



The Relationship between The Amount and Frequency of Milk Consumption with The Incidence of Stunting in Semarang City

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ABSTRACT

Semarang has succeeded in reducing the stunting rate by 8.6% so that in 2021 the prevalence became 21.3%. The district with the highest prevalence in Semarang City is Central Semarang with a stunting rate of 7.25%. Efforts to reduce the prevalence of stunting need to be carried out further so that the incidence of stunting in Semarang City can exceed the WHO target. Lack of milk consumption is one of the factors that causes stunting. This study used a case-control design by examining nutritional status height/age (stunting) as the dependent variable, amounts, and frequency of milk consumption as independent variables, as well as mother's knowledge, father's education, mother's education, father's occupation, mother's occupation, family income, history Exclusive breastfeeding, and infectious diseases as confounding variables. The research subjects were 24 mothers of stunted toddlers and 24 mothers of toddlers who were not stunted. Bivariate data analysis was performed using the Chi-Square or Fisher test as an alternative. Then the results of the bivariate analysis were selected to be continued in multivariate analysis using the logistic regression test. After controlling for confounding variables, the most dominant variable with the incidence of stunting is the amount of milk consumption with an OR value of 12.5. Toddlers with milk consumption ≤ 38 g/day will have a 12.5 times higher risk of experiencing stunting.

Keywords: stunting, sweet condensed, exclusive breastfeeding

INTRODUCTION

Stunting is a condition of a short body compared to children his age due to chronic malnutrition for a long time. This nutritional problem occurs due to inadequate nutrition in the first 1000 days of life (1000 HPK) (Setiawan et al., 2018). A stunted child is characterized by a TB/U z-score of less than -2SD (Halim et al., 2018). According to data from the Ministry of Health (2021), the prevalence of stunting in Indonesia decreased by 2.5% from the previous year, which was 24.4%. However, this figure is still higher than neighboring countries such as Vietnam (23%), Malaysia (17%), Thailand (16%), and Singapore (4%).

Central Java is one of the regions that can reduce the stunting rate well. Based on data from the Indonesian Nutritional Status Study (SSGI), the stunting rate in Central Java has decreased significantly, 2013 It had a prevalence of 37%, in 2018 it had a prevalence of 31%, and in 2021 it

had a prevalence of 20.9% Despite the decline, the incidence of stunting in Central Java remains a serious health problem because its prevalence is still above the standard set by WHO, which is 20%.

In 2021, Semarang City succeeded in reducing the stunting rate rapidly, which was 8.6%, namely in 2019 with a prevalence of 29.73% to 21.3% based on the results of SSGI in 2021. Central Semarang District is the central government area of Semarang City, which based on prevalence data from the City Health Office in 2021 is the highest rank that has stunting toddlers with a prevalence of 7.25% or equal to 118 stunting toddlers out of 1625 toddlers measured. Efforts to reduce the stunting prevalence rate need to be carried out further so that the incidence of stunting in Semarang City can exceed the WHO target.

Direct factors that cause stunting are food intake and infectious diseases (Wibowo et al., 2022). Energy and protein intake play an important role in supporting growth and development in children, especially to prevent stunting. Previous research produced data that a lack of energy intake risks increasing the incidence of stunting in children by 6.1 times, while a lack of protein intake risks increasing the incidence of stunting by 5.2 times (Aisyah & Yuniarto, 2021). One source of protein recommended for consumption in toddlers is milk because it is a source of animal protein that has superior characteristics (Sjarif et al., 2019).

Research by Duan et al. (2020) shows that milk consumption is associated with a 1.9% reduction in stunting rates in middle and low-income countries. This statement is in line with research on toddlers in Denmark which proves that consuming milk is positively correlated with IGF-1 hormone concentration and height (Hoppe et al., 2018). Consumption of cow's milk 300 ml per day is recommended to prevent stunting because it contains approximately 8 grams of protein which meets 25.8% of the daily need for protein in toddlers (Sjarif et al., 2019). Milk consumption here does not include sweetened condensed milk, because sweetened condensed milk is high in sugar content of at least 70% sucrose or 20 grams of sugar in every 1 serving glass and the protein value is only 1 gram lower than other milk, some even do not contain milk (Yudistira et al., 2022).

Based on the background above, researchers are interested in knowing the relationship between the amount and frequency of milk consumption with the incidence of stunting in Central Semarang District, Semarang City. This is because based on the findings of field observations, children in Semarang City mostly consume milk in their daily lives and some make milk an option when children have eating problems.

METHODS

The method used is observational with a *case-control design*. The variables studied are the nutritional status of TB / U (stunting) as a dependent variable, the amount and frequency of milk consumption as an independent variable, as well as maternal knowledge, father's education, maternal education, father's occupation, mother's work, family income, number of family members, history of exclusive breastfeeding, and infectious diseases as confounding variables/confounder. Primary data collection in the form of respondent characteristics and milk consumption was carried

out by observation in the form of direct interviews using questionnaires. Meanwhile, secondary data taken in 2021 were obtained from the Semarang City Health Office, Miroto Health Center, and Poncol Health Center in the form of the prevalence of stunting rates in Semarang City, the toddler population, and the nutritional status of toddlers measured in Central Semarang sub-district.

The sample of this study was 48 mothers under five, with a division of 24 mothers under five stunting (cases) and 24 mothers under five who were not stunting (control). The sample was calculated using a sample calculation formula for a *case-control research design*.

Data analysis in this study was done bivariate using the *Chi-Square* test if the data is normally distributed or Fisher as *an alternative* if the data is not normally distributed. Then the results of the bivariate analysis are selected to be continued in the multivariate analysis process using the Binary Logistics test.

RESULT & DISCUSSION

Characteristics of Respondents

Based on Table 1, it is known that in the variable frequency of drinking milk, the average toddler in the case group consumed milk 2.33 times a day with a variation of 1,857 glasses while in the control group consumed milk 3.33 times a day with a variation of 2,036 glasses. Based on the average data on the frequency of drinking milk, the control group > from the case group. In addition, in the variable amount of milk drinking, it was found that the average amount of milk consumed by toddlers in the case group was 31.12 grams with a variation of 31.253 gr while in the control group 36.33 grams with a variation of 39.47 gr. Based on data on the average consumption of the amount of milk of the control group > from the case group In the variable number of family members living at home, the case group had an average of 4.64 people with a variation of 1,497 people while in the control group had an average of 4.38 with a variation of 1,135 people. Based on data on the number of family members of the case group > from the control group. In the nutrition knowledge variable, it was found that the average maternal nutrition knowledge score in the case group was 83.20 with a variation score of 13.14 while in the control group 89.17 with a variation of 12.825. Based on the average data of the mother's nutritional knowledge score of the control group > from the case group

Table 1. Characteristics of Respondents

Variable	Status	Mean ± SD	Min-Max
Frequency of Drinking Milk	Case	2,33 ± 1,857	0-6
	Control	3,33 ± 2,036	0-7
Amount of Milk	Case	31,12 ± 31,253	0-106
	Control	36,33 ± 39,47	0-176
Size of the Family	Case	4,64 ± 1,497	3-8
	Control	4,38 ± 1,135	3-7

Nutritional Knowledge	Case	83,20 ± 13,14	60-100
	Control	89,17 ± 12,825	60-100

Information

1. The number of study samples (n) = 48, consisting of case group (n) = 24 and control group (n) = 24
2. Case = stunted toddlers (TB/U ≤ SD)
3. Control = Toddler with good nutritional status
4. Variable units include number of families = people, unit of knowledge = score, frequency of drinking milk = amount of consumption per day, and amount of milk = weight in grams

Types of Milk Consumed

The type of milk consumed by toddlers in Central Semarang District can be seen in Table 2. It is known that there are toddlers who consume Sweetened Condensed Milk (SKM), although sweetened condensed milk is a sub-category of condensed milk that is included in the milk category according to BPOM regulation No. 34 of 2019 and Codex Standard for Sweetened Condensed Milk (CXS 282-1971 Rev. 2018). However, sweetened condensed milk is not a dairy product to replace the nutritional needs of toddlers because of its high sugar content and low protein content (Yudistira et al., 2022). Furthermore, sweetened condensed milk is also not recommended for infants to consume until the age of 12 months (BPOM, 2018). Based on observations and interviews, 8.2% of toddlers in the case sample who were recorded consuming sweetened condensed milk started consuming sweetened condensed milk when they were 6 months old while in the roller counter sample it was 4.1%. Toddler mothers give sweetened condensed milk because of the affordable price and lack of economic conditions. Both toddlers consume sweetened condensed milk 2-3 times a day. The toddler mother said from the results of additional data collection that while consuming SKM, her toddler did not experience significant weight or height gain. The information about mothers' knowledge about sweetened condensed milk is the same, namely both mothers already know that sweetened condensed milk is not a dairy-type consumption product whose sugar content has exceeded the daily sugar consumption limit.

Table 2. Types of Milk Consumed

Types of Milk	Case		Control	
	n	%	n	%
Bubuk	18	75	18	75
UHT	3	12,5	4	16,6
Kental Manis	2	8,3	1	4,2
Tidak Minum Susu	1	4,2	1	4,2

The Relationship Between Total Milk Consumption and the Incidence of Stunting

Based on Table 3, it was found that the percentage consuming less milk (≤38 gr/day) in the case group was higher (87.5%) than in the control group (33.3%). The results of statistical tests

using the Chi-Square test show that there is a significant relationship between the amount of milk consumption and the incidence of stunting with a p-value of 0.000 (<0.05). While the OR value of 17 can be interpreted as toddlers who consume less milk (≤ 38 g / day) are 17 times more at risk of stunting.

The results of this study are in accordance with Mediana & Pratiwi (2016) which shows a significant relationship between the amount of milk consumption and the incidence of stunting in children aged 2-5 years. This study is also in line with the research of Sjarif et al. (2019) which shows that toddlers who consume ± 300 ml of milk/day avoid the risk of stunting. Adequate milk intake will be able to help meet the lack of macronutrients such as carbohydrates, proteins, fats, and microelements such as vit B12, calcium, zinc, magnesium, and phosphorus that are not filled from food, to reduce the risk of stunting.

WHO says that 25-33% of protein consumption should come from milk because it will have a positive impact on weight gain and linear growth (Sjarif et al., 2019). There is a biological mechanism in nutrient metabolism that underlies that consuming adequate amounts of milk can reduce the risk of stunting whereas consuming SKM as a single drink does not have any relationship with nutritional intake. Based on research by Vanderhout & Corsi (2020), it is explained that milk intake will increase the circulation of the hormone IGF-1 which can support growth and reduce the incidence of stunting. Milk is also a nutrient-dense food containing carbohydrates, proteins, fats, vit B12, calcium, zinc, magnesium, and phosphorus which are important for child growth and development, especially growth for children who fail to thrive (Golden, 2009; Michaelsen et al., 2011).

Table 3. Relationship between Variables and Nutritional Status

Research Variable	Case		Control		Total		P-value	OR
	n	%	n	%	n	%		
Frequency of Milk Consumption								
Seldom ($\leq 2x$ per day)	15	62,5	9	37,5	24	50	0,083	-
Frequent ($> 2x$ per day)	9	37,5	15	62,5	24	50		
Amount of Milk Consumption								
Insufficient (≤ 38 gr per day)	21	87,5	7	29,2	28	58,3	0,000*	17 (3,8-75,8)
Sufficient (> 38 gr per day)	3	12,5	17	70,8	20	41,7		
Mother's Knowledge								
Lacking (Score < 90)	13	54,2	7	29,2	19	39,6	0,079	-
Good (Score ≥ 90)	11	45,8	17	70,8	29	60,4		
Father's Educational Background								

Low (< High school)	13	54,2	6	25			0,039*	3,5
High (≥ High school)	11	45,8	18	75				(1,0-12,0)
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Mother's Educational Background								
Low (< High school)	12	50	5	20,8	17	35,4	0,035*	3,8
High (≥ High school)	12	50	19	79,2	31	64,6		(1,0-13,5)
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Father's Occupation								
Not working	0	0	0	0	0	0		
Entrepreneur	4	16,7	6	25	10	20,8		
Labour	20	83,3	17	70,8	37	77,1	-	-
Civil servant	0	0	1	4,2	1	2,1		
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Mother's Occupation								
Not working	17	70,8	17	70,8	34	70,8	1,000	-
Entrepreneur	2	8,3	1	4,2	3	6,25		
Labour	5	20,8	6	25	11	22,9		
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Family Income								
Low (≤2,8 million)	17	70,8	9	37,5	26	54,2	0,020*	4,0
High (>2,8 million)	7	29,2	15	62,5	22	45,8		(1,2-13,5)
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Number of Family Members								
Many (>4 people)	16	66,7	10	41,7	26	54,2	0,082	-
Few (≤4 people)	8	33,3	14	58,3	22	45,8		
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Breast Milk History								
Non-exclusive	8	33,3	10	41,7	18	37,5	0,551	-
Exclusive	16	66,7	14	58,3	30	62,5		
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Infectious Disease								
Present	5	20,8	3	12,5	8	16,7	0,701	-
Absent	19	79,2	21	87,5	40	83,3		

Information:

1. The correlation test uses *Chi-Square* and *Fisher* as alternatives, significant at level 0.05, significance indicated by notation *.
2. The number of study samples (n) = 48, consisting of case group (n) = 24 and control group (n) = 24.
3. Case = Toddler with stunting nutritional status (TB/U ≤ 2 SD), Control = Toddler with good nutritional status.

Relationship of Frequency of Milk Consumption with the Incidence of Stunting

The results of the statistical test in Table 3 using the Chi-Square test showed a p-value of 0.083 (<0.05) which means that there is no significant relationship between the frequency of milk consumption and the incidence of stunting.

The results of this study are in line with research by Fikawati et al. (2019) which shows that stunted toddlers drink milk less often than normal toddlers (15 compared to 9 times per week), and to achieve normal TB / U toddlers need to consume milk at least 3 times a day. Another study by Mardian et al. (2020) showed results that were not in line, namely the frequency of milk consumption related to children's height. This happens because toddlers who consume more milk (3 times a day, >500 ml/day) have the hormone IGF-1 which is one of the hormones that support more growth than toddlers who rarely consume milk (2 times a day, <250 ml a day).

The frequency of milk consumption is not solely one of the factors causing stunting because it is also necessary to look at the amount of milk and water in its presentation. In this study, it was found that there was milk making that was not according to standards, or in other words the number of milliliters of water and the milk used was not commensurate. The standard for making milk per day based on balanced nutrition guidelines for toddlers aged 2-5 years is one serving, which is equal to 20 grams of milk powder or 200 ml of liquid cow's milk.

Relationship of Maternal Knowledge with the Incidence of Stunting

Based on Table 3, it is known that the results of the analysis using the *Chi-Square test* show a p-value of 0.079 (>0.05), which means that maternal nutritional knowledge is not related to the incidence of stunting. The results of this study are in line with research by Malka et al, (2021) in Bone Regency, South Sulawesi that maternal nutrition knowledge is not related to the incidence of stunting. In this study, it was explained that although the two variables did not show a relationship, based on the data obtained, there was a tendency that the better the mother's nutritional knowledge, the better the nutritional status of toddlers. Meanwhile, poor knowledge of maternal nutrition may be influenced by educational factors and mothers' indifference to the science of infant nutrition health.

Based on the results of observations in the study, there is no relationship between maternal knowledge and the incidence of stunting because good maternal knowledge does not determine good health behavior. Some mothers have relatively good nutritional knowledge, but this knowledge is not applied in caring for their toddlers in everyday life. This is different from the research of Minkhatulmaula et al. (2020) in a study conducted in West Java that maternal knowledge correlates with malnourished toddlers, that mothers who have high knowledge will choose and provide highly nutritious foods that affect their nutritional status.

The Relationship Between Father's Education and the Incidence of Stunting

Table 1 shows the results of the *Chi-Square* analysis with a p-value of 0.039 (<0.05) which means that there is a relationship between the father's education and the incidence of stunting. In

addition, the calculation results show an OR value of 3.5 which means that toddlers who have poorly educated fathers are 3.5 times more at risk of stunting.

The results of this study are in line with the research of Keluarga et al. (2021), N. Putri et al. (2021), and Soekatri et al. (2020) that there is a relationship between paternal education and the incidence of stunting. In this study, it was explained that the father's education does not directly affect children's nutritional intake, but indirectly affects family income (Keluarga et al., 2021). Highly educated fathers tend to have better incomes and jobs. A high father's income can increase the family's purchasing power in providing nutritious food to support good child nutrition (Iswandari et al., 2020). Based on the observations of researchers, it was found that the high level of a father's education determines the father's occupation which will then affect the level of family income. Because of the dominance of this study sample, family income comes from fathers only.

Parental education is a strong determinant of stunting in Indonesia. The level of formal education of parents causes a 3-5% decrease in the risk of children becoming stunted. The results of other studies that analyzed data from various countries showed that the level of primary school education can reduce stunting by 2.5% while secondary school reduces 10%, it can be concluded that completing 9 years of basic formal education can reduce stunting (Alderman & Headey, 2017). Based on Trimanto (2018) in Herwanti (2016) the higher the education of parents, the higher the level of health concern, especially in maintaining nutritional status.

The Relationship between Maternal Education and the Incidence of Stunting

Based on the results of the analysis using *Chi-Square*, a p-value of 0.035 (<0.05) was obtained so that it can be concluded that there is an influence between maternal education and the incidence of stunting. In addition, the calculation results show an OR value of 3.8 which means that toddlers who have mothers who have low education are 3.5 times more at risk of stunting. Strengthened by the observation of low maternal education in the case group of 12 respondents (50%) while in the control group of 7 people (29.2%).

The results of this study are in line with the research of Dhiah Dwi et al. (2021) and Husnaniyah et al. (2020), namely that there is a relationship between maternal education and the incidence of stunting in toddlers. This is because a high level of education is associated with ease in receiving and understanding information. Maternal education is not the only factor that needs to be balanced with non-formal education to increase knowledge about nutrition such as attending posyandu classes and nutrition counseling or learning with other information media.

The Relationship Between Father's Occupation with The Incidence of Stunting

The relationship between the father's occupation and the incidence of stunting resulted in a statistical test value of 0.362 which means that there is no significant relationship between the father's occupation and the incidence of stunting. In stunted and normal toddlers, all fathers (100%) have jobs.

The results of this study are in line with research by Kusuma (2013) which states that father's work is not a factor causing stunting in toddlers 2-3 years old in East Semarang District. Also in line with research by Putri (2018), that father's occupation is not significantly related to stunting in toddlers in Duren Sawit District. This can happen because occupation is categorized into 2, which are working and not working so that the data becomes homogeneous in the work category.

The Relationship between Mother's Occupation and the Incidence of Stunting

Based on the results of the analysis using *Chi-Square*, a p-value of 0.806 (>0.05) was obtained so that it can be concluded that there is no relationship between the mother's occupation and the incidence of stunting. The number of working and non-working mothers on cases and controls was of similar magnitude.

The results of this study are in line with research (Anak et al., 2021; Marlani et al., 2021) where the mother's occupation has nothing to do with stunting. A mother's occupation is not the only factor that influences the incidence of stunting, but mother's work also needs to be supported by education and nutritional knowledge to achieve optimal toddler needs. The working status of mothers also does not affect the diet that has an impact on the nutritional status of children, because working mothers do not always abandon their family diet with their busy lives and non-working mothers do not always have a guaranteed family diet (Rismawati et al., 2015).

The Relationship of Family Income with the Incidence of Stunting

Low family income in the stunting toddler group was 70.8% while the percentage in the normal toddler group was 37.5%. The results of the analysis using *Chi-Square* obtained a p-value of 0.020 ($p < 0.05$) so it can be concluded that there is an influence between family income and the incidence of stunting. The result of the OR calculation is 4,048 so it can be concluded that low family income is 4 times more at risk of having stunted children than families who have income above the Minimum Regional Wage

The results of this study are in line with research (Agustin & Rahmawati, 2021; Kawulusan et al., 2019; Wahyudi et al., 2022) that income influences the incidence of stunting. Based on research (Illahi, 2017) there is a relationship between family income and the incidence of stunting in Ujung Piring Village, according to Adriani in Rizki family opinion affects family purchasing power in determining the type of food purchased. With a high income, it is possible to meet the need for nutritious food. In low-income countries, the majority of expenditure is used to buy cereals while in high-income countries it is used to buy food sources of protein (Illahi, 2017),

Income is the most determining factor in the quality and quantity of food. Based on research by Kawulusan et al., (2019) families who have low incomes will have difficulty obtaining nutritious and varied foodstuffs, because of low income so that they do not guarantee the availability of food quantities and food diversity because of limited money so they cannot have many choices.

People who have low incomes tend to buy food with higher carbohydrate content because these foods are cheaper and in large quantities.

The Relationship between Family Size with Incidence of Stunting

Families with large categories in the stunting group were greater in percentage (66.7%) than in the non-stunting group (37.5%). Based on the results of the analysis using *Chi-Square*, a p-value of 0.085 (>0.05) was obtained so that it can be concluded that there is no influence between the size of the family and the incidence of stunting.

The results of this study are in line with the research of Ibrahim et al (2015), namely there is no relationship between the incidence of stunting and the number of family members. Children who are in large families will usually be shorter than a small number of families, this happens because of the tendency to attention and minimal childcare. In addition, if a large family has a mother as a caregiver and coordinates eating well and balanced, there will be no nutritional problems.

The results of this study are not in line with the research of Kusumawardhani et al. (2020) and Wahyudi et al. (2022) there is an influence on the number of family members with the incidence of stunting. Although in this study the number of family members is not related to stunting, the number of family members and the number of toddlers are one of the factors that influence the consumption and distribution of food to family members. The increasing number of family members without being balanced with the increase in family income will result in uneven food distribution. Uneven distribution of food consumption can cause family members or toddlers to be malnourished.

Relationship of History of Exclusive Breastfeeding with the Incidence of Stunting

The percentage of toddlers who are not exclusively breastfed in stunted toddlers is smaller (33.3%) than in toddlers who are not stunted (45.8%). Based on calculations using the *Chi-Square test*, a p-value of 0.376 ($p>0.05$) was obtained, which means there is no relationship between the history of exclusive breastfeeding and the incidence of stunting.

The results of this study are in line with research by Gustada et al. (2019) that exclusive breastfeeding does not affect stunting in toddlers aged 6-59 months in Bogor Regency. Researchers suspect that there is no significant relationship between exclusive breastfeeding and stunting due to the large number of young mothers (<30 years) who experience SEZs, mental unpreparedness to have and care for children, and mothers who experience anemia, thus affecting the quality and quantity of breast milk. Similar results were shown by Cynthia et al. (2019) who showed that the incidence of stunting in children aged 12-59 months at Wangaya Hospital was not influenced by a history of exclusive breastfeeding. According to researchers, this does not affect because other factors affect the incidence of stunting such as insufficient food intake and infectious diseases, both of which can be the cause of disruption of toddler growth and development. In addition, after the age of 6 months, breastfeeding must be balanced with the provision of complementary foods with appropriate quantity and good quality, because at that age children are still at risk of stunting. Giving

milk to replace breast milk is not allowed, but dairy products become additional complementary foods after the age of 6 months (Halile & Headey, 2023).

The Relationship of Infectious Diseases with the Incidence of Stunting

Based on calculations using the *Chi-Square test*, a p-value of 0.701 ($p > 0.05$) was obtained, which means there is no relationship between infectious diseases and stunting events. Findings in the field of toddlers who experienced infectious diseases such as ARI and diarrhea in the last 3 months were higher in the percentage of stunted toddlers (20.8%) than in toddlers with normal nutritional status (12.5%).

The results of this study are in line with research by Legi et al. (2022) that infectious diseases do not have a significant relationship with the incidence of stunting. This is because infectious diseases that have a percentage of toddlers do not last long as diarrhea is a disease whose impact can be seen directly in the near term such as weight loss, while stunting is a chronic impact of malnutrition that lasts for a long time and continuously which has an impact on height.

Multivariate Analysis

Based on multivariate tests, it is known that the most powerful factor influencing the incidence of stunting in children aged 2-5 years in Central Semarang District is the amount of milk consumed.

Table 4. Result of Multivariate Analysis

Variable	P-Value	OR
Amount of Milk Consumption	0,000	12,5
Mother's Education	0,101	2,7

From the results of the logistic regression statistical test above, it can be concluded that the variables that have the strongest contribution to the incidence of stunting are the amount of milk consumption, the father's education, the mother's education, and family income. The amount of milk consumption in grams correlates with the amount of protein intake. A father's education is related to the type of father's work that has an impact on the amount of family income, the ability to consume nutritious and diverse foods also depends on family income. Maternal education is often associated with the ease of absorbing information about food nutrition and toddler health. In addition, the most dominant variable is the frequency of milk consumption, while the variables of the father's education and mother's education are confounding variables. Statistical analysis shows that the amount of milk consumption has an OR of 12.5 which can be interpreted that toddlers who have milk consumption with an amount of ≤ 36 grams in a day have a 12.5 times higher risk of stunting. This is in line with the research of Mosites et al. (2017) where milk and egg consumption are associated with increasing children's height.

A study by Wiley (2012) states that milk consumption has a positive influence on linear growth in toddlers and adolescents because the IGF-1 content in cow's milk supports faster growth and development of children. Wiley (2017) states that children of preschool age who consume more milk have more height than children who drink small amounts of milk. Vanderhout & Corsi (2020) explain that there are various biological mechanisms underlying the relationship between milk consumption and child growth. Milk intake increases circulating growth factors such as insulin 1 and is a dietary source of whey and casein that can promote linear growth and decrease the incidence of stunting. The protein content in milk is of high quality and contains many peptides and bioactive factors that have a specific impact on growth (Dror & Allen, 2014).

Protein intake, one of which in milk contains amino acids that the body needs to build bone matrix and affect bone growth. Protein serves to modify the secretion and action of *ostetropic hormone* IGF-1 so that protein intake can modulate genetic potential at the achievement of *peak bone mass*. Low protein intake can impair bone mass mineral acquisition and impair IGF-1 production and effects (Sari et al., 2016).

As a source of macronutrients, micronutrients, and bioactive factors, milk and dairy products play an important role in children's growth and development. Child intake has a good impact because milk is a nutrient-dense food that contains carbohydrates, proteins, fats, vit B12, calcium, zinc, zinc, magnesium, and phosphorus which are important for child growth and development, especially to pursue growth for children who fail to grow (Dror & Allen, 2014; Sari et al., 2016)

In the research of Asrar et al. (2009), protein intake also needs to be considered not only in quantity but also in quality. Protein consumption that is often consumed in the research sample is eggs, fish, and milk with an average protein consumption in stunted children of 28.31 g / day in stunted children and 39.31 g / day in non-stunted children. Milk consumption intake in the study contributed protein 7.67 g / day and in non-stunted children amounted to 16.73 g / day. In one liter of milk in addition to containing micro substances also contains 32-35 grams of protein, some casein and whey in milk contain growth elements. Casein can increase potassium absorption and mineral retention. Avoiding milk consumption during child growth is associated with shorter stature, while in the study of Black et al (2008) milk consumption habits show higher HAZ values compared to those who do not.

In the research of Black et al. (2008) and Lien et al. (2009) the intervention of regular milk and formula milk showed an increase in body weight and height and reduced the incidence of malnutrition and stunting by about 10%. Cow's milk protein is also the main ingredient in products used to correct malnutrition such as F-100, cow's milk is the only source of protein and ready-to-use therapeutic foods (RUTF) that provide 50% protein content. In addition, milk powder is also a food ingredient to improve the profile of amino acids containing calcium and potassium.

CONCLUSION

with the incidence of stunting in toddlers aged 2-5 years in Central Semarang District, Semarang City. After being controlled with confounding variables, the most dominant variable with the incidence of stunting is the amount of milk consumption with an OR value of 12.5. Toddlers with milk consumption of ≤ 38 g / day will be at 12.5 times higher risk for stunting.

The suggestion for the next researcher is to take food intake data using SQ-FFQ which is strengthened by food consumption *recall* for 3 days to strengthen the results of the study that balanced nutritional intake and all sources of protein affect growth and prevent misperceptions in the community that milk is the only source of protein that affects the incidence of stunting. In addition, researchers are further encouraged to conduct in-depth research on the relationship of milk type to the incidence of milk stunting to the incidence of stunting, as well as conduct further research on the effect of SKM on child nutritional disorders.

REFERENCES

- Agustin, L., & Rahmawati, D. (2021). Hubungan Pendapatan Keluarga dengan Kejadian Stunting. *Indonesian Journal of Midwifery (IJM)*, 4(1), 30. <https://doi.org/10.35473/ijm.v4i1.715>
- Alderman, H., & Headey, D. D. (2017). How Important is Parental Education for Child Nutrition? *World Development*, 94, 448–464. <https://doi.org/10.1016/j.worlddev.2017.02.007>
- Anak, P., Dasar, S., Kesehatan, J., Perdana, S., & Maynarti, S. (2021). Hubungan Pendidikan, Pekerjaan Ibu dan Riwayat Pemberian ASI dengan Kejadian Stunting Pada Anak Sekolah

Dasar. *Jksp*, 4(1), 2021.

- Asrar, M., Hadi, H., & Boediman, D. (2009). Pola Asuh, Pola Makan, Asupan Zat Gizi dan Hubungannya dengan Status Gizi Anak Balita. In *Jurnal Gizi Klinik Indonesia* (Vol. 6, Issue 2, pp. 84–94).
- Black, R. E., Allen, L. H., Bhutta, Z. A., Caulfi, L. E., Onis, M. De, Ezzati, M., Mathers, C., & Rivera, J. (2008). Maternal and Child Undernutrition 1 Maternal and child undernutrition: global and regional. *The Lancet*, 371, 243–260.
- Codex Alimentarius (2018). Codex Standard for Sweetened Condensed Milk (CXS 282-1971 Rev. 2018).
- Cynthia, Suryawan, I. W. B., & Widiassa, A. A. M. (2019). Hubungan Riwayat ASI Eksklusif dengan Kejadian Stunting pada Anak Usia 12-59 Bulan di RSUD Wangaya Kota Denpasar The Association Between Exclusive Breastfeeding and Stunting in Children Age 12-59 Months at Wangaya Hospital Denpasar. *Jurnal Kedokteran Meditek*, 25(1), 29–35.
- Dhiah Dwi Kusumawati, Tri Budiarti, S. (2021). Hubungan Tingkat Pendidikan Dengan Kejadian Balita Stunting. *Jika*, 6(1), 2598–3857.
- Dror, D. K., & Allen, L. H. (2014). Dairy product intake in children and adolescents in developed countries: Trends, nutritional contribution, and a review of association with health outcomes. *Nutrition Reviews*, 72(2), 68–81. <https://doi.org/10.1111/nure.12078>
- Fikawati, S., Adhi, E. K., Syafiq, A., & Bakara, S. M. (2019). Research Article Age of Milk Introduction is a Dominant Factor of Stunting Among Toddlers Aged 24 Months in Bogor District : A Cross-Sectional Study. *Pakistan Journal of Nutrition*, 18(10), 969–976.
- Fitriani, F., & Darmawi, D. (2022). Hubungan Pengetahuan Dan Sikap Ibu Dengan Kejadian Stunting Pada Balita Di Desa Arongan Kecamatan Kuala Pesisir Kabupaten Nagan Raya. *Jurnal Biology Education*, 10(1), 23–32. <https://doi.org/10.32672/jbe.v10i1.4114>
- Golden, M. H. (2009). *Proposed recommended nutrient densities for moderately malnourished children*. 30(3).
- Gustada, H., Rohsiswatmo, R., & Ronoatmodjo, S. (2019). *Efek ASI Eksklusif terhadap Stunting pada Anak Usia 6-59 bulan di Kabupaten Bogor tahun 2019 Impact of Exclusive Breastfeeding on Stunting among Child Aged 6-59 Months in Kabupaten Bogor at 2019*. 3(2), 77–82.
- Haile, B., & Headey, D. (2023). Growth in milk consumption and reductions in child stunting: Historical evidence from cross-country panel data. *Food Policy*, 118(September 2022),
- Herwanti, E. (2016). Hubungan Peran Ayah Dalam Upaya Perbaikan Gizi Dengan Status Gizi Balita Pada Masyarakat Budaya Patrilineal di Desa Toineke dan Tuafanu Puskesmas Kualin Kabupaten Timor Tengah Selatan. *Journal of Neonatology*, 19(4), 353–355.
- Husnaniyah, D., Yulyanti, D., & Rudiansyah, R. (2020). Hubungan Tingkat Pendidikan Ibu dengan Kejadian Stunting. *The Indonesian Journal of Health Science*, 12(1), 57–64. <https://doi.org/10.32528/ijhs.v12i1.4857>
- Ibrahim, I. A., & Faramita, R. (2015). The relationship between family socio-economic factors and

- the incidence of stunting in children aged 24-59 months in the working area of the Barombong Health Center Makassar City in 2014. *Al-Sihah : Public Health Science Journal*, 7(1), 63–75.
- Illahi, R. K. (2017). Hubungan Pendapatan Keluarga, Berat Lahir, dan Panjang Lahir dengan Kejadian Stunting Balita. *Manajemen Kesehatan*, 3(1), 1–14.
- Iswandari, D. P., Hariastuti, I., Anggriana, T. M., & Wardani, S. Y. (2020). Biblio-Journaling sebagai optimalisasi peran Ayah pada 1000 Hari Pertama Kehidupan (1000 HPK). *Counsellia: Jurnal Bimbingan Dan Konseling*, 10(1), 14. <https://doi.org/10.25273/counsellia.v10i1.4988>
- Kawulusan, M., Walalangi, R. G. M., Sineke, J., & Mokodompit, R. C. (2019). Pola Asuh Dan Pendapatan Keluarga Dengan Kejadian Stunting Pada Anak Usia 2-5 Tahun Di Wilayah Kerja Puskesmas Bohabak. *Jurnal GIZIDO*, 11(2), 80–95. <https://doi.org/10.47718/gizi.v11i2.778>
- Keluarga, H. P., Ibu, P., Gizi, T., Badan, T., Hapsari, W., & Ichsan, B. (2021). *Orang Tua , Dan Tingkat Pendidikan Ayah Dengan Kejadian Stunting Pada Anak Umur 12-*. 119–127.
- Kurniati, P. T. (2022). Hubungan Tingkat Pengetahuan Dan Sikap Ibu Terhadap Kejadian Stunting Pada Balita Di Puskesmas Sungai Durian Kabupaten Sintang Tahun 2021. *Jurnal Medika Usada*, 5(1), 58–64. <https://doi.org/10.54107/medikausada.v5i1.128>
- Kusuma, K. E. (2013). *Faktor Risiko Kejadian Stunting pada Anak Usia 2-3 Tahun (Studi di Kecamatan Semarang Timur)*.
- Kusumawardhani, A., Nurruhyuliawati, W., & Garna, H. (2020). Hubungan Riwayat Bayi Berat Lahir Rendah dan Jumlah Anak dalam Keluarga dengan Kejadian Stunting Usia 12-59 Bulan di Desa Panyirapan Kabupaten Bandung. *Jurnal Integrasi Kesehatan & Sains*, 2(1), 81–85. <https://doi.org/10.29313/jiks.v2i1.5582>
- Lailatul, M., & Ni'mah., C. (2015). Hubungan Tingkat Pendidikan, Tingkat Pengetahuan dan Pola Asuh Ibu dengan Wasting dan Stunting pada Balita Keluarga Miskin. *Media Gizi Indonesia*, 10(2015), 84–90. <https://doi.org/Vol. 10, No. 1 Januari–Juni 2015: hlm. 84–90 terdiri>
- Legi, N. N., Pasambuna, M., Walalangi, R. G. M., Tomastola, Y., Robert, D., Boyke, R., & Batewa, E. (2022). Kurang Energi Kronik pada Ibu Hamil, Pemberian ASI Eksklusif, dan Penyakit Infeksi (Diare) terhadap Kejadian Stunting pada Balita 24-60 bulan di Puskesmas Gogagoman. *Jurnal Gizido*, 14, 32–41.
- Lien, D. T. K., Nhung, B. T., Khan, N. C., Hop, L. T., Nga, N. T. Q., Hung, N. T., Kiers, J., Shigeru, Y., & Biesebeke, R. (2009). Impact of milk consumption on performance and health of primary school children in rural Vietnam. *Asia Pacific Journal of Clinical Nutrition*, 18(3), 326–334.
- Lubis, F. A., & Boy, E. (2021). Hubungan Antara Pendidikan Orang Tua Dengan Status Gizi Anak Pada Keluarga Binaan FK UMSU. *Jurnal Imlementa Husada*, 47(4), 124–134.
- Malka, S., Musni, M., & Fatimah, S. (2021). Faktorkehamilan Dini, Antenatal Care, Asi Eksklusif Dan Pengetahuan Gizi Terhadap Stunting Pada Balita Resiko Stunting Pada Balita Di Kabupaten Bone. *Jurnal Kebidanan Malahayati*, 7(1), 59–64.
- Mardian, A. D., Simanjuntak, B. Y., & Wahyudi, A. (2020). *Original Article Hubungan Kebiasaan Konsumsi Susu Dengan Tinggi Badan Siswa SDN 01 Kota Bengkulu. Relationship of Milk*

- Consumption Habits with The Height of Students SDN 01 Bengkulu City*. 3(2), 67–73.
- Marlani, R., Neherta, M., & Deswita, D. (2021). Gambaran Karakteristik Ibu yang Mempengaruhi Kejadian Stunting Balita Usia 24-59 Bulan di Puskesmas Talang Banjar Kota Jambi. *Jurnal Ilmiah Universitas Batanghari Jambi*, 21(3), 1370. <https://doi.org/10.33087/jiubj.v21i3.1748>
- Mediana, S., & Pratiwi, R. (2016). Hubungan Jumlah Konsumsi Susu Formula Standar Terhadap Kejadian Stunting Pada Anak Usia 2-5 Tahun. *Jurnal Kedokteran Diponegoro*, 5(4), 1743–1751.
- Mentari, S., & Hermansyah, A. (2019). Faktor-Faktor Yang Berhubungan Dengan Status Stunting Anak Usia 24-59 Bulan Di Wilayah Kerja Upk Puskesmas Siantan Hulu. *Pontianak Nutrition Journal (PNJ)*, 1(1), 1. <https://doi.org/10.30602/pnj.v1i1.275>
- Michaelsen, K. F., Nielsen, A. H., Roos, N., Friis, H., & Mølgaard, C. (2011). *Cow's Milk in Treatment of Moderate and Severe Undernutrition in Low-Income Countries*. 67, 99–111.
- Minkhatulmaula, Pibriyanti, K., & Fathimah. (2020). Faktor Risiko Kejadian Gizi Kurang pada Balita di Etnis Sunda. *Sport and Nutrition Journal*, 2(2), 41–48. <https://journal.unnes.ac.id/sju/index.php/spnj/article/view/39763>
- Mosites, E., Aol, G., Otiang, E., Bigogo, G., Munyua, P., Montgomery, J. M., Neuhouser, M. L., Palmer, G. H., & Thumbi, S. M. (2017). Child height gain is associated with the consumption of animal-source foods in livestock-owning households in Western Kenya. *Public Health Nutrition*, 20(2), 336–345. <https://doi.org/10.1017/S136898001600210X>
- Nhien, N. Van, Khan, N. C., Ninh, N. X., Huan, P. Van, Hop, L. T., Lam, N. T., Ota, F., Yabutani, T., Hoa, V. Q., Motonaka, J., Nishikawa, T., & Nakaya, Y. (2008). Micronutrient deficiencies and anemia among preschool children in rural Vietnam. *Asia Pacific Journal of Clinical Nutrition*, 17(1), 48–55.
- Olsa, E. D., Sulastri, D., & Anas, E. (2018). Hubungan Sikap dan Pengetahuan Ibu Terhadap Kejadian Stunting pada Anak Baru Masuk Sekolah Dasar di Kecamatan Nanggalo. *Jurnal Kesehatan Andalas*, 6(3), 523. <https://doi.org/10.25077/jka.v6i3.733>
- Paramita, L. D. A., Devi, N. L. P. S., & Nurhesti, P. O. Y. (2021). Hubungan Pengetahuan Dan Sikap Ibu Mengenai Stunting Dengan Kejadian Stunting Di Desa Tiga, Susut, Bangli. *Coping: Community of Publishing in Nursing*, 9(3), 323.
- Putri, M. S. W. (2018). *Pengaruh Konsumsi Susu dengan Kejadian Stunting pada Anak Usia 24 Bulan di Kecamatan Duren Sawit*.
- Putri, N., Nurlinawati, & Mawarti, I. (2021). Gambaran Tingkat Pendidikan dan Tinggi Badan Orangtua Balita Stunting Usia 24-59 Bulan Pendahuluan Masa ketika anak berada di bawah umur lima tahun (balita) merupakan masa kritis dari perkembangan dan pertumbuhan didalam siklus hidup manusia . Masa bali. *Jurnal Ilmiah Ners Indonesia*, 2(1), 24–32.
- Rachman, R. Y., Nanda, S. A., Larassasti, N. P. A., Rachsanzeni, M., & Amalia, R. (2021). Hubungan Pendidikan Orang Tua Terhadap Risiko Stunting Pada Balita: a Systematic Review. *Jurnal Kesehatan Tambusai*, 2(2), 61–70.

- Rismawati, Rahmiwati, A., & Febry, F. (2015). *Korelasi Perilaku Kadarzi Terhadap Status Gizi Balita di Puskesmas Simpang Timbangan Indralaya tahun 2014*. 195–201.
- Salsabila, S., Dewi Noviyanti, R., Pertiwi, D., Kusudaryati, D., & Abstrak, K. K. (2022). Hubungan Tingkat Pendidikan Ibu dan Pola Asuh Orang Tua dengan Kejadian Stunting pada Balita Usia 12-36 Bulan di Wilayah Puskesmas Sangkrah. *PROFESI (Profesional Islam): Media Publikasi Penelitian, 19(2)*, 143–151.
- Sari, E. M., Juffrie, M., Nurani, N., & Sitaresmi, M. N. (2016). Asupan protein, kalsium dan fosfor pada anak stunting dan tidak stunting usia 24-59 bulan. *Jurnal Gizi Klinik Indonesia, 12(4)*, 152. <https://doi.org/10.22146/ijcn.23111>
- Sjarif, D. R., Yuliarti, K., & Iskandar, W. J. (2019). Daily Consumption of Growing-up Milk is Associated with Less Stunting Among Indonesian Toddlers. *Medical Journal of Indonesia, 28(2)*, 203. <https://doi.org/10.13181/mji.v28i2.4090>
- Soekatri, M. Y. E., Sandjaja, S., & Syauby, A. (2020). Stunting was associated with reported morbidity, parental education, and socioeconomic status in 0.5–12-year-old Indonesian children. *International Journal of Environmental Research and Public Health, 17(17)*, 1–9. <https://doi.org/10.3390/ijerph17176204>
- Trisnawati, M., Pontang, G. S., Mulyasari, I., Studi, P., Gizi, I., & Waluyo, S. N. (2000). Faktor-faktor yang Berhubungan dengan Kejadian Stunting Pada Balita Usia 24-59 Bulan di Desa Kidang Kecamatan Praya Timur Kabupaten Lombok Tengah. *Karya Ilmiah, 7*–18.
- Vanderhout, S. M., & Corsi, D. J. (2020). *Milk consumption and childhood anthropometric failure in India : Analysis of a national survey. March*, 1–9. <https://doi.org/10.1111/mcn.13090>
- Wahyudi, Kuswati, A., & Sumedi, T. (2022). Hubungan Pendapatan Keluarga, Jumlah Anggota Keluarga, Terhadap Stunting Pada Balita Umur 24-59 Bulan. *Journal of Bionursing, 4(1)*, 63–69. <https://doi.org/10.20884/1.bion.2022.4.1.122>
- Wiley, A.S. (2009). Consumption of Milk, but not Other Dairy Products, is Associated with Height among US Preschool Children in NHANES 1999-2002. *American Journal of Human Biology, 36*, 125–138.
- Wiley, A.S. (2012). Cow Milk Consumption, Insulin like Growth Factor-I, and Human Biology : A Life History Approach. *American Journal of Human Biology, 24*, 130–138.
- Wiley, Andrea S. (2017). Cow's milk consumption and child growth. In *Dairy in Human Health and Disease across the Lifespan*. Elsevier Inc. <https://doi.org/10.1016/B978-0-12-809868-4.00011-X>