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The Maternal, Dietary Diversity, and Immunization Completeness Factors as the Determinants of Two-Year-Old Toddler Stunting in Kalinyamatan District Jepara Regency

Faktor Maternal, Keragaman Pangan dan Kelengkapan Imunisasi sebagai Determinan Stunting Baduta di Kecamatan Kalinyamatan Kabupaten Jepara

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ABSTRACT

Background: Stunting affects the quality of a country's human resources so it is important to prevent and overcome it. Stunting cases in Kalinyamatan Jepara District have increased from 12.4% in 2021 to 18.9% in 2022 and to 19.05% in 2023.
Objectives: This research analyzed the stunting risk factors of two-year-old toddlers in Kalinyamatan district, Jepara Regency.
Methods: This case-control study involved 77 stunting children and 77 normal children. The researchers selected the subjects at the integrated health care service with the highest number of visitors of two-year-old toddlers from 12 villages in Kalinyamatan district, Jepara regency, based on the inclusion and exclusion criteria. The research lasted from March to April 2024. The researchers collected the primary data with a questionnaire and the dietary diversity with a food recall questionnaire for 2x24 hours. Secondary data was collected from the mother-child health book (KIA).
Results: The results showed no differences in terms of ages and sex types from both stunting and normal children. The multivariate analysis with logistic regression test found a correlation between the anemia history during pregnancy (OR:2.75; 95% CI:1.31 – 5.78; p:0.007), career woman status (OR: 2.81; 95% CI: 1.24-6.37; p:0.014), low birth weight (OR: 3.98; 95% CI: 1.54-10.27; p:0.004), low dietary diversity (OR: 3.71; 95% CI: 1.63-8.44; p:0.002), and incomplete immunization (OR: 4.02; 95% CI: 1.66-9.74; p:0.002) with the stunting prevalence.
Conclusions: Maternal (the anemia history during the pregnancy, career woman status, and low birth weight), lack of dietary diversity, and incomplete immunization become the simultaneous determinants of stunting risk factors for two-year-old toddlers in Kalinyamatan district, Jepara Regency.

INTRODUCTION

Stunting cases in the Kalinyamatan district have been on the rise for the last three years. The percentage of stunted children under the age of two reached 11.2% by 2020 and then increased to 12.4%. By 2022, the presentation of stunting cases reached 18.9% and then increased again to 19.05% by 2023. The stunting case rate of Kalinyamatan was mostly observable in Pendosawalan village. This village becomes the stunting locus in Jepara with the stunting case of 23.1%. The other villages with stunting case were Manyargading (22.1%), Margoyoso (21.4%), Bandungrejo (20.9%), Kriyan (20.1%), Batukali (6.1%), Banyuputih (11.8%), Damarjati (8%), Purwogondo (19.9%), Sendang (14.7%), Robayan (9.5%), and Bakalan (11.6%)[1].

Children aged 1 to 5 who suffer from chronic malnutrition sometimes seem shorter than their actual age due to stunting, a condition known as growth failure. Chronic malnutrition and recurrent infection in the first 1,000 days of life are the roots of stunting. A comparison of the z-score value of body height per age <-2 standard deviation on the growth curve set by the WHO in 2005 proves the occurrence of stunting. When the z-score of the high body per age is less than two standard deviations, the WHO's 2005 growth curve indicates stunting[2].

Research found that children suffering from stunting due to malnutrition before the age of two have a higher risk of obesity and diabetes mellitus in adulthood. Stunting is associated with an increase in chronic degenerative disease in adults[3]. Children younger than 2 years old and suffering from stunting are more likely to experience cognitive impairment in the future. Among the children suffering from stunting, those who managed

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to pursue their developmental lag in the future had a better chance of raising their cognitive scores[4].

UNICEF developed the theory that factors such as poor feeding habits, a lack of maternity care, and family food resistance behavior drive stunting problems at the household level. The following aspects of childcare are important: nutrition, health, hygiene, mental stimulation, and breastfeeding. On the contrary, prenatal care and lactation are the most important times for mothers[5]. A mother's lack of understanding influences an imbalanced food supply in terms of nutrition. Factors such as wealth, parity, and the distance between pregnancies can influence the incidence of stunting. The prevalence of stunting is high in children from low-income families. Similarly, poor childcare habits and difficulties in caring for young children are consequences of having a close birth period, influencing family nutrition[6]. The declining stunting rate is associated with mothers' dietary habits, including a variety of foods, nuts, fruits, vegetables, and animal proteins. Consuming a variety of foods boosts nutritional needs. To help them grow and thrive, young people need a variety of foods that provide a wide range of nutrients, including carbohydrates, vitamins, proteins, and calories[7].

The main health problem in Kalinyamatan district is the low rate of exclusive breastfeeding (ASI), according to the results of the Self-awareness Survey (SMD) conducted by the health cadres in 2022 with 600 respondents. As many as 66% of the observed children surveyed did not receive exclusive milk. The investigation's findings revealed that many women work as industrial workers, leading to low exclusive breastfeeding coverage[8]. In Kalinyamatan district, children with mothers suffering from stunting are more likely to work as industrial workers (48%), merchants (21%), unemployed (19%), or in other professions (12%). Because of their increasing concentration on work to meet household needs, women in this scenario are less attentive to the development and growth of their toddlers. Full-time mothers often find it difficult to breastfeed because they have no time to pump the breast milk with their hands. If their babies do not get enough milk, mothers give them more formula milk[9].

The availability of formula milk also affects household spending. Poverty is the root cause of income-related malnutrition; low-income populations have a higher rate of stunting[10]. Inadequate purchasing power due to low household incomes affects the quality and quantity of food available at home, influencing nutrition intake[11]. A household achieves good food security when all members have access to adequate safe and nutritious food within a specific time frame. The study attempted to identify the associated variables with stunting in children in Kalinyamatan District, those aged 6–23 months. Therefore, the researchers design effective treatments to prevent and deal with stunting.

METHODS

This quantitative case-control study in the Kalinyamatan district of Jepara identified the most important variables associated with stunting in children aged 6 months to 2 years old. There are two groups, one representing the case and one representing the control. These groups are formed from samples. The study involved 154 participants, divided evenly between case and control groups. In this study, childhood age, gender, mother's age, parity, and father's employment status were all considered to be potential disruptive factors. In this study, the researchers conducted a comparison test between the two groups (case and control) to identify potential interference factors (Tabel 1). Both the case group and the control group share the same age.

The study was conducted in March–April 2024. The researchers selected the subjects at the Integrated Public Health Care service with high visits of two-year toddlers in Kalinyamatan district, Jepara regency, based on the inclusion and exclusion criteria. The inculcation criteria for the case group are children aged 6 months to 2 years, z-score body length/age <-2 standard deviations, and a mother and child health book. The criteria for inclusion in the control group are 6 months to 2 years old, z-score body length/age >-2 standard deviation, z-score weight/body length >-3 standard deviation, have mother-child book. The exclusion criteria for the case group and the control group are children with a congenital disorder and having no intentions to be respondents.

The calculation of the child's age was based on the full month, meaning the age of 1 month was counted if the infant reached 30 days. The researchers measured the data of the two-year-old toddlers or infants based on the body length with an infantometer. The researchers conducted a total of three times and calculated the mean value. If the infants could not stand properly, the measurement would apply the infants' weight with fewer clothes put on the infants. The researchers measured the weights until the number on the OneMed baby scale screen type 725 did not change. Once an infant could stand, the researchers used digital infant tests to measure their weight. When the digital weight shows the number 00.0, the infant should stand in the middle of the weight and stay until showing a stable figure.

The investigated variables were the mother's characteristics, the child's history of acute respiratory tract infection, the child's history of diarrheic infection, birth weight, food diversity, complementary feeding (MPASI), and drinking water availability. The mother's characteristics included a mother's education, a history of anemia during pregnancy, a maternal employment status, an antenatal care history, a per capita income, nursing patterns, and a mother's knowledge of nutrition. Mother education refers to the number of years of formal education without recurrence. If the mother's education was less than or equal to 9 years, the category of education would be low category. The anemia history refers to the records of suffering from anemia during the pregnancy with Hb lower than 11 g/dL.

The mother's occupational status refers to the jobs the mothers do to earn money. There are two categories: working and not working. Antenatal care history is defined as the number of antenatal care visits made by the mother during pregnancy. The irregular category refers to visiting prenatal care is less than 6 times during pregnancy. The family's monthly income in Rupiahs was divided by the number of family members, known as per capita income[12]. The low per-capita category refers to per-capita earnings of ≤ Rp 479,131.

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The parenting pattern refers to a nutritional fulfillment and hygiene pattern. A questionnaire with a Likert scale measured nursing patterns. The poor category refers to the total score falling below the average. Mother's knowledge of nutrition refers to a percentage of the number of correct answers to questions about child nutrition. When answer scores are ≤75%, categories are less frequent.

An infant's history of acute respiratory tract infections refers to the conditions of the infant after suffering from an upper acute respiratory infection in the last month. Acute respiratory tract infection is a symptom of a fever along with a cold or cough for 1 day, more than two days, or only coughing for more than 2 days. The diarrhea infection of children refers to the diarrhea records of the two-year-old toddler in a recent month with at least runny fecal consistency at least once within 24 hours or mushy fecal consistency three times in a recent month[13].

Food diversity is defined as the number of food groups consumed within the last 24 hours. The food group includes items such as milk, tubers, nuts, roots, grains, dairy products (cheese, yogurt, and formula milk), meat (such as meat, beef, and poultry), eggs, vegetables, and vitamin A-rich fruits, among other vegetables. The low category refers to a consumption habit of less than five food groups. The variable of complementary food for breast milk includes the administration of foods and liquid besides breast milk for children aged younger than 6 months. The basic immunization completeness refers to the basic immunization relevance with the received immunization of the two-year toddlers until the interview session based on the age. The excellence of the drinking water included no smell, taste, or color. In addition, the potential of hydrogen (pH) is 6.5–9.2, and the total dissolved solids (TDS) are <1000 parts per million.

Data from joint interviews with respondents using structured questionnaires are considered primary data sources. The researchers measured nursing patterns and mothers' knowledge variables using questionnaires from previous research and modified them based on field conditions[14]. The researchers used a Likert-scale questionnaire with 20 statement items (value r > r table for each statement) and Cronbach's alpha (0.885). The mother's knowledge questionnaire uses a double selection method with 20 question items, each with a value r > r table and Cronbach's alpha 0,789. The mother's examination history is in the mother-child book, followed by the observation sheet. Physical examination of drinking water samples included observations of odor, color, taste, pH, and TDS tests. Bivariate analysis is performed with a Chi-Square test at a 95% acupuncture rate (α 0.05). The researchers used logistic regression for multivariate analysis. The Ethics Commission of the Faculty of Public Health at Diponegoro University has qualified this research for ethics under Number 224/EA/KEPK-FKM/2024.

RESULTS AND DISCUSSIONS

Respondent Characteristics

Table 1 shows the respondent characteristics. No proportion differences between the infant sex types and ages; and stunting and normal infants. The mean of the infants' ages from the stunting group is 17 months-old while the mean of the normal infant age is 16.4 months old.

Table 1. The characteristics of infant sex types, the parity, and the job statuses of the fathers

Characteristics	Case		Control		p
	n	%	n	%	
The Sex Types of the Infants**					
Males	39	50.6	33	42.9	0.333
Females	38	46.3	44	53.7	
Parity Total					
1	25	32.5	16	20.8	
2	14	18.2	20	26	
3	20	26	22	28.6	0.374
4	17	22.1	19	24.7	
5	1	1.3	0	0	
Father Employment Statuses					
Unemployed	10	13	6	6	0.428
Employed	67	87	71	92.2	

**Infants (younger than two years old)

Table 2. The characteristics of infants and mothers in Kalinyamatan District, Jepara Regency,

Characteristics	Case	Control	p
Ages of the Infants**			
Mean	17.0	16.4	
Median	17.0	16.0	0.594
SD	3.83	4.84	
Min-Max	8 – 23	7-24	
Ages of Mothers			
Mean	31.5	32.1	0.753
Median	32	31	
SD	6.15	6.33	

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Characteristics	Case	Control	p
Min-Max	20-43	21-44	

**chi-square (significant at p<0.05)
**Infants (younger than two years old)

The result shows no significant difference between the age mean of mothers with stunting infants to those mothers with normal infants. The stunting group's age mean is 31.5, while the normal group is 32.1. The age mean of the mothers from both groups is at a safe age, 20 - 35 years old. Mothers are recommended to be pregnant at the age between 20 and 35 years old[15]. Mothers younger than 20 years old still have no optimum reproduction organs and physiological functions[16]. Besides that, their emotional and mental states are not stable. During the pregnancy, the mothers may suffer from gestational complications with the potential to deliver low-weight babies. This matter may lead to stunting. A more mature person will have more life experience and more readily accept behavioral adjustments. Age will also increase a person's maturity and strength in thinking and working[16].

Table 3. The correlation between maternal factors, acute respiratory infection history in children, diarrhea infection history in children, dietary variety, breast milk supplementary meals, basic immunization, and drinking water toward the stunting incidents in Kalinyamatan District, Jepara Regency

Variables	Stunting				p (Chi-square)	OR 95% CI (Upper – lower)
	Yes		No			
	n	%	n	%		
The Anemia History during Pregnancy						
Yes	44	61.1	28	38.9	0.015*	2.3 (1.22–4.46)
No	33	40.2	49	59.8		
The Job Statuses of The Mothers						
Employed	60	55.6	48	44.4	0.053	2.1 (1.05-4.33)
Unemployed	17	37.0	29	63.0		
The Education of The Mothers						
Low	27	65.9	14	34.1	0.029*	2.4 (1.15-5.12)
High	50	44.2	63	55.8		
Antenatal Care Record						
Irregularly	11	55.0	9	45.0	0.811	1.3 (0.49 – 3.24)
Regularly	66	49.3	68	50.7		
The Maternity Nutritional Cognition						
Low	30	63.8	17	36.2	0.036*	2.3 (1.11-4.57)
Excellent	47	43.9	60	56.1		
Parenting Pattern						
Poor	45	59.2	31	40.8	0.036*	2.1 (1.09-3.97)
Excellent	32	41.0	46	59.0		
Per-capita Income						
Low	20	69.0	9	31.0	0.039*	2.7 (1.12-6.28)
Adequate	57	45.6	68	54.5		
The Record of Acute Respiratory Tract Infection on Children						
Yes	40	51.3	38	48.7	0.87	1.1 (0.59-2.09)
No	37	48.7	39	51.3		
The Record of Diarrheal Infection						
Yes	19	46.3	22	53.7	0.715	0.8 (0.40-1.68)
No	58	51.3	55	48.7		
Birth Weight						
Low Birth Weight**	24	72.7	9	27.3	0.006*	3.4 (1.47-7.97)
Normal Birth Weight**	53	43.8	68	56.2		
The Food Diversity						
Low	31	63.3	18	36.7	0.038*	2.2 (1.10-4.44)
Excellent	46	43.8	59	56.2		
The Provision of Breast Milk Food Supplementary						
Early Breast Milk Food Supplementary	31	56.4	24	43.6	0.313	1.5 (0.77-2.89)
Exclusive Breast Milk	46	46.5	53	53.5		
The basic immunization						
Incomplete	27	67.5	13	32.5	0.017*	2.7 (1.25-5.67)
Complete	50	43.9	64	56.1		
Drinking Water Worthiness						
Unworthy	9	47.4	10	52.6	1.000	0.9 (0.34-2.32)
Worthy	68	50.4	67	49.6		

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*chi-square (significant if p<0,05)
**BBLR (Low Birth Weight)
*** BBLN (Normal Birth Weight)
****MPASI (The Breast Milk Food Supplementary)

The bivariate analysis, in Table 3, shows a strong correlation (p<0.05) between the anemia record (p<0.05) and anemia record during the pregnancy (p: 0.05), per capita income (p: 0.039), birth weight (p: 0,006), food diversity (p: 0.038), parenting pattern (p:0,036), basic immunization (p: 0.017), education of mothers (p: 0.029) and the mother nutritional knowledge (p: 0.036) with *stunting* case On the other hand, the variable of job status of the mothers, the upper respiratory infection, the diarrhea infection, the administration of complementary foods for breast milk, and the drinking water reliability have insignificant correlation (p>0.05) toward stunting prevalence.

The results of the independent and dependent variable analysis found 9 variables had a p<0.25 value, i.e., anemia record during pregnancy, maternal employment status, per capita income, birth weight, food diversity, nursing patterns, basic immunization availability, mother education, and mother's knowledge of nutrition. Table 4 shows the multivariate analysis.

Table 4. The determinant of stunting case based on logistic regression

Variables	B	p	Exp B**	95% CI
The record of anemia during pregnancy	1.013	0.007*	2.75	1.31 – 5.78
Employed Mothers	1.032	0.014*	2.81	1.24 – 6.37
Low Birth Weight	1.381	0.004*	3.98	1.54 – 10.27
Food Diversity	1.312	0.002*	3.71	1.63 – 8.44
Complete Basic Immunization	1.391	0.002*	4.02	1.66 – 9.74
Constant	-3.878	0.000*	0.02	1.31

*Logistic regression (significance if p <0,05)
**Exp B (the exponent of logistic regression coefficient)
R^2 = 0,291

The logistic regression shows the variables simultaneously determine the stunting of anemia record during the pregnancy (p: 0,007), employed mothers (p: 0,014), BBLR (p: 0,004), low food diversity (p: 0,002), and incomplete immunization (p*:* 0,002). The influential size of the record of anemia during pregnancy, the career mother, the low birth weight, the low dietary diversity, and incomplete immunization is 29.1% toward stunting prevalence. The logistical regression model determinant of stunting in a child aged 6 months–2 years in the Kalinyamatan district of Jepara is as follows:

$$\text{logit p (stunting incident)} = (-3.87) + (1.013 \times \text{Anemia history during pregnancy}) + (1.032 \times \text{Mother's employment status}) + (1.381 \times \text{Birth weight}) + (1.312 \times \text{Dietary diversity}) + (1.391 \times \text{Immunization completion})$$

Inadequate basic vaccinations make children susceptible to disease and cause growth impairment. The infants will get infected and remain at risk until being managed. Among the risk factors for stunting reported in the Kalinyamatan district of Jepara, inadequate vaccination became the most significant risk factor. (OR: 4.02; 95% CI: 1.66 – 9.74; p: 0.002). Wanda et al. (2021) discovered that stunting was more prevalent in Hegarmanah Village, Jatinagor District[16].

Because the body uses a lot of energy to fight disease, stunting becomes a problem for children whose diet is inadequate and often sick. An infection will disrupt the infants' nutritional condition, and a prolonged illness will increase the risk of stunting[17]. The extent to which mothers vaccinate their children depends on a variety of factors, including education levels, knowledge, support from family and friends, motivation, attitudes, behavior, and access to health services[18]. Previous research on the work area of Public Health Care Citarip Kota Bandung found no significant correlation between stunting incidents and vaccination history in children aged 24-59 months (p: 0.056)[19]. Furthermore, research at Depok found no statistically significant correlation between vaccination status and stunting figures. The p-value is 0.49520[20].

In the bivariate analysis, the odds ratio (OR) of anemia during pregnancy is 2.75, meaning that after controlling for another variable, the risk of stunting is 2.75 times higher in mothers with a record of anemia during pregnancy compared to those who did not. Anggraini et al. found that a mother's anemia increased the risk of stunting in the young (p: 0.001)[21]. Pregnancy anemia disrupts the fetus's nutrition, leading to developmental abnormalities in the early stages of life. These diseases also inhibit the development of the brain, organs, and other tissues[22].

After calculating other factors, the employed mother is associated with an increased risk of growth inhibition in infants (OR: 2.81; 95% CI: 1.24 – 6.37; p: 0.014). According to the real story, unemployed mothers could spend more time in the morning at Integrated Public Health Care, where could buy food and get health education. Because of their low wages, working mothers may have difficulty meeting their family's basic needs, including nutrition for their children[23]. Previous studies in Yogyakarta did not discover a correlation between

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mothers' employment status and the rate of growth inhibition (p: 0.053)[24]. The current result found contradictory results. Even if they have no time to go to Integrated Public Health Care, employed mothers could boost family income, indicating their capabilities to meet their children's nutritional needs, helping them to thrive[25].

In terms of providing adequate childcare and ensuring that infants get attention about their healthy development, family money is a big problem. There appears to be an inverse correlation between income and the incidence of stunting. Statistically, the results show a significant correlation between per-capita income and stunting incidents, (p: 0.031), based on the bivariate analysis. If the economy goes excellently, people will have more income to use for better nutrition, boosting the immune system and making them stronger against disease. It is essential to pay attention to ensuring that the children have enough food[26]. Previous research found no correlation between per capita income and the prevalence of stunting in young people (p: 0.13827). The result is contradictory with the current research[27].

A child's birth weight can be a reliable predictor of their growth chances. Anthropometric assessment, measuring the baby's weight, body length, upper arm circumference, and baby head circle, is one of the significant assessments of baby nutrition. Based on the data in Kalinyamatan district, Jepara Regency, on toddlers aged between 6 and 24 years old, the obtained result shows a significant correlation between birth weight and the stunting prevalence (p: 0.006). The findings of this study align with previous research, indicating that infants with low birth weight had a 3.26 increased risk of stunting compared to those without a history of low birth weight (OR: 3.26; 95% CI: 1.46-7.31). Because of their immature digestive tract, low-birth-weight babies suffer from gastrointestinal disorders. For example, their bodies cannot digest protein or absorb fat, thus causing them to be malnourished[28].

Giving infants a variety of foods is crucial because it covers the various kinds of nutrients that the body needs. Studies about dietary diversity for two-year-old toddlers in Kalinyamatan found many toddlers suffered from stunting due to a lack of dietary diversity (40.3%) than diverse or normal dietary (23.4%). The results of the Chi-square test indicate a significant correlation between food diversity and stunting (OR: 2.2; 95% CI: 1.100-4.435; p: 0.038). Poor dietary diversity over time, low-quality of supplementary foods, and inadequate calorie intake can increase the risk of stunting in infants and children[29]. Food quality refers to the nutrients the body needs to control how much food is consumed and balanced food variation in one dish. The results show no single food that provides all nutrients in good quantity and variation; the more balanced and varied the content and type of food eaten, the higher the quality of the food[30].

Tika (2020) examined the potential relationship between food variety and stunting incidents (p: 0.047)[31]. A child in their first two years of life reaches a high level of growth, requiring a very high micro-nutrient and macro-nutrient content in their diet to achieve optimal growth[32]. Food diversity is an indicator for evaluating the adequacy of child micronutrient and macronutrient intake. Optimum nutrition provision with diverse dietary is a stunting preventive effort[33].

The role of a mother is very important to provide nutrition to her child. Mothers must behave excellently and provide support and attention. The role involves adhering to a proper diet, preparing highly nutritious foods, and maintaining cleanliness and nutritional hygiene[34]. In this research, the researchers found a significant correlation between parenting patterns and stunting prevalence in two-year-old toddlers in Kalinyamatan district (p: 0.036). Parenting patterns in setting up an excellent food menu for the child is important in meeting the adequate nutritional needs of the child, thereby lowering the child's susceptibility to disease[35]. The previous research obtained a result of 69.4%. Poor parenting patterns influenced stunting. On the contrary, an excellent maternal pattern leads to a low incidence of stunting[36]. A mother's knowledge is crucial to foster an individual behavior.

The level of knowledge about nutrition influences the family's ability to adequately nourish the infants. The bivariate analysis found a significant correlation between cognition about nutrition and stunting prevalence (OR: 2.4; p: 0.036). The results indicate that the low educational status of mothers has a higher risk of 2.4 than the high educational status of mothers toward stunting prevalence. The cognition about nutrient-rich foods influences a mother's behavior when feeding infants, as the evolution of this information shapes behavior. Mothers with adequate nutritional cognition should provide appropriate food types and quantities based on the infant's developmental stage so that the infant can grow healthy and avoid complications[36].

Based on the research results, the researchers found two-year-old toddlers suffering from stunting. These toddlers had mothers with low educational statuses, 35.1%. On the other hand, normal two-year-old toddlers had a percentage of 25.6% of mothers with low educational status. The bivariate statistic test obtained a p of 0.029, indicating a significant correlation between the mother's education and stunting prevalence. Mothers with excellent formal education could process various information into new knowledge. This matter influences the health and nutritional status of individuals. Education plays an important role in developing critical thinking skills and communicating health information directly to women, especially mothers. Mothers with a high educational level have excellent skills in planning, preparing, and choosing nutritious food for their children, especially young infants. Higher educational levels in mothers also contribute to increased knowledge and attitude towards nutrition and health-related information[37].

Research shows that antenatal care records are not significantly related to the stunting of infants in the Kalinyamatan district of Jepara (p: 0.811). Based on the observations in the field, most mothers with stunting or normal children already completed routine antenatal care visits and standardized services. The government set a standard for antenatal care, mandating antenatal visits at least six times during pregnancy to maintain the mother's health during pregnancy, and childbirth, and to strive for the health of the newborn[38].

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Amini (2016) found that antenatal care was not correlated significantly to stunting prevalence in two-year-old toddlers in Kalinyamatan district, Jepara regency. The findings revealed that visiting an irregular antenatal care service was 2.1 times more likely to cause stunting in children than visiting a quality antenatal care service[39]. Routine prenatal care visits can predict the mother's early pregnancy risks, particularly those associated with nutritional issues[40]. The study found an insignificant correlation between the time of breast milk supplementary food administration and the risk of stunting (p: 0.313). This result happened because various factors such as the age of the subject influenced the provision of complementary foods for breast milk of the subject and the possible modification from other factors (the adequacy and diversity of complementary foods)[41].

The infections brought on by a lack of access to clean water and poor sanitation hinder growth. This will ultimately inhibit growth by making it harder for the body to absorb nutrients[42]. However, the bivariate analysis results indicate no significant correlation between the frequency of stunting and the availability of drinking water (p: 1.000 > 0.05). These findings differ slightly between the two case and control groups but are not statistically significant. In addition, direct and indirect factors also contribute to the occurrence of stunting. The immediate causes of stunting include the nutrition pregnant mothers consume, the nutrition of their children, and infectious diseases. Meanwhile, water and sanitation were two of the indirect variables. Most citizens in the Kalinyamatan district used well water or groundwater from electric pumps. Some people boil this water before drinking. The water is also useful for bathing and washing.

Only 40 stunting infants (51.9%) had previously suffered from acute upper respiratory tract infection. Following the test and the results, p: 0.872 indicates no significant correlation between the history of acute upper respiratory tract infection and the occurrence of stunting. The findings are similar to previous studies, finding no evidence of a significant correlation between acute upper respiratory tract infection frequencies and stunting incidence. Various factors such as adequate nutrition before, during, or after illness, can cause stunting[19].

Acute upper respiratory tract infection is a common infection in children and is very contagious. Most children had mild infections characterized by fever, colds, and coughing that usually lasted less than 3 days[43]. These matters make upper respiratory infections and stunting not correlate. The current research found that stunting in two-year-old toddlers with diarrhea infection for the recent month had a percentage of 24.7% (19 cases) while the normal toddlers with the same infection record had a percentage of 28.6% (22 cases). The test found a p-value The test results revealed a p-value of 0.715, indicating no significant correlation between the risk factors for diarrheal infection and stunting occurrence.

The findings are consistent with previous studies, showing no evidence of a significant correlation between the incidence of stunting and diarrhea[44]. This study may not find a significant correlation between the incidence of stunting and a record of diarrhea because diarrhea has a greater impact on weight loss than height loss. Toddlers suffering from diarrhea may experience anorexia and dehydration. This situation must receive immediate care to prevent weight loss, an indication of acute malnutrition; or stunting, a sign of chronic and recurrent malnourished[45]. A previous study found young people aged 24-59 months in the area of operation Simolawang Public Health Care, Surabaya, with diarrhea records were significantly more likely to experience stunting (OR: 3.61; p: 0.025)[45]. Wicaksono (2020) asserts that a record of diarrheal infection significantly influences the incidence of stunting (OR: 5.41; 95% CI: 2.20-13.29; p: 0.001)[45].

The integrity and memory of the respondents, and the honesty and rigor of the interviewer when performing observations and completing the questionnaires, heavily influenced the accuracy of the data in this questionnaire-based data collection method. This can affect the quality of the obtained data and information. However, the limitations of this research include the use of a case-control design on the population and the presence of direct observations.

CONCLUSIONS

Anemia during pregnancy, low per capita income, low birth weight, poor food diversity, poor nursing patterns, poor maternal education, and poor mothers' knowledge of nutrition are risk factors for stunting infants in the Kalinyamatan district of Jepara. Incomplete immunization, low birth weight, low dietary variety, career woman status, and anemia during pregnancy are simultaneously the determinant factors of stunting in two-year-old toddlers in Kalinyamat district, Jepara Regency. The researchers suggest future researchers put more variables such as the period and frequency of acute upper respiratory tract infection and diarrhea in children, the home environmental factor, and detailed nutritional compounds.

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CONFLICT OF INTEREST AND FUNDING DISCLOSURE

The researchers found no conflict of interest. The researchers used personal funds for this research.

AUTHOR CONTRIBUTIONS

AH: conceptualization, data curation, formal analysis, funding acquisition, investigation, methodology, project administration, resources, software, supervision, validation, visualization, roles/writing-original draft; MIK: formal analysis, project administration, supervision, methodology, writing-review, and editing; S: formal analysis, methodology, writing-review and editing; DS: formal analysis, supervision, validation, visualization, roles/writing-original draft; MSA:: formal analysis, supervision, validation, visualization, roles/writing-original draft.

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