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Analysis of the Influence of Family Functions on Reducing of Stunting Incidence

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Abstract

The prevalence of stunting is one of the children's well-being indicator. Stunting control efforts can be carried out with a family approach. Study on stunting has been carried out several times; however, a study that specifically discusses the relationship between family function and stunting has not yet existed. Therefore, the study wants to analyze the relationship of family function to stunting in Pemalang. The case-control design was conducted in July 2019 in Pemalang District. The total samples were 137 children under three years old, selected based on multistage techniques. The variables were anthropometric measurement and age to identify a stunting child, family function by APGAR (Internal family function) and SCREEM (External family function) score, immunization status, history of breastfeeding and complementary feeding, history of infectious diseases, hygiene, data regarding characteristics of children, also socio-demographic family. All data were analyzed bivariate using Mann-Whitney and multivariate with a logistic regression test. The fixed model factors results were internal family function OR = 3.440 (p = 0.013; 95%CI 1.299-9.107) had an influence on the incidence of stunting and a history of infectious disease OR = 2.917 (p = 0.006; 95%CI 1.359-6.262) as a confounding factor. Stunting is the impaired growth and development in children that can relate to relationships within the family. Guidance to improve the family's internal function and prevention of infectious diseases needs to be pursued in the stunting control program.

INTRODUCTION

Malnutrition is a nutritional problem experienced by every developing country, including Indonesia. Nutritional burdens in Indonesia are obesity, wasting, and stunting (Halimatunnisa et al., 2020). Based on an Indonesian nutrition case study by the Ministry of Health of the Republic of Indonesia, there was a 27.7% prevalence of stunting in Indonesia in 2019. Another study shows that the prevalence of stunting is higher than the prevalence of other nutritional problems, such as malnutrition (17.7%), underweight (10.2%), and obesity (8%) (Ministry of Health of Republic Indonesia, 2018). According to the WHO data from 2015 to 2017, Indonesia is ranked as the third country with the highest prevalence of stunting in the Southeast Asia Region. Central Java is one of the provinces with a high prevalence of stunting (30-40%) (Beal et al., 2018; Diana et al., 2020; Halimatunnisa et al., 2020). Pemalang Regency is included in the list of 10 priority cities/regencies for stunting interventi-

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on, with 11.1% stunting prevalence in toddlers (Central Java Provincial Health Office, 2019). Pemalang district is one of the areas in Pemalang regency with a stunting rate of 26% (National Team for the Acceleration of Poverty Reduction, 2017). These numbers are concerning, as stunting in children, especially those under the age of five years, can cause physical growth disorders, hinder intelligence development, reduce immunity and learning ability, as well as increase the risk of morbidity, mortality, and degenerative diseases in the future (Halimatunnisa et al., 2020; Januarti et al., 2020; Khairani and Pawiliyah, 2020).

Stunting is caused by complex interactions of household, environment, socioeconomic, and cultural influences (Beal et al., 2018; Huriah and Nurjannah, 2020; Nshimyiryo et al., 2019). There are direct and indirect factors that cause stunting. Direct factors of stunting in children include low birth weight, nutritional intake (breastfeeding and complementary feeding), and infectious diseases. The indirect factors of stunting include parents' education level, family income, and family function (Carolin et al., 2021; Soekatri et al., 2020a). The family as the first and foremost environment for children plays an important role in the growth and development of children, as well as in all forms of prevention. Every family function is to be able to balance and affect the components within it. When the function of a family is successful, then most of the processes that occur within it will be positive, including the process of child growth and development (Hanifah et al., 2017).

The research in Jember, Indonesia showed that family function value has a 2.217 times higher chance of leading to good under-five children nutritional status (Febrianti et al., 2022). This result is in line with the study of families with autistic children that stated there is a relationship between family function and the nutrition status of autistic children (Khotibuddin and Shellia, 2022). As for this study, the focus is on families with stunted children and the relationship between them. Several studies in Pemalang Regency proved that the factors of stunting incidence in Pemalang include birth weight and nutritional knowledge as well as parenting patterns (Almaas et al., 2021; Muslimah and Setiawan, 2020). Stunting research has been carried out by several researchers. However, the relationship between family function factors and stunting has not been established before. The function of the family is very important and can be one of the items in the stunting control program.

The internal family function can be assessed based on six main dimensions of family life consisting of problem-solving, communication, roles, affective responsivity, affective involvement, and behavioral control. Internal aspects include family satisfaction, problem-solving in the family, communication between family members, and affection, which can be measured using the APGAR score (Adaptation, Partnership, Growth, Affection, Resolve). Assessing external factors of family function can be done using SCREEM scores (Social, Culture, Religion, Economic, Education, Medic) (Takenaka and Ban, 2016). This assessment of family functions is important for providing mental support to children and can reduce mental pressures that inhibit the child's normative development. However, data on the description of family functions in Pemalang and Kebondalem Regency has yet to be found (BPS-Statistics Indonesia Pemalang Regency, 2019). Several studies in Pemalang have been conducted, but there has been no research specifically focusing on the variable of family support. In a study conducted in Taman District, birth weight and birth length were analyzed in relation to stunting, with the results showing that birth length was associated with stunting (Sutrio and Lupiana, 2021). Another research in Jepara Regency in 2019, utilizing qualitative research, concluded that the role of the community in the stunting reduction program was still lacking. Therefore, the study of family function on the incidence of stunting is expected to provide valuable information about the strength of influence, as well as offer additional references for programs involving the community in efforts to reduce stunting rates (Lituhayu, Dwimawanti and Maesaroh, 2022).

METHODS

This study used a case-control design study and was conducted from June to August 2019 in Pemalang District which comprises six villages (Tambakrejo, Lawangrejo, Wanamulya, Bojongbata, Bojongnangka, and Kebondalem). The subjects of this study were children aged under 36 months or under 3 years old. The sample selection process used multistage techniques, specifically cluster and consecutive sampling. Cluster sample techniques were used based on villages, ensuring that cases and controls were included from all villages. Once the clustering was completed, samples were selected from the list, and those willing to participate became respondents who were interviewed for data collection from June to August 2019. The sample size for this study was calculated based on previous research

using P1 = 45%, P2 = 23%, alpha 5%, and power 80% with Lemeshow formula.

$$N1=N2 = \frac{(Z_{1-\alpha\sqrt{}}(P_2(1-P_2)) + Z_{1-\beta}\sqrt{(P_1(1-P_1))})^2}{(P1-P2)^2}$$

Based on the provided information, the minimum sample size for each group (case and control) is 61 samples, and the minimum total number of samples (1:1 case-control ratio) is 122. Sampling was done using non-proportional sampling, meaning the number of samples per village varied due to the willingness of respondents.

Case and control samples were obtained from secondary data collected at primary health centers. Cases were families with stunted children (HAZ <-2), while controls were families with normal children (HAZ -2 through 2). The inclusion criteria were toddlers from families who had lived in Pemalang sub-district for at least 6 months, with anthropometry recorded at primary health care and willingness to become respondents. For those who agreed to participate, the researcher re-measured their anthropometric data during the study. Data was collected through direct measurements and questionnaire interviews conducted by enumerators. The dependent variable in the study was the child's body length/height according to age, used to identify the nutritional status of stunting, known as the HAZ score based on the Children's Anthropometric standards by the Ministry of Health of the Republic of Indonesia. Stunting was defined by a z-score <-2 based on the child's height and age. The main independent variable in this study was family function, and the confounding variables controlled in this research included immunization status, history of breastfeeding and complementary feeding, history of infectious diseases, parental education level, mother's employment status, family income, household family members, and hygiene.

The study utilized APGAR and SCREEM questionnaires to measure internal and external family functions. The family APGAR questionnaire consists of five indicators for assessing family function, with each indicator scored from 1 to 2. The total score range of the APGAR questionnaire is 1-10, which is categorized into 7-10 (functional family) and 0-6 (dysfunctional family). On the other hand, the SCREEM questionnaire includes six indicators for assessing family function, with each indicator scored from 0 to 3. The SCREEM questionnaire has a score range of 1-18, which is categorized into 0-6 (inadequate family function), 7-12 (moderate family function), and 14-18 (adequate family function).

Children under five years old are categorized as completely and appropriately immunized if their immunization status aligns with Indonesia's complete basic immunization program. The study considered the history of infectious diseases, including diarrhea, hepatitis, Acute Respiratory Infection (ARI), tuberculosis, and dengue. Toddlers were considered exclusively breastfed and appropriately supplemented if they were given only breastfeeding for the first 6 months, and the complementary food's texture was appropriate for their age. Families were deemed to have good hygiene if they scored at least 80% of the 6 questions related to hygiene.

Ethical approval for the study was obtained from the Health Research Ethics Commission (KEPK) of the Faculty of Medicine, Universitas Diponegoro (357/EC/KEPK/FK-UNDIP/VII/2019). Additionally, this study received formal permission from each participant in the form of a written permission list, with each participant's signature on informed consent

The collected data were checked and coded using both Microsoft Excel and SPSS 25, and the analysis was carried out using SPSS 25. The analysis in this study included univariate, bivariate, and multivariate analysis. Univariate analysis was used to describe the characteristics of the subjects. In bivariate and multivariate analysis, variables with a p-value <0.05 indicated an association between each variable. For bivariate analysis, the Mann-Whitney test was used to examine differences in internal and external family function between the stunting and non-stunting family groups for each indicator. In the multivariate analysis, logistic regression was used to identify the risk factors for stunting. All variables were analyzed using a full logistic regression model, calculating odds ratios (OR), 95% confidence intervals (CI), and p-values. Subsequently, a fixed logistic regression model was conducted using the stepwise method.

RESULT AND DISCUSSION

A total of 137 families participated in this study, with 64 (46.7%) of them being families with stunted children. The characteristics of the children, families, internal family function, and external family function scores of the study participants are presented in Table 1. The results showed the characteristics of children and their families, which were divided into stunting and non-stunting groups based on the high Z-score according to the child's age (HAZ). The prevalence of stunting was most prominent in the

18-23 month age group, and stunting was more prevalent in male children. Additionally, the results indicated that more stunted toddlers had a history of infectious diseases (75% vs. 50.7%), but stunted children had a higher proportion of children receiving complete immunizations compared to non-stunted toddlers (76.6% vs. 68.5%).

The results showed family functions based

Table 1. Characteristics of respondents for stunting and non-stunting

Characteristics	Stunting		Non-stunting		Total	
	N (64)	%	N (73)	%	N (137)	%
Children characteristic						
Age (in months)						
6-11	9	14.1	22	30.1	31	22.6
12-17	23	35.9	24	32.9	47	34.3
18-23	28	43.8	22	30.1	50	36.5
24-36	4	6.3	5	6.8	9	6.6
Sex						
Male	40	62.5	40	54.8	80	58.4
Female	24	37.5	33	45.2	57	41.6
History of Infectious Disease						
Yes	48	75	37	50.7	85	62
No	16	25	36	49.3	52	38
Immunization Status						
Incomplete	15	23.4	23	31.5	38	27.7
Complete	49	76.6	50	68.5	99	72.3
History of breastfeeding and complementary feeding						
Poor	12	18.8	15	20.5	27	19.7
Good	52	81.2	58	79.5	110	80.3
Family Characteristic						
Household family member						
≤ 4 people	56	87.5	62	84.7	118	86.0
> 4 people	8	12.5	11	15.3	19	14.0
Family income						
< Minimal labor income	31	48.4	28	38.4	60	43.1
≥ Minimal labor income	33	51.6	45	61.6	82	56.9
Father's education						
< Senior High School	60	93.8	70	95.9	130	94.9
≥ Senior High School	4	6.2	3	4.1	7	5.1
Mother's education						
< Senior High School	48	75	54	74.0	102	74.5
≥ Senior High School	16	25	19	26.0	35	25.5
Mother employment status						
Unemployed	55	85.9	68	93.2	123	89.8
Working	9	14.1	5	6.8	14	10.2
External Family Function (SCREEM Score)						
Moderate	52	81.3	54	74.0	106	77.4
Adequate	12	18.7	19	26.0	31	22.6
Internal Family Function (APGAR Score)						
Dysfunctional family	19	29.7	8	11.0	27	19.7
Functional family	45	70.3	65	89.0	110	80.3
Hygiene						
Poor	37	57.8	48	65.8	85	62
Good	27	42.2	25	34.2	52	38

on the SCREEM score and APGAR score. It indicated that the number of families with non-stunting toddlers is more likely to have adequate family functions and functional families, respectively, compared to families with stunting toddlers.

The results of the different test analysis between each of the SCREEM and APGAR indicators in respondent families showed that there was no difference in external family function scores. However, the overall score for external family function indicated that families with stunting children had lower scores than families with non-stunting toddlers. Based on the results of the internal family function (APGAR) difference test, it was found that there was a difference in scores between family groups with stunting and non-stunting toddlers. The most influential indicator was the growth indicator (p: 0.046).

Table 2. Distribution of Family Function Indicators by Stunting Status

Characteristics	Mean (±s. d)		p-value
	Stunting	Non-stunting	
Internal Family Function (APGAR Indicators)			
Adaptation	1.7 (±0.494)	1.70 (±0.456)	0.910
Partnership	1.31 (±0.614)	1.30 (±0.594)	0.914
Growth	1.47 (±0.616)	1.67 (±0.554)	0.045
Affection	1.39 (±0.553)	1.52 (±0.530)	0.163
Resolve	1.61 (±0.553)	1.73 (±0.507)	0.200
Total Score	7.55 (±1.425)	8.00 (±1.213)	0.046
External Family Function (SCREEM Indicators)			
Social	2.08 (±0.27)	2.1 (±0.414)	0.770
Culture	2.11 (±0.362)	2.1 (±0.379)	0.996
Religion	2.16 (±0.366)	2.26 (±0.472)	0.156
Economy	1.62 (±0.63)	1.74 (±0.578)	0.268
Education	1.91 (±0.495)	1.71 (±0.612)	0.045
Medicine	2.16 (±0.366)	2.18 (±0.385)	0.735
Total Score	12.03 (±1.755)	12.08 (±1.824)	0.868

The fixed model table shows that internal family function has a relationship with stunting in toddlers (p-value: 0.013; OR: 3.44; 95% CI: 1.299-9.107). This result indicates that toddlers in dysfunctional families have a 3.44 times greater risk of stunting than toddlers in functional families after controlling for factors such as the history of infectious diseases. Internal family function is defined as the process of communicating, relating, and making decisions to solve problems among family members or within the family (Go et al., 2022). Scores for internal and external family function indicators showed that families with stunted children had lower scores than families with non-stunted children.

There has been no specific research to determine the effect of family function on the incidence of stunting. However, previous studies have shown that there is a relationship between family function and the nutritional status of children (Go et al., 2022). Growth indicators suggest that family support plays a role in providing freedom for family members to make decisions and engage in activities. Internal family functions include broad child support, encompassing physical, emotional, educational, and socialization needs. Physical needs include safety, nutrition for growth, shelter, and healthcare. Emotional support includes affection, stimulation, communication, guidance/discipline, and support for education, while socialization involves values, relationships, community, and formal schooling. Families play a vital role in supporting the growth of children (Marcdante, K.J., and Kliegman, R.M., 2019).

Internal and external influences on the family are defined by the emotional support and psychological environment within the family,

Table 3. Full Model Multivariate of the Relationship Between Family Function and Stunting

Variable	p-value	OR	95%CI
APGAR Score (Internal Family Function)			
Dysfunctional Family	0.010*	3.909	1.379-11.087
Functional Family	Ref		
SCREEM Score (External Family Function)			
Moderate	0.209	1.900	0.698-5.171
Adequate	Ref		
Child's Sex			
Male	0.813	1.106	0.481-2.542
Female	Ref		
Child's Age			
6-11	Ref		
12-17	0.112	0.375	0.112-1.258
18-23	0.032*	0.237	0.064-0.881
24-36	0.252	0.312	0.039-1.966
History of Infectious Diseases			
Yes	0.014*	3.055	1.248-7.477
No	Ref		
History of Breastfeeding and Complementary Feeding			
Poor	0.795	0.895	0.387-2.068
Good	Ref		
Immunization Status			
Incomplete	0.554	0.748	0.286-1.956
Complete	Ref		
Hygiene			
Poor	0.317	1.619	0.630-4.159
Good	Ref		
Father's Education			
< Senior High School	0.341	0.361	0.044-2.937
≥ Senior High School	Ref		
Mother's Education			
< Senior High School	0.626	1.308	0.444-3.857
≥ Senior High School	Ref		
Maternal Employment Status			
Unemployed	0.138	0.321	0.072-1.441
Working	Ref		
Family Income			
< Minimal Labor Income	0.412	0.705	0.305-1.626
≥ Minimal Labor Income	Ref		
Household Family Member			
≤ 4 people	Ref		
> 4 people	0.671	1.288	0.401-4.132

Table 4. Fixed Model of Multivariate Analysis

Characteristics	p-value	OR	95%CI
Internal Family Function (APGAR Score)			
Dysfunctional Family	0.013	3.440	1.299-9.107
Functional Family	Ref		
History of Infectious Disease			
Yes	0.006	2.917	1.359-6.262
No	Ref		

which can be influenced by the family's access to satisfaction, and impacted by socioeconomic factors (Go et al., 2022). However, the external family function (SCREEM) score showed no relationship with the incidence of stunting. This result may be due to the stronger influence of internal family functions on the incidence of stunting in the study population. These results align with previous studies, which also showed no relationship between external family function and the nutritional status of children (Hanifah et al., 2017).

The study found no association between sex and the incidence of stunting, which is consistent with several previous studies that reported no relationship between the child's sex and stunting (Huriah and Nurjannah, 2020; Utami et al., 2019). However, in this study, the age of children had no relationship with the incidence of stunting, which differed from previous studies suggesting that children aged 24-59 months had a higher risk of stunting compared to children aged 6-23 months (Huriah and Nurjannah, 2020). The result was likely influenced by other dominant variables in the analysis.

The number of family members may affect the incidence of stunting in several ways. Previous studies have indicated that an increasing number of family members can influence economic factors and family hygiene, leading to insufficient food intake for children and increased exposure to infections due to an unsanitary environment (Fadjriah et al., 2021a; Shinsugi and Mizumoto, 2022). However, in this study, there was no relationship found between the number of family members and the incidence of stunting, which could be due to nearly the same proportion of samples in both stunting and non-stunting groups.

This study showed that there was no influence of socioeconomic factors on the incidence of stunting in children. This result may be influenced by the dominant factors found in the analysis, namely internal family function and the history of infectious diseases, or due to other factors that have not been analyzed in this study. Previous studies have suggested that family income was the most influential factor in the incidence of stunting in children under 5 years of age. High family income supports families in achieving food security and provides easier access to education and health services (Berhe et al., 2019; Diana et al., 2020; Huriah and Nurjannah, 2020; Wicaksono et al., 2021).

This study also showed that there was no relationship between parental education and the incidence of child stunting. The proportion of fathers with less than senior high school education in the stunting and non-stunting toddler groups was 93.8% and 95.9%, respectively. These results differ from several previous studies that reported an effect of a father's education on stunting. A similar trend was observed for maternal education, where the proportion of mothers with less than senior high school education was almost the same in the stunting and non-stunting groups. Previous studies have shown that parental education is associated with the incidence of stunting in children (Laksono et al., 2019; Wicaksono et al., 2021). Parental education is related to parental income and the ability to provide good caregiver services for their children while parents are at work (Laksono et al., 2019). Maternal education, especially, is a significant factor in the incidence of stunting in children. Mothers with higher levels of education are more likely to receive and understand knowledge about nutrition, health, and food better (Halimatunnisa et al., 2020; Laksono et al., 2019). Knowledge of maternal nutrition is crucial, especially in the first 1000 days of a child's life. Stunting can be related to malnutrition during pregnancy, where malnutrition with excess calories and micronutrient deficiencies can impact the child's future growth. Good maternal knowledge about nutrition and food is related to countering the negative influence of myths, beliefs, and traditions in Indonesia regarding food choices during pregnancy. Myths about food in Indonesia can affect the mother's food choices during pregnancy and may impact the success of exclusive breastfeeding and the timely introduction of complementary foods (Halimatunnisa et al., 2020; Wicaksono et al., 2021).

Immunization can reduce the incidence of repeated infections in children, thus affecting their nutritional status. However, there was no relationship between immunization and the incidence of stunting in this study. Previous studies have shown that immunization can prevent recurrent infections in children (Budiastutik and Nugraheni, 2018; Wahyuni et al., 2021). The proportions of children with stunting and non-stunting status were equal in terms of immunization status. This may be due to the success of the immunization program coverage in Indonesia, resulting in homogeneous proportions of complete immunizations between stunting and non-stunting groups.

In the variables of breastfeeding and complementary feeding, there was no relationship with the incidence of stunting. The proportions of breastfeeding behavior and complementary feeding were the same in the stunting

and non-stunting groups, with both being 18.8% and 20.5%, respectively. This result may be attributed to chance characteristics of the participants in this study. Exclusive breastfeeding in infants up to 6 months of age has been shown to be associated with stunting in previous studies. Breastfeeding until the age of 6 months without additional feeding provides complete immunization and reduces the frequency of diarrhea and other gastrointestinal diseases in children. Exclusive breastfeeding offers benefits to children in the first six months, such as reducing the risk of infection and increasing immunity, as reported by studies conducted in Sri Lanka (2012) and Central Java (2018). Another study found that 70.1% of stunting subjects were not given exclusive breastfeeding (Cetthakrikul et al., 2018; Wicaksono et al., 2021).

Environmental hygiene, especially the hygiene of drinking water, food safety, and personal hygiene, affects the incidence of stunting (Shinsugi and Mizumoto, 2022). However, in this study, no relationship was found between the hygiene variable and the incidence of stunting. The number of non-stunting groups had poorer hygiene scores than the stunting group. This may be due to changes in the participants of this study. Poor hygiene implementation is associated with stunting events, as it allows a connection to infectious diseases (Fadjriah et al., 2021a).

The study further found a relationship between a history of infection in children and the incidence of stunting. A history of infectious diseases in children was the strongest confounding factor in the relationship between internal family function and stunting. The incidence of infection and malnutrition influence each other, where children with malnutrition are more at risk of infection, and frequently infected children are at risk for malnutrition. Children suffering from diarrhea and/or ARI experience a lack/loss of appetite and nutrient malabsorption. If the child's nutritional intake is inadequate, it can lead to an imbalance between the body's requirements and food intake. Infectious diseases increase nutritional requirements due to increased metabolism. The impact of infection is the excessive use of energy to overcome the disease, which hampers adequate energy utilization for the child's growth and development. Therefore, children who suffer from infectious diseases tend to experience malnutrition (Walson and Berkley, 2018). This can simultaneously increase the risk of malnutrition or worsen existing conditions of malnutrition (Soekatri et al., 2020). The relationship between infectious diseases and the incidence of stunting in toddlers has been proven in previous studies (Fadjriah et al., 2021b; Pacheco et al., 2017; Permatasari and Sumarmi, 2018; Vonaesch et al., 2017).

CONCLUSION

There was a correlation between internal family function and stunting in toddlers, with a history of infectious diseases as a confounding factor. However, there was no relationship between the external function of the family and the incidence of stunting. Interventions targeting internal family functions and the elimination of infectious diseases can be considered to improve the stunting program.

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