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**Abstract**

Stunting is a condition of failure to thrive in children under five due to chronic malnutrition, especially in the first 1000 days of Life. Stunting is closely related to the growth and development of the brain and the risk of suffering from chronic diseases in adulthood. Multi-factors that caused stunting include nutrition intake, toddler health status, maternal characteristics, parity, breastfeeding history, and the environment sanitation. This study aimed to identify the factors associated with the incidences of stunting in children under five years. This study was a quantitative study with a cross-sectional approach. This study was conducted from April to October 2019. This study involved 220 toddlers aged 1-5 years with their mothers. Study revealed that number of children were statistically correlated with to the incidence of stunting (p-value 0.005). There were three factors associated with the incidence of stunting in children under five years of age These factors are parity, history of exclusive breastfeeding, and mother's knowledge. The parity factor or the number of children is the most related factor with the incidence of stunting in children (p-value 0.007). Mothers of toddlers must be motivated to provide adequate nutrition in accordance with the needs at the age of growth and development. Government programs to overcome stunting need to start from family planning and the quality of performance of nutrition programs, one of which is intensive nutrition education for pregnant women and mothers of toddlers.

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## 1. INTRODUCTION

Health indicators in the *Millennium Development Goals* (MDGs) place the nutritional status of children under five as an important target for success in a country. Toddlers are a group that is prone to experiencing malnutrition, one of which is stunting. Stunting or short is a linear growth disorder caused by malnutrition in chronic nutrient intake or chronic or recurrent infectious diseases as indicated by the Z-score of height for age (H/A) which is less than -2 SD (1). *United Nations Children's Fund* (UNICEF) records the number of children under five in the world who are stunted as much as 22.2% (2). Data in Southeast Asia in 2018 reveal that the number of children under five who are stunted is 35% (3). Results of Basic Health Research in 2013 show that the prevalence of stunting in Indonesia reached 37.2%, and based on Nutrition Status Monitoring in 2016, it reached 27.5%. This figure exceeds the limit that has been set by the World Health Organization (WHO), which is <20%. These data show that around 8.9 million Indonesian children experience sub-optimal growth or, in other words, 1 of 3 Indonesian children is stunted. The heights of more than 1/3 of children under 5 years of age in Indonesia are below average (4).

The problem of stunting in children under five in West Java shows the mean rate of 35.3% and the highest prevalence of stunting is in West Bandung Regency (52.5%) (5). Karawang Regency is one of the areas in West Java which also still has stunting problems in most of the children under five. The results of a preliminary field study conducted by the researchers in August 2018 show that health workers at Wadas Health Center admit that there are still many incidences of stunting, especially in pre-school children in the area.

Stunting in children under five is caused by multi-dimensional factors. This is often associated with poor parenting practices, limited health services including Ante Natal Care (ANC) services, quality post-natal and early learning, lack of access to nutritious food, and lack of access to clean water and sanitation (6). The factors related to the chronic nutritional status of children under five differ between urban and rural areas, so efforts to overcome them must be adjusted with these related factors (28).

This study specifically wanted to identify the relationship between maternal knowledge about health and nutrition, availability of health services, availability of access to nutritious food, and availability of access to clean water and sanitation with the incidence of stunting in Wadas Village after being controlled by other factors. This study can be useful for the basic justification for the creation of programs for prevention and management of stunting in children under five in Wadas Village and other areas with similar characteristics.

## 2. Methods

This study involved mothers and their toddler children. The total number of samples in this study was 220 mothers and children aged 1 to 5 years. This study was a quantitative analysis study with a cross-sectional approach. This study was conducted from April to October 2019.

This study has previously obtained ethical suitability information from the Ethics Commission for Health Research and Development (KEPPK) of Sekolah Tinggi Ilmu Kesehatan Sint Carolus number 019/KEPPKSTIKSC/V/2019.

Data were collected using a questionnaire and nutritional status measurement was done using the anthropometric tools. The questionnaire consisted of data on child characteristics, mother characteristics, and environmental sanitation. The dependent variable, namely the incidence of stunting, was classified into stunting and non-stunting. Stunting was defined as WHO HAZ below -2 SD according to the gender of the child. The independent variable consisted of 13 variables that were asked directly to the mother of the toddler about the toddler's age, history of Early Breastfeeding Initiation, history of exclusive breastfeeding, history of complementary feeding, history of illness in the last 1 month, history of

immunization, mother's age, mother's education, mother's job, household income, parity, mother's knowledge of stunting, and environmental sanitation.

Questionnaire and anthropometric data were analyzed with descriptive analysis to show the frequency distribution of the variables. Bivariate analysis was done using the Chi-Square test and Kendall's Tau to see the significance of the relationship of the stunting variable in children and the independent variables. Multivariate analysis was done using the Multiple Logistic Regression test to see the factors most associated with stunting in children under five years of age, namely the history of breastfeeding and the number of children in the family.

### 3. Results

#### *Descriptive analysis*

This study involved 220 toddlers and their mothers. Study found that most of children aged 1-3 years (55.9%); majority of children with a history of early breastfeeding initiation were (63.2%); majority of children did not receive exclusive breastfeeding (63.2%); most of children with history of receiving complementary feeding at age of > 6 months (86.4%); majority of children had a history of illness in the last month (75.9%); most of children have received complete basic immunization (80.9%) (Table 1).

**Table 1.** Children Characteristics (N=220)

<b>Children Characteristics</b>	<b>n</b>	<b>%</b>
<b>Children age</b>		
1-3 years	123	55.9
3-5 years	97	44.1
<b>History of Early Breastfeeding Initiation</b>		
Breastfeeding initiation was not carried out	81	36.8
Breastfeeding initiation was carried out	139	63.2
<b>Exclusive Breastfeeding History</b>		
Did not get exclusive breastfeeding	139	63.2
Got exclusive breastfeeding	81	36.8
<b>History of Complementary Feeding</b>		
Did not get complementary feeding	30	13.6
Got complementary feeding	190	86.4
<b>History of Illness (in last 1 month)</b>		
Had no history of illness	53	24.1
Had a history of illness	167	75.9
<b>History of Immunization</b>		
Was not Given Immunization	2	0.9
Incomplete Immunization	40	18.2
Complete Immunization	178	80.9

**Table 2.** Toddlers' Mothers Characteristics (N=220)

<b>Toddlers' Mothers Characteristics</b>	<b>n</b>	<b>%</b>
<b>Maternal Age</b>		
Late Adolescence (17-25 years)	37	16.8
Early Adult (26-35 years)	110	50
Late Adult (36-45 years)	73	33.2
<b>Mothers' last education</b>		
Primary level	64	29.1
Secondary level	122	55.5
Tertiary level	34	15.5

<b>Toddlers' Mothers Characteristics</b>	<b>n</b>	<b>%</b>
<b>Mother's Occupation</b>		
Does not work	200	90.0
Work	20	9.1
<b>Number of children</b>		
1 Child	49	22.3
2 Children	80	36.4
3 Children	59	26.8
4 Children	21	9.5
5 Children	5	2.3
More than 5 Children	6	2.7
<b>Household Income</b>		
Less than Minimum Wage	84	38.2
Greater than or equal to Minimum Wage	136	61.8
<b>Mother's Knowledge</b>		
Moderate	32	14.5
Good	188	85.5

Study also revealed most of mothers (50%) were in early adulthood (26-35 years); majority of them had their latest education in the secondary level (55.5%); majority of them (90%) were not working; most of mothers had more than one child; most of them had a higher household income than minimum wage (61.8%); and majority of mothers had good knowledge about stunting (85.5%) (Table 2).

**Table 3.** Environmental Sanitation Characteristics & Incidence of Stunting in Children (N = 220)

<b>Environmental Sanitation Characteristics</b>	<b>n</b>	<b>%</b>
Bad sanitation	80	36.4
Good sanitation	140	63.6
<b>Toddler Stunting Incidence</b>		
Not Stunting	187	85
Stunting	33	15

Table 3 showed that 140 mothers (63.6%) had good household environmental sanitation and still 33 children (15%) experienced stunting.

### ***Bivariate Analysis***

Study results showed there was no correlation between the toddler's age and the incidence of stunting (p-value 0.332). Table 4 showed that 20 children (14.4%) experience stunting based on History of Early Breastfeeding Initiation data. Study results using chi-square analysis there was no correlation between the history of early breastfeeding initiation and the incidence of stunting (p-value 0.739). Data on history of not getting exclusive breastfeeding also showed that 24 children (17.3%) experienced stunting and also revealed that there was no correlation between the history of exclusive breastfeeding and the incidence of stunting (p-value 0.218).

Study also revealed that 29 children (15.3%) experienced stunting based on history of getting complementary feeding > 6 months of age. Study results also showed that there was no correlation between the history of getting complementary feeding with the incidence of stunting a (p-value 0.783). This study also showed most of children under five (85%) who had a history of illness (cold cough, diarrhea, and pulmonary tuberculosis) in the last 1 month

not experienced stunting, whereas there were 25 children under five (15%) who had a history of illness experienced stunting.

Study results showed that there was no correlation between the history of illness and the incidence of stunting (p-value 0.982). Despite 8 children under five years of age (toddlers) (19%) had a history of complete immunization, but there were 25 children (14%) who did not receive complete immunization experienced stunting. Study showed also showed that there was no correlation between the history of childhood immunization and the incidence of stunting (p-value 0.414).

**Table 4.** Correlation Analysis of Children Characteristics with Incidence of Stunting

Variable	Stunting Incidence		total n (%)	p-value
	Not Stunting n (%)	Stunting n (%)		
<b>Children Age</b>				
1-3 years	102 (82.9)	21 (17.1)	123 (100)	0.332
3-5 years	85 (87.6)	12 (12.4)	97 (100)	
<b>History of Early Breastfeeding Initiation</b>				
Breastfeeding initiation was not carried out	68 (84.0)	13 (16.0)	81 (100)	0.739
Breastfeeding initiation was carried out	119 (85.6)	20 (14.4)	139 (100)	
<b>Exclusive Breastfeeding History</b>				
Did not get exclusive breastfeeding	115 (82.7)	24 (17.3)	139 (100)	0.218
Got exclusive breastfeeding	72 (88.9)	9 (11.1)	81 (100)	
<b>History of Complementary Feeding</b>				
Did not get complementary feeding	26 (86.7)	4 (13.3)	30 (100)	0.783
Got complementary feeding	161 (84.7)	29 (15.3)	190 (100)	
<b>History of Illness (in last 1 month)</b>				
Had no history of illness	45 (84.9)	8 (15.1)	53 (100)	0.982
Had a history of illness	142 (85.0)	25 (15.0)	167 (100)	
<b>History of Immunization</b>				
Incomplete Immunization	153 (86.0)	25 (14.0)	178 (100)	0.414
Complete Immunization	34 (81.0)	8 (19.0)	42 (100)	

\* $\alpha=0.05$

**Table 5.** Correlation Analysis of Mothers' and Environmental Characteristics with Incidence of Stunting in Children

Variable	Stunting Incidents		total n (%)	p-value
	Not Stunting n (%)	Stunting n (%)		
<b>Maternal Age</b>				
Late Adolescence (17-25 years)	32 (86.5)	5 (13.5)	37 (100)	0.316

Variable	Stunting Incidents		total n (%)	p-value
	Not Stunting n (%)	Stunting n (%)		
Early Adult (26-35 years)	96 (87.3)	14 (12.7)	110 (100)	
Late Adult (36-45 years)	59 (80.0)	14 (19.2)	73 (100)	
<b>Mothers' last education</b>				
Primary level	52 (81.3)	12 (18.8)	64 (100)	0.312
Secondary level	105 (86.1)	17 (13.9)	122 (100)	
Tertiary level	30 (88.2)	4 (11.8)	34 (100)	
<b>Mother's Occupation</b>				
Does not work	170 (85.0)	30 (15.0)	200 (100)	1.000
Work	17 (85.0)	3 (15.0)	20 (100)	
<b>Number of children</b>				
≤ 2 children	165 (87.8)	23 (12.2)	188 (100)	0.005
> 2 Children	22 (68.8)	10 (31.3)	32 (100)	
<b>Household Income</b>				
Less than Minimum Wage	72 (85.7)	12 (14.3)	84 (100)	0.816
Greater than or equal to Minimum Wage	115 (84.6)	21 (15.4)	136 (100)	
<b>Mother's Knowledge</b>				
Moderate	25 (78.1)	7 (21.9)	32 (100)	0.239
Good	162 (86.2)	26 (13.8)	188 (100)	
<b>Environment sanitation</b>				
Bad sanitation	66 (82.5)	14 (17.5)	80 (100)	0.432
Good sanitation	121 (86.4)	19 (13.6)	140 (100)	

\* $\alpha=0.05$

Study results revealed there was no correlation between the maternal age (p-value 0.316), mothers last education (p-value 0.312), mothers' occupation (p-value 1.000), household income (p-value 0.816), mothers' knowledge of stunting (p-value 0.239), and environment sanitation (p-value 0.432) with the incidence of stunting in children. On the contrary, number of children were statistically correlated with to the incidence of stunting (p-value 0.005).

### **Multivariate Analysis**

Analysis of the most related factors used the Multiple Logistic Regression test. The results of multivariate analysis showed that there were three factors associated with the incidence of stunting in children under five years of age. These factors are parity, history of exclusive breastfeeding, and mother's knowledge. The parity factor or the number of children is the most related factor with the incidence of stunting in children (p-value 0.007) (Table 6).

**Table 6.** Analysis of the Factors Most Related to the Incidence of Stunting in Children

	Variable	B	Sig	Exp (B)
Step	Number of children	1.204	0.007	3.333
1a	Knowledge	-.505	0.302	0.603
	History Exclusive breastfeeding	-.571	0.183	0.565
	Constant	1.242	0.011	3.463
Step	Number of children	1.220	0.006	3.386

2a	History Exclusive breastfeeding	-.570	0.182	0.565
	Constant	1.142	0.016	3.134
Step	Number of children	1.182	0.007	3.261
3a	Constant	0.788	0.039	2.200

\* $\alpha=0.05$

#### 4. Discussion

Toddlers are children under 5 years of age with fast growth characteristics at the age of 0-1 years, the age characteristics of toddlers are divided into two groups, namely toddlers aged 1-3 years who are passive consumers, meaning that they receive food provided by their parents and pre-school children aged 3-5 years who are active consumers, meaning that they can choose the food they like (7). As children age, the risk of becoming stunted becomes greater, children aged 12-17 months have a 1.51 times greater risk compared to children aged 6-11 months (95% CI: 1.33-1.71), children aged 18- 23 months have a 1.7 times greater risk of becoming stunted than children aged 6–11 months (95% CI: 1.51–1.92) (8). Another study also explains that children who experience stunting in younger age (2 years old) is 21.1% less than children aged 4-5 years (9). In this study, the incidence of stunting tends to occur in younger children aged 1-3 years. Meanwhile, in children aged >3-5 years, the incidence of stunting was less. Stunting is an indicator of chronic nutritional status that describes stunted growth due to long-term malnutrition (10). The incidence of stunting has a trend along with the increasing age because children do not have the opportunity to catch up with growth at a previous age.

Research results showed that there was no correlation between the history of early breastfeeding initiation with the incidence of stunting. This result is in line with study research result of 76 children in Tanjung Pauh, which show no significant difference in the prevalence of stunted children based on breastfeeding initiation(11). Early Breastfeeding Initiation more than 1 hour is recommended to help the continuity and success of exclusive breastfeeding (11). Exclusive breastfeeding is strongly associated with a reduced risk of stunting, where exclusive breastfeeding is protective against the incidence of stunting in children, but it is not significant, both for exclusive breastfeeding > 6 months (OR = 0.99, 95% CI 0.63-1.59) and exclusive breastfeeding for 4 - <6 months (OR = 0.93, 95% CI: 0.63-1.39). Inadequate breastfeeding and poor complementary feeding both in quality and quantity may affect negatively on children growth and cause stunting (12).

This study found that children who did not receive exclusive breastfeeding experienced stunting, but there were also who received exclusive breastfeeding but still experienced stunting. Exclusive breastfeeding that is given optimally will greatly increase the nutritional status and reduce the incidence of stunting in children. Exclusive breastfeeding is the main source of nutritional needs in the first 6 months of life for growth during the *windows of opportunity* (12). Study also found that children who received complementary breastfeeding experienced stunting. There is a significant relationship between the first time the complementary breastfeeding is given, and the nutritional status of children aged 6-23 months using the height for age (H/A) index which has a 2.8 times greater effect on the incidence of stunting (13). Complementary feeding can only meet 60% of the total daily energy needs, thus this intake is still very low when compared to WHO recommendations. Supposedly the composition of complementary feeding should continue to change and be increased as the baby gets older, where carbohydrates become the main energy contribution. The inability to buy good quality solid food for children may cause children to be malnourished. Therefore, exclusive breastfeeding, especially for children who come from poor families, is an effort that must be optimized (12).

The results of the study which related to the history of illness show that more than half of the children's respondents had a history of acute respiratory infection and diarrhea

with a duration of  $\leq 3$  days per illness episode, a history of illness frequency  $\leq 6$  episodes of illness per year (14). Infectious diseases are diseases caused by pathogenic microorganisms, such as bacteria, viruses, parasites, or fungi. These diseases can spread either directly or indirectly, from one individual to another. Toddlers are an age group that is susceptible to disease, one of the diseases that is often experienced by toddlers is infectious diseases, namely acute respiratory infection, and diarrhea (15). This is in line with the results of this study, which reveal that the diseases experienced by toddlers included colds cough, diarrhea, and pulmonary tuberculosis. Other research results reveal that infectious diseases can reduce food intake, disturb absorption of nutrients, directly cause a loss of nutrients, and increase metabolic requirements (15). There is reciprocal interaction between nutritional status and illness of infectious diseases. Malnutrition can increase the risk of infection, whereas infection can cause malnutrition. If this condition occurs for a long time and is not immediately treated, it can reduce food intake and interfere absorption of nutrients, thus increasing the risk of stunting in children under five years of age.

This study showed that toddlers who had a history of illness in the last one-month experienced stunting and the types of illness that are often experienced by toddlers include cold cough and diarrhea. This study also found that there was no correlation between the history of illness and the incidence of stunting. Other studies also stated that there is no significant relationship between a history of illness/infectious diseases and the incidence of stunting with a p value of 0.297 (p value  $>0.05$ ). Some study argue that infection is only measured over a period of three months regardless of previous year history of infection (16). In addition, the existence of a nearby IHC makes it easier for mothers to bring their children for treatment thus early treatment of illness of infectious diseases is better.

The results of this study showed that toddlers who have a complete history of immunization experience stunting but statistical analysis showed that there was no correlation between the history of immunization and the incidence of stunting. In line with this another study also found history of immunization were not correlated with the incidence of stunting (17). Toddlers are a group that really needs immunization because at their age, their immunity is not as good as adults (18). Another study showed that 52 children under five years of age (77.6%) have a complete basic immunization status (14). This is also supported by some research results which reveal that 100% of children under five years of age (25 - 60 months) receive complete basic immunization (19). The immunity of children is influenced by other factors such as nutritional status and the presence of pathogens (16). There is a term "herd immunity" or community immunity in immunization, where individuals who do not receive an immunization program become protected because most of the other individuals in the group are immune to the illness/disease after receiving immunization (20).

The results of this study showed that mothers who are in late adulthood (36-45 years) have children who experience stunting and there was no correlation between the maternal age and the incidence of stunting. Maternal age is considered more of a role as a psychological factor of the mothers that affects their parenting patterns, in this case the pattern of care for feeding the children (21). Early adulthood is a period of reproductive age, which is marked by the desire to get married and form a household. This period, especially for women before 30 years old, is a reproductive period, where a woman is ready to accept the responsibility of being a mother. At this period the organs of human reproduction have reached maturity and are ready to reproduce (11). Women try to adjust to their married life, parental roles, and careers. At the age of 30-40 years, the adjustment is more focused on relationships in the family.

This study found that mothers with low education level were not correlated with the incidence of stunting in their children. Other research results also stated that there was no relationship between maternal education and the incidence of stunting (p-value 0.155) (22). The insignificant level of maternal education is thought to be related to the mother's employment status where highly educated mothers usually have jobs. In this study, mothers



who have low education feel insecure, thus they interact less with their environment, which eventually make the information they get about nutritional intake is less (22). Another study also showed that most of the mothers (68.5%) who are in the working area of Siantan Hulu Health Care, North Pontianak District, have a low level of education (23). Working parents must spend more time outside the home due to busy work. This mothers' occupation and work life will affect their family life and children health and growth. Another study also found that mothers who also work have children who experienced stunting (18.8%) (24). The number of children is closely related to the Total Fertility Rate (TFR) which is an important reference figure for the National Population and Family Planning Board. The number of children is also included in the socio-demographic factors that can affect the social, economic, and level of household welfare conditions. National Development Planning Agency also shows that regions with high TFR have high rates of stunting as well (25).

This study also revealed that the number of children were correlated with the incidence of stunting among. In line with this study, another study stated number of children in the family greatly affects the adequacy of children's nutritional intake because of the risk of being shared with other family members (26). The greater the number of children is a significant risk factor for the incidence of low-birth-weight baby. Mothers with more than 3 children have a 2.4 times greater risk of giving birth to LBW baby, thus the nutritional status of the toddlers is not sufficient since infancy and toddlerhood (21).

This study showed that family income as well as maternal knowledge were not correlated with the incidence of stunting in children. In line with this study Setiawan et al. also found that there was no correlation between the level of maternal knowledge about nutrition as well as the family income with the incidence of stunting (14). This study argues that the income levels are not directly related to the incidence of stunting. The income levels are more closely related to one's education level because income tends to increase according to one's education level. Mother's knowledge is also directly related to one's education level. Good knowledge will help the mother in determining and choosing the right food for the child's growth, but there are other factors that also influence it such as household stability, parent's personality, and family income, thus knowledge does not directly determine the incidence of stunting in children (8).

This study revealed that sanitation is not directly related to the incidence of stunting. This is in line with the Framework for the Causes of Stunting in Indonesia, which states that environmental factors are an indirect cause of stunting (26). Environmental sanitation is directly related to the health status of the family, one of which is the toddler in the family; and it is also closely related to environmental diseases such as diarrhea, helminthiasis, and acute respiratory infection (16). Stunting prevention in accordance with the national strategy involves the availability of clean water and environmental sanitation. These factors are expected to prevent illness/diseases that cause malnutrition in children.

This study results showed that three factors associated with the incidence of stunting in children were parity, history of exclusive breastfeeding, and mother's knowledge. The parity factor or the number of children is the factor most closely related to the incidence of stunting in children. The number of children is also included in the socio-demographic factors that can affect the social, economic, and level of household welfare conditions, and affects the adequacy of children's nutritional intake (26). Another study also stated that a higher number of children cause a higher risk of stunting in children under five (27).

## **5. Conclusion**

This research revealed that the number of children were correlated with the incidence of stunting in children under five years of age. In the contrary another factors of children's age, history of early breastfeeding initiation, history of exclusive breastfeeding, history of complementary feeding, history of illness, and history of immunization, maternal age,

mothers' last education and occupation, maternal knowledge, family income, and sanitation were not related to the incidence of stunting in children. Government programs to overcome stunting need to start from the quality of performance of nutrition programs, one of which is intensive nutrition education for pregnant women and mothers of toddlers. Health services also need to pay attention to the family planning and number of children in the family, so that mothers and fathers can determine and provide the right food for their children according to their age, growth, and development needs.

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