's knowledge (P=0.000; OR =15.969), and feeding pattern (p =0.022; OR = 0.330) is also a dominant factor that can cause stunting.

The scoring results in the conversion of the value OR odds ratio. The scoring system was then tested in the card and the validity test was carried out. The results of the validity test, indicating that the result of the value of sig. (2 tailed) is 0.000, <0.005 and the Pearson correlation positively 0284 which means that the scoring card used is valid, so that the card can be used as a research instrument. ROC test is done after validity test. The results of the ROC test are as follows:

Fig. 1: ROC curve accuracy system scoring stunting prediction

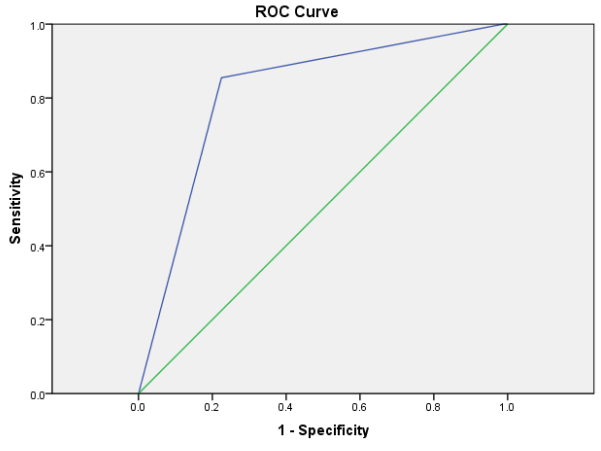

Table 5: Under the curve area

Area	Std error[a]	Asymptotic Sig.[b]	Asymptotic 95% Confidence Interval	
			Lower Bound	Upper Bound
0.816	0.024	0.000	0.769	0.862

Based on the ROC analysis test result obtained that the area below the curve is 0.816 or 81.6% means that the

factors in the card are strong and accurate, making it feasible to use as a stunting prediction tool

From the ROC test results, there are also sensitivity and card specificity as follows:

Positive if greater than or equal to[a]	Sensitivity	1-Specifity
1.5	1	0.989

Based on the results it can be noted that the screening Prediction card has 100% sensitivity and 98.9% specificity.

DISCUSSION

Stunting is a global problem that still gets special attention. Stunting is a nutritional status based on the body's long index (PB/U) or height according to age (TB/U) which is the equivalent of stunted (short) and severely stunted (very short) terms. The Z-score for the short category is-3 SD up to the <-2 SD and very short is-3 SD.[6]

The characteristics of a toddler who has stunting the majority of male genders, BB was born < 2500 grams, age of mother > 35 years old, SMA IBU education, self-employed mother work, number of work in one family as much as 1 person, history of premature birth, not given exclusive ASI, has a history of diarrhea, has a history of ISPA, has a history of KEK, has a history of complications during pregnancy, has a history of anemia, has a habit of smoking Enough.

From the results of bivariate analysis, it is known that gender, birth weight, mother's height, work of mothers, number of working families, baby's length, birth history, feeding, ISPA history, History of diarrhea, History of KEK, history of anemia, smoking habit, availability of clean water, mother's knowledge, and feeding patterns have a meaningful relationship statistic with stunting events (P value < 0.005), maternal age, maternal education, and history complications when pregnant do not have Meaningful relationships with stunting events.

From the process of multivariate analysis with logical regression, there are only 5 dominant variables which are meaningfully related to stunting of sex (OR = 0.003), BB born (OR = 0061), a History of anemia (OR = 0.001), Mother's Knowledge (OR: 9.349), and the provision of patterns Eat (OR = 0128). The results of the fourth analysis of those variables by looking at the ratio Odds (OR) value of each variable can be concluded that the most dominant variable associated with stunting in toddlers aged 0-24 months is the knowledge variable of the OR value of the Most of the 9.3 means that mothers with a low education opportunity of 9.3 times larger have shorter children than mothers whose knowledge is lacking after being in the control of sex variables, bb birth, history of anemia, and feeding of the diet. The results of this study were not in line with cross-sectional research conducted by Abuya, B.A., Onsomu, E.O., Kimani, J.K. et al., 2011) in Sub-Saharan Africa that maternal education was the strongest predictor in the incidence of stunting children. The mechanism of relationship between maternal education and child health is still not generally understood. In this case it is necessary to emphasize the education of children, especially girls who will become mothers in order to contribute to the termination of the poverty circle.[7]

Based on gender characteristics, the proportion of respondents are stunting more on male gender than female gender. From the test results also get the result there is a significant relationship between the gender and stunting (p value = 0034; OR = 1,574). This may be because male gender is more risky to occur than women, because male body size is usually larger, requiring greater intake, if not fulfilled for long periods of time will be Increase the risk of growth disorders and one of them is stunting. This is in line with the research of Aguayo, Nair, Badgaiyan& Krishna (2016) in India that toddlers stunting more male genders (25.40%) of female toddlers (19.30%) and mentioned the results of a multivariate regression analysis showed the possibility of stunting in higher boys 38% than girls.[2] The research conducted by Adani &Nindya (2017) is also found that children are stunting more common in males with a percentage of 62.50%.[3]

Based on the results of a bivariate majority of toddlers who have stunted experience weight loss of < 2500 grams compared with infants born > 2500 grams (P = 0.000) can thus be concluded that there is a meaningful relationship between birth weight with stunting events in infants. This may be because infants with low birth weight (BBLR) are more prone to experiencing intrauterine growth retardation due to poor maternal nutrition and increased numbers of infections with developed countries. The results of this study were not in line with Sumarmi's research (2016) indicating that the number of newborns in the stunting category amounted to 23.40% while infants born with a normal birth body length of 76.60%.[8] Similar results are also obtained in research conducted by Damayanti, Muniroh, &Farapti (2016) that the proportion of toddlers with a history of short birth body more in the stunting group is 43.80%, while in children born with normal body weight of 20.60%. Toddlers with a long history of short birth body have a risk of stunting 2.90 times greater than toddlers with a long history of normal birth body[9].

Based on the characteristic history of anemia, Chi Square test results stated that there is a meaningful link statistic between the history of anemia and stunting events (P-= 0.000; OR = 24,053). Results of multivariate analysis also showed that the history of anemia is the dominant factor affecting the occurrence of stunting (P = 0.000; OR = 0.001 – 0.018). This may mean the higher the rate of Hb pregnant women III trimester Hence the better nutritional status (BB/PB) of pregnant women with less nutritional status will risk 3 times suffering from anemia than pregnant women with good nutritional status. This is not in line with research in Yogyakarta proves anemia in pregnant women is not related to the stunting event in children aged 6-24 months. Other studies have also stated that anemia when pregnant affects infant weight. Other factors that affect the growth and development of the infant including the length of the infant after the birth of the baby are offspring, environmental conditions, infectious diseases, and age of the introduction of MP-ASI too early[10].

Based on the karekateristic knowledge of the mother, the test results of the Chi Square say that there is a significant meaningful relationship between the mother's knowledge and the stunting event (P = 0.000). Basically,

mother's knowledge seems to greatly affect the child's dilution. Children born from mothers with good knowledge have a lower risk of stunting than those born of illiterate mothers. Studies from Brazil and Zambia also support that women who are educated more or have good knowledge will tend to distinguish and practice proper child nutrition, hygiene, and health care that can greatly improve the status their children's nutrition. Semba et al research in Bangladesh and Indonesia shows that the higher the mother's knowledge can decrease 4-6% in Bangladesh's stunting risk[11].

Based on the dietary characteristics of the diet, the results of the Chi Square test say that there is a significantly meaningful relationship between the infant's diet and the stunting event (P = 0.000). This may be due to poor feeding or less nutritional intake will affect the growth of infants. Nutritional Status is the size of one's body condition that can be seen from food consumption and nutrient use in the body.

Stunting prediction scoring aims to detect early stunting events that could possibly occur. In this scoring is used variable factor-the stunting cause factor. The results showed that scoring factor stunting was a good enough instrument to detect the risk of stunting events in children. High Spesivity cause subjects with high risk according to scoring very likely to experience heavy stunting can even complication may occur. The results of this study showed that in the ROC curve found an area below the 0816 curve with a sensitivity of 100% and a specificity of 98.9%, indicating that stunting prediction scoring is a good enough instrument to detect the risk of occurrence Stunting[12].

CONCLUSION

1. Based on the results of multivariate test there are only 5 variables that are dominant affect the stunting events such as gender, birth BB, History of anemia, maternal knowledge, and feeding patterns.
2. Based on ROC test results, the scoring card has high accuracy in forecasting the risk of stunting that is with high sensitivity and specificity results.

RECOMMENDATION

For midwives: It is hoped that midwives can provide extensive information either through counseling and training to the community or health cadres about stunting

For parents of toddlers: Toddler parents are expected to provide adequate nutritional intake that can reduce the risk of stunting in infants.

For health centers: It is hoped that puskesmas with the Government and related parties can provide solutions or make policies in order to improve the nutritional status of toddlers, especially stunting

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