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Risk Factors of Stunting among 1-2 Years Old Children in Semarang City

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ABSTRACT

Background: *Prevalence of stunting in children under five years in Central Java is high, more than 33%. Semarang City has high prevalence of malnutrition therefore there is a need to identify risk factors of stunting in Semarang city.*

Method: *This was a case control study, completed with qualitative study about risk factors of stunting. Samples were 58 cases and 58 controls. Data were analyzed by univariate analysis, bivariate analysis with chi square test, and multivariate analysis with multiple logistic regression. Qualitative study was done by using indepth interview, and presented in narration.*

Results: *The multivariate analysis result showed that risk factors of stunting in children 1-2 years old were short stature father (<162 cm) (p=0.016; OR=2.7; CI=1.2-6), children had history of low birth weight (p=0.028; OR=11.2; CI=1.3-96.3), and children had history of underweight (p=0.006; OR=3.3; CI=1.4-7). Risk factors which were not proven to influence the incidence of stunting were maternal height, history of exclusively breastfed, complementary feeding history; sex, history of infection, and immunization history.*

Conclusions: *Risk factors that influence the incidence of stunting in children 1-2 years olds are having father's height <162 cm, and positive history of low birth weight, and of underweight.*

Keywords: *Stunting, malnutrition, children, growth, risk factors*

ABSTRAK

Faktor risiko dari stunting *pada anak usia 1-2 tahun di kota Semarang*

Latar belakang: Stunting *adalah perawakan pendek yang timbul akibat malnutrisi yang lama. Prevalensi stunting pada balita di Jawa Tengah tinggi, yaitu lebih dari 33%. Kota Semarang merupakan ibukota Jawa Tengah yang memiliki prevalensi malnutrisi cukup tinggi sehingga diperlukan studi untuk mengetahui faktor risiko* stunting *di Kota Semarang.*

Metode: *Penelitian ini merupakan studi kasus kontrol, dilengkapi kajian kualitatif mengenai* stunting *pada status ekonomi kurang dan status ekonomi cukup. Jumlah sampel 58 kasus dan 58 kontrol. Analisis data dilakukan secara univariat, bivariat dengan* chi square test*, multivariat dengan metode regresi logistik ganda. Kajian kualitatif dengan metode* indepth interview *dan disajikan dalam bentuk narasi.*

Hasil: *Hasil analisis multivariat menunjukkan faktor risiko yang berpengaruh terhadap kejadian* stunting *pada anak 1-2 tahun di kota Semarang adalah tinggi badan ayah <162 cm (p=0,016; OR=2,7; CI:1,2-6), anak yang mempunyai riwayat BBLR (p=0,028; OR=11,2; CI=1,3-96,3), dan anak mempunyai riwayat* underweight *(p=0,006; OR=3,3; CI=1,4-7). Faktor risiko yang tidak terbukti mempengaruhi kejadian* stunting *adalah jenis kelamin, tinggi badan ibu, riwayat ASI eksklusif, riwayat infeksi, riwayat imunisasi, dan riwayat makanan pendamping ASI.*

Simpulan: *Faktor risiko yang mempengaruhi kejadian stunting pada anak 1-2 tahun adalah yang mempunyai ayah dengan tinggi badan <162 cm dan mempunyai riwayat BBLR, serta berat badan kurang.*

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INTRODUCTION

Stunting is short stature caused by chronic malnutrition. Stunting at children under five years are usually less aware due to differences with children whose normal height is not too visible. Stunting is usually realized after the child enters puberty or adolescence. This is adverse because more late realizing it, more difficult to overcome stunting.[1]

Indonesia region consisting of rural and urban areas. Urban areas characterized by population density and income per capita is higher than rural areas. Per capita income or high socioeconomic status did not guarantee better health status, as evidenced by high rates of malnutrition in the big cities. According to Health Research Association *(Riskesdas)* 2010 national prevalence of sever undernutrition in children under five years was 4.9%, and undernutrition was 13.0% while the national prevalence of stunting was 35.6%. Percentage of stunting in children under fives years in Central Java was 33.1%.[2]

Semarang as the capital city of Central Java also has high malnutrition rates. Infants with low birth weight (LBW) in 2009 as many as 90 babies (0.35%), decreased from the previous year of 135 infants (0.54%). Nutritional problems still existnand the numbers tend to increase. Cases of severe undernutrition found as many as 39 cases (0.04%).[3]

The government's failure to overcome malnutrition might be due to malnutrition prevention and treatment programs are not based on risks factors. Considering stunting problem increasingly difficult to treat as the increasing age, stunting should be prevented and identified at the earliest possible age. The author hope child's growth potential is achieved optimally by knowing the risk factors of stunting in children 1-2 years old.

METHOD

This was case control studies. Population study were children who lived in Semarang city, age 12-24 months. Samples were getting by purposive sampling method. Data were collected from the village which has the largest number of children under five years. Required minimum number of samples were 58 samples for each case and control groups.[4]

Dependent variable was stunting, which was determined by calculating the Z score height/age using WHO 2005 standard. It was categorized stunting if Z score height/ age <-2 SD and normal if Z scores ≥-2. The independent variables were child's age, child's sex, child's weight, height of child, child birth weight, underweight history, history of exclusively breastfed, history of complementary feeding, infection history, history of immunization, maternal height, and father's height.

History of infection was the presence of chronic diarrhea or respiratory tract infection (the duration of illness >2 weeks) or acute infection (the duration of illness ≤2 weeks) each month. Exclusively breastfed was breastfed only without other food or drink from birth until 6th month. It was categorized maternal short if height <150 cm and normal if ≥150 cm and categorized paternal short if height <162 cm and normal if ≥162 cm.

Primary data were obtained from the results of anthropometric measurements and interviews. Age and birth weight were determined from birth certificate or document *kartu menuju sehat* (*KMS).* Children's height were measured using microtoise and infantometer with precision 0.1 cm while the weight was measured with digital scales and infant scale with precision of 0.1 kg. Parent's weight was measured by digital scales and parent's height was measured by microtoise.

History of birth weight, underweight and immunization obtained from *KMS*. History of infections, exclusively breastfed, and complementary feeding obtained from interviews with the subject's mother using questionnaire.

Data analysis was done in univariate, bivariate with chi-square test, and multivariate with multiple logistic regression method. Qualitative studies by in depth interview method and presented in narrative form.

RESULTS

The most subjects in case and control are female. The number of subjects who had low birth weight was greater in the case group than in the control group. The most subjects in case group had history of underweight whereas in control group did not have history of underweight. More than 80% of subjects in the case and control groups have been fully immunized. In this study the most subjects were not exclusively breastfed. Subjects who received breast milk exclusively in the case group was higher than in the control group. Positive history of infection in the case group was higher than in the control group. In both groups complementary feeding was still insufficient, but in the case group the number was higher than in the control group. Most mothers in case groups are short whereas in control group are normal. Most fathers in the case group are short, whereas in the control group most fathers are normal.

The relationship between risk factors with stunting was indicated by the value of $p<0.05$, OR >1 and the 95% CI

not include value <1. Variables that proved as risk factor of stunting from bivariate analysis were, father's height, mother's height, history of complementary feeding, history of low birth weight and history of underweight. Variables that were not proven as risk factors of stunting were sex, history of exclusively breastfed, history of infection and immunization history.

Multivariate analysis conducted with the aim of knowing what the independent variable can be predictor of stunting. Variables used as candidates in the logistic regression test were variables which in bivariate analysis had p values ≤0.25, which amounts to 8 variables ie variables mother's height, father's height, history of exclusively breastfed, history of complementary feeding, history of infection, history of low birth weight, history of underweight, and immunization history. Multivariate analysis showed three independent variables that statistically significant; they were father's height, history of low birth weight, and history of underweight.

DISCUSSION

Short stature father (<162 cm) was a risk factor for stunting in children 1-2 years old (OR=2.88; CI :1,36-6,13). This is consistent with previous studies by Ferreira et al and Adigo H, et al.[5,6] Father's height is influenced by many factors including internal factors such as genetic factors and external factors such as disease factors and nutrient intake from an early age. Genetic factors are factors that can not be changed

Table 1a. Characteristics of subjects

Characteristics	Case		Control	
	n	%	n	%
Sex				
Male	21	36.2	26	44.8
Female	37	63.8	32	55.2
Birth weight				
Low	10	17.2	1	1.7
Normal	48	82.8	57	98.3
History of underweight				
Positive	44	75.9	28	48.3
Negative	14	24.1	30	51.7
History of imunization				
Incomplete	9	15.5	3	5.2
Complete	49	84.5	55	94.8
History of ex breastfed				
Not exclusively breastfed	31	53.4	39	67.2
Exclusively breastfed	27	46.6	19	32.8
History of infection				
Positive	28	48.3	18	31
Negative	30	51.7	40	69
Complementary feeding				
Insufficient	49	84.5	36	62
Sufficient	9	15.5	22	38

Table 1b. Characteristics of responden

Characteristics	Case		Control	
	n	%	n	%
Mother’s height				
Short (<150 cm)	22	38	12	20.7
Normal (≥150 cm)	36	62	46	79.3
Father’s height				
Short (<162 cm)	36	62	21	36.2
Normal (≥162 cm)	22	38	37	63.8

Table 2. Bivariate analysis for risk factors of stunting

Risk factors	Case		Control		OR	95% CI	p
	n	%	n	%			
Mother's height							
Short	22	37.9	12	20.7	2.34	1.02-5.36	0.04
Normal	36	62.1	46	79.3			
Father's height							
Short	36	62.1	21	36.2	2.88	1.36-6.13	0.005
Normal	22	37.9	37	63.8			
History of ex. breastfeed							
Not ex. breastfeed	31	53.4	39	67.2	0.56	1.26-1.2	0.13
Exlusive breastfeed	27	46.6	19	32.8			
Histrory of comp. feed							
Insufficient	49	84.5	36	62.1	3.33	1.37-8.1	0.006
Sufficient	9	15.5	22	37.9			
Sex							
Male	21	32.6	26	44.8	0.7	0.33-1.5	0.34
Female	37	63.8	32	55.2			
History of infection							
Positive	28	48.3	18	31	2	0.97-4.43	0.058
Negative	30	51.7	40	69			
History of low birthw							
Positive	10	17.2	1	1.7	11.88	1.5-96.1	0.004
Negative	48	82.8	57	98.3			
History of underw							
Positive	44	75.9	28	48.3	3.4	1.5-7.4	0.002
Negative	14	24.1	30	51.7			
History of immuniz.							
Incomplete	9	15.5	3	5.2	3.37	0.86-13.1	0.067
Complete	49	84.5	55	94.8			

Table 3. The result of multivariate analysis: significant risk factors of stunting

Variables	B	SE	p	OR	95%CI
Father's height <162 cm	1	0.4	0.016	2.7	1.2-6
Positive history of *underweight*	1.2	0.43	0.006	3.3	1.4-7.7
Positive history of low birthw	2.4	1.1	0.028	11.2	1.3-96.3

B: constanta

while the external factors are factors that can be changed. This means that if father has short stature because the genes on chromosomes carrying short feature and genes are inherited in the offspring, then stunting that arise in children or descendants are difficult to overcome. But if father has short stature because of illness or poor nutrition, should not affect the child's height. Children can still have normal height as long as not exposed to other risk factors.[6]

History of malnutrition was a risk factor for stunting in children 1-2 years old. In this study the history of malnutrition determined by looking at the history of low birth weight and underweight. The results are consistent with previous research, including research conducted by Adel EL et al, concluded that a history of malnutrition affecting the incidence of stunting in children 1-2 tahun ($p<0.05$, OR:1.58, 95% CI :1,09-2, 29).[7] Low birth weight denotes malnourished fetus in the womb while underweight indicates the condition of acute malnutrition. Stunting it self caused by chronic malnutrition. Babies born weighing less than normal (<2500 g) may still have normal body length at birth. Stunting will occur a few months later, although this is often not realized by the parents. Parents know that their child stunting usually after the child starts playing out with friends so that the child looks shorter than is friends. Therefore, children born weighing less or children who were born with low weight should be

aware will be stunting. The earlier conducted prevention of malnutrition, the smaller the risk of stunting.[13]

Based on the results of multivariate analysis can be concluded that the risk factors that do not affect the incidence of stunting in children 1-2 years old were sex, maternal height, history of exclusively breastfed, complementary feeding history, history of infection, and immunization history. In the bivariate analysis factors not related to the incidence of stunting were sex, history of exclusively breastfed, history of infection, and immunization history.

Male sex was not a risk factor for stunting in children 1-2 years old. Research in the Philippines by Linda S et al concluded that at the age under one year boys have more at risk to be stunting while over one year of age girls more at risk to be stunting.[8] Based on theory the boys more at risk to be stunting because immunologically boys are more susceptible to disease than girls. In addition, boys have a larger body size and thus require more energy. Lack of energy in an equal amount of boys and girls lead boys have higher risk than girls so it is more risky to stunting.[9]

This study concluded that a history of exclusively breastfed was not associated with the incidence of stunting in children 1-2 years old. Not getting exclusively breastfed was not a risk factor for stunting in children 1-2 years old. Previous studies, one by Siti Fatimah concludes that did not receive breast milk is risk factor for stunting (OR=1.009; CI=0.690 to 1.415).[10] By in depth interview we know many mothers used a combination of breast milk and infant formula with a variety of reasons. The most reason was working. Another reason was the milk insufficient for the baby needs. Baby's nutritional needs be met by providing a formula. Ease of obtaining milk formulas make mother less to tried to increase her breast milk production. Breastfeeding together with formula can indeed meet the nutritional needs so that the baby is not impaired in growth. But the formula has many shortcomings compared to breast milk. Formula milk does not contain immunity as good as breast milk so that the child will be more susceptible to disease. Besides milk formulas are expensive and often not affordable to low economic groups.[11]

Case group had more subjects who were breastfed exclusively over the control group because most of the cases were low economic group. They could not afford to buy formula, so that mothers in this group choosed to consume food that could increase milk production because the food was much cheaper price. After 6 month-old infants breastfeeding should be accompanied by other foods because they need more energy and can not be provided by breast milk alone. In the groups of case that have low economic status and exclusively breasfed, the problems begin to arise when the baby is 6 months old. Mothers in this group difficult to provide complementary feeding enough so that children begin to be malnutrition. This is due to the inability to buy food that have good quality and low maternal knowledge of nutrition. Child malnutrition causes disease and the disease can interfere with the growth process that caused stunting.[12] In the control group, there were more subjects that not exclusively breastfed. In this group did not occur stunting because they were given formula milk in addition to breast milk so that the nutrient requirements for growth and development were met. Also in the control group subjects who did not receive exclusive breastfeeding were not much exposure to other risk factors such as disease so they were not stunting, although not exclusively breastfed. The results of hypothesis testing in bivariate or multivariate analysis concluded that there was no significant association between history of infection with the incidence of stunting in children 1-2 years old. The history of infection was not a risk factor for stunting in children 1-2 years old. Previous studies, one by Linda S et al concluded that the incidence of stunting increased significantly in the presence of diarrheal diseases and respiratory infections.[8] History of infection in this study was defined as the presence of chronic diarrhea or chronic respiratory tract infections (the duration of illness ≥2 week) or acute infection (the duration of illness <2 weeks), which happens every month. The absence of a significant association between a history of infection with the incidence of stunting in this study was probably caused by a too broad definition of infection so mild infections included into the definition. Mild infectious disease that does not affect a child's appetite and metabolism do not cause stunting because malnutrition not occur.[13] Infectious diseases such as mild upper respiratory infection common in children because the disease is highly contagious. But this disease can heal itself in short time so not to lower the nutritional status.[8,12,13]

The results of hypothesis testing in bivariate and multivariate analysis concluded that history of immunization does not have a significant relationship with the incidence of stunting in children 1-2 years old. Incomplete immunization was not a risk factor for stunting in children 1-2 years old. Previous studies, one conducted by Siti Fatimah concludes that children who did not get BCG have risk to become stunting (OR=1.34; 0,69 CI-1,4).[10] The cause why it does not found a significant association between immunization with the incidence of stunting due to the possibility

immunization status assessment only considered complete or incomplete. It should more detailed assessment of the immunization status so they could know what types of immunizations have been obtained, and immunizations have not been obtained. Complete immunizations that given to a child in Indonesia include BCG, DPT, polio, hepatitis, and measles. Not all infectious diseases have vaccine or immunization so that although a child has given complete immunization as mentioned above child is still susceptible to other infectious diseases. It also might be the cause why the history of immunization does not have a significant relationship with the incidence of stunting in children 1-2 years old.

The results of univariate analysis said that most of the subjects in this study had insufficient complementary feeding (84.5% in the case group and 62.1% in the control group). This is consistent with previous research conducted by Faisal Anwar et al who concluded that most of the energy consumption of a toddler who came to *posyandu* is still less than 80% RDA.[14] The results of multivariate analysis concluded that complementary feeding does not affect the incidence of stunting in children 1-2 years proven the value of p>0.05. But in the bivariate analysis hypothesis test results the value of p=0.006 concluded there was a significant association between complementary feeding and the incidence of stunting in children 1-2 years old. The history of complementary feeding was less risk factor for stunting in children 1-2 years old. Previous studies by Siti Fatimah concludes that the deficit of protein in milk is risk factor of stunting in infants (OR=1.048; 0.876 CI-1.149).[10] The absence of a significant association in multivariate analysis due to the influence of other variables are more robust, given the variable influential analyzed at once so it is likely controlled by a variable greater influence.[15]

CONCLUSIONS

After multivariate analysis was performed risk factors of stunting in children 1-2 years olds were short stature father (<162 cm), children had history of low birth weight, and children had history of underweight. Factors that were not proven to be the risk of stunting were sex, maternal height, history of exclusively breastfed, complementary feeding history; history of infection, and immunization history.

SUGGESTIONS

This study used many questionnaires to obtain data. The use of questionnaires are potential for recall bias as in the history of infection and history of complementary breast milk. It is therefore advisable to obtain the data by using other instruments that cause less bias such as medical records.

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