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A Determinant Analysis of Stunting Prevalence on Under 5-Year-Old Children to Establish Stunting Management Policy

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Abstract

OBJECTIVE: In Indonesia, stunting is a nutritional problem that is a threat to the growth and development of toddlers since the beginning of life. The total stunting of children under-five in 2018 in Palu city was 30.8%. Hence, it is necessary to strengthen the system that supports the determination of continued government policies in achieving a reduction in the incidence of stunting.

METHODS: A case control with research subjects totaling 520 toddlers. The sampling technique used was proportional stratified random sampling at all Puskesmas Kota Palu.

RESULTS: There is a multifactorial relationship between knowledge variables (p = 0.019), children have been sick (p = 0.000), mother's height (p = 0.050), and mother's education (p = 0.000) against the incidence of stunting. Low knowledge has a chance of 1.581 times and the status of the child having been sick has a chance of 9.166 times the incidence of stunting.

CONCLUSION: Multiple factors play a role in causing stunting in the city of Palu. Analysis of factors related to the incidence of stunting in children under-five in the working area of the Palu City Health Center is considered necessary in supporting the government in determining policies to tackle stunting problems.

Introduction

Globally, in 2017, there were 151 million of under 5-year-old children (22%) who experienced stunting (their growth is below the average growth for their age). About three-fourth of those children live in Southeast Asia or Africa. High level of stunting has negative impact on nation's development as its related to morbidity risk and child's mortality, learning capacity of the children, and non-communicable diseases in later stage of life. In 2017, about 51 million under 5-year-old children (7.5%) experienced wasting (too light for their body height), whereas 38 million of under 5-year-old children (5.6%) were obese (too heavy for their body height) [1].

Based on the nutrition status monitoring for the past 3 years, shortness has the highest prevalence than other nutrition-related cases. The prevalence of shortness or stunting has been steadily increasing from 27.5% in 2016 to 29.6% in 2017 [2]. Compared to other ASEAN countries, stunting prevalence in Indonesia is categorized into high prevalence, together with Cambodia and Myanmar [3]. Out of 556 million of under 5-year-old children in developing countries, 178 million of them (32%) are short and 19 million of them are severely underweight (<–3SD) and 3.5 million of these children die each year.

Based on the data above, a study was to analyze determinant factors of stunting prevalence in under 5-year-old children in Palu city health-care centers to support government in creating stunting reduction policy.

Methods

This was a case–control study on factors that determine stunting prevalence. There were a total of

520 toddlers involved in this study based on the inclusive and exclusive criteria. Samples for this study were determined using proportional stratified random sampling in 13 health-care centers (Puskesmas) in Palu city. This study was implemented in several health-care centers (Puskesmas) in Palu city of Central Sulawesi and was implemented from June to August 2020. The variables in this study were stunting, birth weight, exclusive breastfeeding record, immunization record, infectious diseases record, mother's level of education, mother's parenting method, level of family income, number of family members, parents' weight, and residence.

Results

Table 1 shows that based on univariate analysis of the respondents' characteristic of the age of mother's whose child is affected by stunting; the highest percentage is on mothers age 20–35 years old by 202 respondents (74.8%) and the lowest is on <20 years old age group by 13 respondents (4.8%). Similarly, this 20–35 years old mothers have the largest percentage of healthy children by 229 respondents (79%) and the <20 years old group is also the group with smallest number of healthy children by only 16 children (5.5%).

Table 1: Characteristics of respondents

Characteristics	Stunting				Total	
	Yes		No			
	n	%	n	%	n	%
Mother's age group (years old)						
< 20	13	4.8	16	5.5	29	5.2
20–35	202	74.8	229	79.0	431	77.0
> 35	55	20.4	45	15.5	100	17.9
Level of education of the head of family						
Uneducated	7	2.6	11	3.8	18	3.2
Elementary school	72	26.7	42	14.5	114	20.4
Junior high school	71	26.3	55	19.0	126	22.5
Senior high school	103	38.1	140	48.3	243	43.4
Diploma/tertiary school	17	6.3	42	14.5	58	10.5
Mother's level of education						
Uneducated	8	3.0	9	3.1	17	3.0
Elementary school	70	25.9	63	21.7	133	23.8
Junior high school	63	23.3	70	24.1	133	23.8
Senior high school	106	39.3	101	34.8	207	37.0
Diploma/tertiary school	23	8.5	47	16.2	70	12.5
Head of family's employment status						
Unemployed	4	1.5	3	1.0	7	1.3
Student	1	0.4	1	0.3	2	0.4
Government employee	8	3.0	21	7.2	29	5.2
Non-government employee	27	10.0	34	11.7	61	10.9
Businessman	116	43.0	125	43.1	241	43.0
Others	114	42.2	106	36.6	220	38.3
Mother's employment status						
Unemployed	198	73.3	218	75.2	416	74.3
Student	1	0.4	3	1.0	4	0.7
Government employee	1	0.4	6	2.1	7	1.3
Non-government employee	5	1.9	9	3.1	14	2.5
Businesswoman	27	10.0	36	124	63	11.3
Others	38	14.1	18	6.2	56	10.0
Mother's height (cm)						
< 150	111	41.1	96	331	207	37.0
≥ 150	159	58.9	194	66.9	353	63.0
Family economic status						
< UMK	222	82.2	231	79.7	453	80.9
≥ UMK	48	17.8	49	20.3	107	19.1
Number of family member (people)						
1–4	50	18.5	67	23.1	117	20.9
≥ 4	220	81.5	223	76.9	443	79.1
Residence status						
Temporary shelter	13	4.8	2	0.7	15	2.7
Non-temporary shelter (house)	257	95.2	288	99.3	545	97.3
Total	270	100	290	100	560	100

Table 2 shows that according to sex group, 53.3% of male toddlers' (144 respondents) were affected by stunting. Meanwhile, 160 female toddlers (55.2%) were not affected by stunting. This table also describes that children age 0–23 months old are the most vulnerable age group to stunting, where 132 respondents (48.9%) were affected by stunting. Meanwhile, the largest age group unaffected by stunting is the 37–60 months old group, where 124 respondents (42.8%) were unaffected.

Table 2: Toddler's characteristics

Variable	Stunting				Total	
	Yes		No			
	n	%	n	%	n	%
Sex						
Female	126	467	160	55.2	286	51.1
Male	144	53.3	130	44.8	274	48.9
Age group (months)						
0–23	132	48	78	26.9	210	37.5
24–36	60	22.2	88	30.3	148	26.4
37–60	78	28.9	124	42.8	202	36.1

Table 3 shows that portrays p = 0.019 (p ≤ s0.05) to reject H0, which means that there is a correlation between knowledge level and stunting incidence. There are 193 respondents (71.5%) with stunting who have sufficient knowledge, whereas 232 respondents (80%) have sufficient knowledge and healthy baby. Further, on toddler's has ever sick indicator shows a result of p= 0.000 (p ≤ 0.05), which means that toddlers who have been sick have a significant correlation with the incidence of stunting. This means that there is a correlation between stunting incidence and sickness record of children. There are 265 respondents (98.1%) who have ever sick and affected with stunting, whereas 246 toddlers (84.8%) have ever sick but they have normal growth.

Table 3: Research variable

Variable	Stunting				Total		p
	Yes		No				
	n	%	n	%	n	%	
Knowledge							
Insufficient	77	28.5	58	20.0	135	24.1	0.019
Sufficient	193	71.5	232	80.0	524	75.9	
Toddler's was never sick (sickness record)							
Yes	265	98.1	246	84.8	511	91.3	0.000
No	5	1.9	44	15.2	49	8.8	
Colostrum administration							
N	34	12.6	29	10.0	63	11.3	0.332
Yes	236	87.4	261	90.0	497	88.8	
Family economic status							
< UMK	222	82.2	231	797	453	80.9	0.444
≥ UMK	48	17.8	49	20.3	107	19.1	
Number of family members (people)							
1–4	50	18.5	67	23.1	117	20.9	0.182
≥ 4	220	81.5	223	76.9	443	79.1	
Mother's height (cm)							
< 150	111	41.1	96	33.1	207	37.0	0.050
≥ 150	159	58.9	194	66.9	353	63.0	
Father's level of education							
Low	150	55.6	108	37.2	258	46.1	0.448
High	120	44.4	182	62.8	302	53.9	
Mother's level of education							
Low	141	52.2	142	49.0	283	50.5	0.000
High	129	47.8	148	51.0	277	49.5	
Breastfeeding record							
No	24	8.9	15	5.2	39	7.0	0.084
Yes	246	91.1	275	94.8	521	93.0	
Immunization record							
No	5	1.9	11	3.8	16	2.9	0.168
Yes	265	98.1	279	96.2	544	97.1	

Table 4 shows that the p value of knowledge variable is significant by 0.026 (p < 0.05). Thus, there is a significant influence of knowledge on stunting

Table 4: Multivariate analysis

Variables in the equation	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Step 1[a]								
Knowledge (1)	0.481	0.208	5.332	1	0.021	1.617	1.075	2.432
Mother's level of education (1)	0.132	0.179	0.541	1	0.462	1.141	0.803	1.619
Mother's height (1)	0.308	0.183	2.834	1	0.092	1.360	0.951	1.945
Has (name of the child) ever been sick (1)	2.208	0.482	21.006	1	0.000	9.102	3.540	23.404
Constant	–2.434	0.488	24.906	1	0.000	0.088		
Step 2[a]								
Knowledge (1)	0.458	0.206	4.956	1	0.026	1.581	1.056	2.365
Mother's height (1)	0.323	0.181	3.165	1	0.075	1.381	0sss.968	1.971
Has (name of the child) ever been sick? (1)	2.215	0.482	21.150	1	0.000	9.166	3.565	23.564
Constant	–2.374	0.480	24.420	1	0.000	0.093		

[a]Variable(s) entered on Step 1: Knowledge, mother's level of education, mother's body height, has (name of child) ever sick?

incidence with the determinant coefficient value of 0.458. In addition, the child's sickness record (has she/he ever been sick) was also a significant variable on stunting incidence. The determinant coefficient for this variable is 0.000 ($p < 0.05$). Thus, there is a significant influence on the status of the child who has been sick on stunting incidence with the determinant coefficient of 2.215. Further, based on the exp(B) value, it is known that insufficient knowledge contributes to the stunting incidence by 1.581 times higher than respondents with sufficient knowledge. Next, on the child who has been sick variable (sickness record), it shows that the child who has ever been sick has the exp(B) value of 9.166. This indicates that a child who has ever been sick is 9.166 times more susceptible to stunting that child who has never been sick.

Discussion

Level of knowledge

Preparation of balanced nutritious food is an important factor to increase the nutrition status of a family member. This will only be attained when the family, especially mother, has sufficient knowledge on nutrition. Proper understanding, attitude, and behavior on selection of food materials, food preparation, including food security for family will have a significant impact on stunting prevention [4]. This present study revealed a correlation between level of knowledge and stunting incidence (0.019). Regardless to having a mother with sufficient knowledge, 193 children in this study were still affected with stunting. This finding is consistent with the study by Ni'mah and Nadhroh, 2015, West *et al*., 2018, which showed that appropriate level of knowledge would minimize the risk of stunting. The nutrition knowledge is not only obtained from school but also from other sources. Puskesmas (health-care center) and Posyandu (integrated health-care center) are the frontline of nutrition service for expecting mothers and children. These services are not only limited to providing additional nutritious food for expecting mothers and children but also providing information for selection and preparation of healthy and nutritious food products [5].

Child's sickness record

On variable of child's who has ever been sick, the result is $p = 0.000$ ($p \leq 0.05$), thus, H0 is rejected. This means that there is a correlation between child's sickness record and stunting incidence. This study does not differentiate type of sickness experienced by toddler and stunting incidence. This result supports the result of study by Nkurunziza *et al*. which indicated that children with stunting were affected with sickness, especially in the early days of after their birth [6]. However, the result of this present study is different from Muldiasman *et al*. who differentiate types of diseases and their correlation to stunting incidence. In their study, it was revealed that only diarrhea correlates with stunting incidence, whereas cough, fever, and breathing difficulties are not correlated with stunting [7]. Diarrhea correlates with stunting as it causes losses of various nutrition and electrolyte from the body of the toddlers, in addition to reduce the quality of their digestion system [8].

Administration of colostrum

Colostrum contains vitamins, minerals, and antibodies who are essentials nutrition to prevent stunting. This study exposes that there is no correlation between colostrum administration and stunting incidence ($p = 0.332$). The result is in sync with the study conducted by Torlesse *et al*. who indicated that there is no association between early breastfeeding initiations that contain colostrum with stunting incidence [9]. This result, however, opposes the result of study conducted by Muldiasman *et al*. who reported that toddlers who did not receive early breastfeeding initiation with colostrum in it have 1.3 times higher risk of stunting than those who received early breastfeeding initiation [7]. In addition, Kidane also reported that babies who received colostrum have 49% smaller possibility to experience stunting than those who did not [10]. Various studies have revealed a correlation between stunting incidence and breastfeeding. Nevertheless, a specific description on the strength of this correlation is yet provided [11]. Torlesse *et al*. reported a moderate correlation between administrations of age-appropriate meals, including exclusive breastfeeding on 0–5 months old babies, with the reduction of stunting incidence. This indicates that without administration of colostrum on early breastfeeding initiation accompanied by

age-appropriate meal can prevent stunting on under 5-year-old children [9].

Family economic status

This study reveals that there is no correlation between family economic status and stunting incidence (p = 0.444). The respondents in this study came from various economic backgrounds. This diverse economic background is intended to delimitate respondents, thus, more obtained data are obtained. The result of this present study is different from the findings of El Kishawi *et al*. and Ramadhan *et al*. who reported a correlation between economic status and stunting. However, their studies tend to have similarity in terms of its environment, one was carried out in Gaza strip and the later was conducted in the urban area of Banda Aceh city. The bad economic condition of these two locations will increase stunting prevalence as of their subjects inability to provide nutritious meal for the family [12], [13].

Number of family members

Number of family members is one of the indicators to determine socioeconomic status in stunting incidence. In this study, it reveals that there is no correlation between number of family members and stunting incidence (p = 0.182). Similar result is also reported by Torlesse *et al*. and Rohmawati and Antika. Number of family members is one of the elements to prevent acute and chronic malnutrition [9], [14]. The larger the family size, the larger the burden of family expense for food. The effect is on the distribution of food for children. Rahmawati *et al*. and Wicaksono and Harsanti reported results that are different from this study on the correlation between number of family members and stunting incidence [15], [16].

Mother's body height

Mother's body height genetically influences a child's growth [17]. Black as cited in Faridah found that intrauterine growth failure increases on bad nutritional status and mother's with short height. This causes insufficient intrauterine growth that will further effect the after birth growth and development of the baby [18].

Mother's body height is one of the variables that determine stunting incidence. In this study, mother's height significantly predicts a baby to be affected with stunting (p = 0.050). There are 159 respondents whose mother's height is ≥150 cm which are affected with stunting, whereas 194 other respondents whose mother's height is ≥150 cm are not affected with stunting. This result is consistent with the studies by El Kishawi *et al*. and Mikawati *et al*. who found that stunting is also influenced by mother's height. Anthropometry is useful in predicting nutritional status of individual related to general evaluation of health. One of the methods is to measure body height. Short body height of the previous generation will be passed down to the next generation during the growth period. This may cause by genetic and non-genetic factors, such as nutrition [12], [19].

Parents' level of education

Father's level of education does not show a correlation with stunting (p = 0.448). This result is in contrast with the result of study by Rohmawati and Antika who showed that father's level of education also plays a role on stunting incidence on children. This different result is suspected to the common practice in our community, where direct parenting activities are mostly carried out by mothers and not fathers. Father's level of education influences on the possibility of having better job to provide better income for the family [14].

A study by Dewi and Widari states that parents' level of education has no correlation with stunting incidence in under 2-year-old children in Balen subdistrict of Bojonegoro district. This is because the level of education has no direct influence on stunting incidence. However, there are other factors that may influence stunting incidence. One of the undisputed facts is that mothers who have high level of education will better understand information and can learn to understand appropriate parenting methods and nutrition that are appropriate for under 2-year-old children, thus, the children can have better nutrition status [20].

Mother's age

This study reveals that the highest percentage of stunting happens in the mother's age 20–35 years old group by 74.8%. The percentage of healthy babies in the same group age is a bit higher by 79%. In their study, Agustiningrum *et al.* [20] reported that mother's age has no influence on stunting incidence. However, it has more significant influence on their parenting method, in this case, the way they select and prepare meals for their children. In addition, it is also related to psychological readiness of the mothers to accept their pregnancy. Similarly, Wahyuni *et al*. [17] also reported in their study that the age of expecting mothers influences the intrauterine growth of the baby and in addition to balanced food intake also has a positive impact on baby.

Low level of mother's education influences the family and personal hygiene knowledge, and provision of nutrition [10], [14], [21]. Mother plays an important role that determines the health status of her baby, thus, mother's level of education made her more selective and creative in selecting, preparing, and presenting meals for her baby [22], [23]. A previous study in Burundi has reported that mother with low level of education is 1.6 times riskier to give birth to a stunted child [6]. Low

level of education is inseparable with low economic level or low family income. Due to this low level of income, large proportion of family budget is allocated for basic necessities like food and less are allocated for education [14].

Employment and family economic status

Employment and economic status of the parent may contribute to the provision of nutrition needs of the family and access to health services [24]. Parents with no stable jobs will have difficulty to manage their provision of family necessities and, in turn, will be less attentive to the nutrition needs of the child. Hence, children from low-income family, due to their family's lack of ability to provide nutritious meals, tend to be more vulnerable to malnutrition risks. A different result is reported by Dewi and Widari [25] where they reported that there is no correlation between low-income family and stunting incidence. However, larger proportion of stunting children came from low-income family than non-low-income family. Level of family income reflects family ability to provide nutritious meals for their members.

Residence

Residence or housing is a building the family lives and resides [26]. Personal hygiene of the resident influenced the function of the housing. A poor personal hygiene possesses higher risk for disease transmission through meals prepared and provided for family members, especially children in their growth time. Failure to provide balanced nutritious intake will result in growth failure or stunting, which will influence child's immunity and growth [27].

Studies conducted in India and Ethiopia reported a correlation between stunting and residence condition. A study in Ethiopia was carried out in the southern part of the country, which are mostly rural area with low level of environmental health. In India, a study was carried out in the north, in urban areas with better environmental quality [8], [28].

Toddler's characteristics

This present study reveals that boys are more vulnerable to stunting than girls. This condition due to differences on feeding practices by the parents [18]. The age of toddlers who are affected with stunting is influenced by mother's condition in the first 1000 days of life, from the fetus up to the baby is 2 years old. This time is a critical window due to at this time brain development or intelligence development and the growth of the body happen at its maximum speed. Thus, when expecting mother is not supplied with balanced and nutritious food, baby does not get exclusive breastfeeding after birth, and nutritious complementary food for breast milk, the child will be more likely to experience stunting. Stunting that happens on 0–2 years old baby and continued up to the baby ages 3–6 years old will have a higher risk for pre-puberty stunting (age 7–9 years old) [29].

Conclusion

The evidence from this study suggests that knowledge, mother's height, child's sickness record, and mother's level of education are risk factors for stunting incidence in Palu city. Meanwhile, the main risk factors of stunting in Palu city are knowledge, child's sickness record, and mother's body height. Child with sickness record in their early life is 9.166 times more susceptible to stunting than child with no sickness record in their early life. Meanwhile, low level of knowledge is 1.581 times riskier for stunting compared to sufficient knowledge. Taking into consideration these risk factors for stunting in Palu city area, the factors that can be modified are level of knowledge and child's sickness record. Therefore, parents who have or plan to have under 5-year-old children are recommended to increase their knowledge on nutrition intake needed for the children and to maintain their children's health to prevent stunting incidence.

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