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# CONVERGENCE MODEL DEVELOPMENT FOR A VILLAGE-LEVEL STUNTING REDUCTION PROGRAM USING TRADITIONAL INSTITUTION APPROACH IN PIDIE REGENCY (STUNTING DETERMINANTS STUDY IN PIDIE REGENCY ON 2021)

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**Abstract**: In Indonesia, the prevalence of stunting did not significantly change between 2005 and 2017. Stunting in early childhood can impede optimal physical and cognitive development, with both immediate and long-term effects. Low nutritional intake and infectious diseases are hallmarks of stunting. Additionally, it is multifaceted, encompassing social environment, health services, access to wholesome food, and hygienic conditions. In Pidie Regency, the purpose of this study is to characterise the prevalence of stunting and examine the factors that contribute to it. A cross-sectional study design was employed in the research. Families with toddlers were included in the 2021 Electronic Report on Community-Based Nutrition Recording and Reporting (Laporan Elektronik-Pencacatan dan Pelaporan Gizi Berbasis Masyarakat / EPPGBM), which comprised the population. Ten toddlers were selected using a multi-stage random sampling technique. Surveys in the field and questionnaire-based interviews with respondents were used to gather data; analysis included the Chi-square test and Odds Ratio calculations. Furthermore, proceeded with the Regression Logistic test. The findings indicate that the following factors have the most significant impact on stunting in the Pidie district: the cleanliness of toddlers' cooking utensils (p; 0.001), fish consumption habits (p; 0.006), diarrhoea incidence (p; 0.003), Upper Respiratory Infection (p; 0.001), irregular use of Fe tablets during pregnancy (p; 0.005), birth length (p; 0.009), Complete Basic Immunization (p; 0.001), and exclusive breastfeeding (0.016). The most significant factor influencing stunting is receiving the Complete Basic Immunization.Xxx
**Keywords**: Stunting, Traditional Institutions, Toddlers, Nutrition, Sanitation

## INTRODUCTION

Stunting in toddlers is one of the major nutritional issues that the Indonesian people face (Mediani, 2020). In Indonesia, 36.4% of the population was stunted between 2005 and 2017 (Aprihatin, Barlian, Fatimah, Yanti, & Armaita, 2020). In Indonesia, there are typically no notable changes in stunting prevalence. Stunting prevalence dropped to 27.67% (Izwardy, 2019) and 24.4% (Kemenkes, 2021), according to the SSGBI (Indonesian Toddler Nutrition Status Study) combined with the 2019 Susenas (National Socio-Economic Survey). However, this number is still significantly higher than the RPJMN's (National Medium-Term Development Plan) target of 14% by 2024 (Kemenkes, 2020).

Early-life stunting will make it difficult for children to develop physically and cognitively to their full potential; irreversible (Alam et al., 2020). The short-term impacts of stunting include increased morbidity and

mortality in children, impaired cognitive and motor development, suboptimal verbal skills, and increased healthcare costs (De Onis, 2017). Long-term effects include brain cell damage and irreversible neurological dysfunction, which impair learning in school and affect adult productivity at work (Hall et al., 2018). Furthermore, it raises the risk of degenerative illnesses like stroke, coronary heart disease, diabetes mellitus, and hypertension (Hossain et al., 2017).

WHO states that infectious diseases and inadequate nutrition are the leading causes of stunting (Unicef, 2013). Stunting, on the other hand, is caused by a variety of indirect factors (Coile et al., 2021), including family income, nutritional status during pregnancy, infectious diseases that children contract from birth, inadequate nutritional intake, poor hygiene and sanitation, and poor parenting (Beal, Tumilowicz, Sutrisna, Izwardy, & Neufeld, 2018). As a result, initiatives to reduce stunting focus on addressing the root causes of nutritional issues, including social environments, access to safe food, health care, and hygienic conditions (Wali, Agho, & Renzaho, 2019).

While Aceh has the third-highest prevalence of stunting in Indonesia among toddlers (37.3%), Aceh has the highest prevalence among children under five (37.9%) (Aceh, 2018); in 2021, it rose to 33.2% (Kemenkes, 2021), while Pidie has a 6% higher rate (39.3%) (Kemenkes, 2021). In light of the background information provided, researchers aim to investigate the factors that contribute to stunting in Pidie Regency. The purpose of this study is to assess the prevalence of stunting and examine the factors contributing to it in Pidie Regency.

## IMPLEMENTATION METHODOLOGY

This study, "Development of a Convergence Model for the Acceleration Program for Stunting Reduction at the Village Level Using a Traditional Institution Approach in Pidie Regency," is a preliminary cross-sectional study that describes the incidence of stunting in the research location and identifies its determinants. As of the end of 2021, all families with toddlers included in the EPPGBM (Electronic Report on Community-Based Nutrition Recording and Reporting) comprised the study's population. Multi-stage random sampling was used to select the sample. Ten toddlers were randomly selected from each of the villages chosen as research sites.

Field surveys and questionnaire-based interviews with respondents were used to gather data on a variety of topics, including education, access to clean water and sanitation, food availability, health history, pregnancy history and its outcomes, childcare and parenting patterns, and the family head's smoking habits. A foot scale was used to measure weight, and a Microtoise was used to measure height. The length-for-age or height-for-age index (Length/Age or Height/Age) is used to evaluate nutritional status and stunting. Utilising the WHO-anthropometry application to determine the index value, using the Chi-squared test, and examining the value of the Odds Ratio. Afterward, the Regression logistictest was conducted.

### 1. Research Results

Table 1 below displays the study's findings:

TABLE 1 Stunting distribution based on education level

| Variable | Stunting | | Normal | | Total | | P |
|---|---|---|---|---|---|---|---|
| | n | % | n | % | N | % | |
| 1. Education Level | | | | | | | |
| Elementary School | 15 | 35,7 | 27 | 64,3 | 42 | 100 | 0,070 |
| Junior High School | 41 | 39,8 | 62 | 60,2 | 103 | 100 | |
| Senior High School | 74 | 29,8 | 174 | 70,2 | 248 | 100 | |
| College | 11 | 20,4 | 43 | 79,6 | 54 | 100 | |
| 2. Mother's education level | | | | | | | |
| Elementary School | | | | | | | |
| Junior High School | 16 | 44,4 | 20 | 55,6 | 36 | 100 | 0,004 |
| Senior High School | 35 | 36,5 | 61 | 63,5 | 96 | 100 | |
| College | 79 | 32,6 | 163 | 67,4 | 242 | 100 | |
| | 11 | 15,1 | 62 | 84,9 | 73 | 100 | |

According to the analysis results (Table 1), up to 35.7% of respondents with lower levels of education have stunted toddlers, specifically those with only an elementary school education. The mother's knowledge increases, and the prevalence of stunting decreases with her level of education. The outcomes of stunting risk factors are as follows:

TABLE 2 Stunting distribution based on sanitation and clean water

| Variable | Stunting | | Normal | | Total | | P | OR (95% CI) |
|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | N | % | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1. Toilet | | | | | | | | |
| No | 32 | 42,7 | 43 | 57,3 | 75 | 100 | 0,033 | 1,8 (1,1-2,9) |
| Yes | 109 | 29,3 | 263 | 70,7 | 372 | 100 | | |
| 2. Septic tank distance | | | | | | | | |
| < 10 m | 32 | 29,6 | 76 | 70,4 | 108 | 100 | 0,62 | 0,9 (0,5-1,4) |
| > 10 m | 109 | 32,2 | 230 | 67,8 | 339 | 100 | | |
| 3. Waste disposal | | | | | | | | |
| Gutter | 108 | 32,4 | 225 | 67,6 | 333 | 100 | 0,74 | |
| Septic tank | 29 | 29,6 | 69 | 70,4 | 98 | 100 | | |
| Open land | 4 | 25,0 | 12 | 75,0 | 16 | 100 | | |
| 4. Building shape | | | | | | | | |
| Wooden house | 15 | 48,4 | 16 | 51,6 | 31 | 100 | 0,046 | |
| Semi-permanent | 44 | 34,9 | 82 | 65,1 | 126 | 100 | | |
| Permanent | 82 | 28,3 | 208 | 71,7 | 290 | 100 | | |
| 5. Floor | | | | | | | | |
| Dirt | 4 | 80 | 1 | 20,0 | 5 | 100 | 0,013 | |
| Wood/cement | 84 | 34,6 | 159 | 65,4 | 243 | 100 | | |
| Ceramic | 53 | 26,6 | 146 | 73,4 | 199 | 100 | | |
| 6. Washing hands with soap | | | | | | | | |
| Yes | 109 | 30,4 | 250 | 69,6 | 359 | 100 | 0,54 | 0,8 (0,4-1,6) |
| No | 15 | 34,9 | 28 | 65,1 | 43 | 100 | | |
| 7. Immediately washing used cooking utensils | | | | | | | | |
| Yes | 134 | 34,3 | 257 | 65,7 | 391 | 100 | 0,01 | 3,6 (1,6-8,3) |
| No | 7 | 12,5 | 49 | 87,5 | 56 | 100 | | |

The study's findings show that 75 individuals (100%) lack a family lavatory. Stunting is significantly associated with having a family toilet in bivariate analysis. The p-value in this table is 0.033 ($p<0.05$). The OR value in this table is 1.8 with a 95% CI of 1.1-2.9.

TABLE 3 Stunting distribution based on food access

| Veriabel | Stunting | | Normal | | Total | | P | OR (95% CI) |
|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | N | % | | |
| 1. PKH assistance | | | | | | | | |
| Yes | 43 | 32,3 | 90 | 67,7 | 133 | 100 | 0,81 | 1,0 (0,7-1,6) |
| No | 98 | 31,2 | 216 | 68,8 | 314 | 100 | | |
| 2. Social assistance | | | | | | | | |
| Yes | 91 | 32,2 | 192 | 77,8 | 108 | 100 | 0,71 | 1,1 (0,7-1,6) |
| No | 50 | 30,5 | 114 | 69,5 | 339 | 100 | | |
| 3. Nutrition yard | | | | | | | | |
| No | 115 | 31,4 | 251 | 68,6 | 366 | 100 | 0,90 | 1,1 (0,6-1,6) |
| Yes | 26 | 32,1 | 55 | 67,9 | 81 | 100 | | |
| 4. Rice sources | | | | | | | | |
| Buying | 88 | 31,7 | 190 | 68,3 | 278 | 100 | 0,94 | 1,0 (0,7-1,5) |
| Self Production | 53 | 31,4 | 116 | 68,6 | 169 | 100 | | |
| 5. Fish sources | | | | | | | | |
| Buying | 138 | 31,4 | 301 | 68,6 | 439 | 100 | 0,71 | 0,8 (0,2-3,2) |
| Self Production | 3 | 37,5 | 5 | 62,5 | 8 | 100 | | |
| 6. Fish consumption habits | | | | | | | | |
| 2-3 x per week | 7 | 70,0 | 3 | 30,0 | 10 | 100 | 0,00 | |
| 4-5x per week | 45 | 40,5 | 66 | 59,5 | 111 | 100 | | |
| Everyday | 89 | 27,3 | 237 | 72,7 | 326 | 100 | | |

This table's findings demonstrate that respondents who benefited from PKH (Family Hope Program) assistance did not significantly reduce stunting rates.

TABLE 5 Stunting distribution based on Medical History

| Veriabel | Stunting | | Normal | | Total | | P | OR (95% CI) |
|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | N | % | | |
| 1. Diarrhea | | | | | | | | |
| Yes | 23 | 59,0 | 16 | 41,0 | 39 | 100 | 0,000 | 3,5 (1,8-6,9) |
| No | 118 | 28,9 | 290 | 81,1 | 408 | 100 | | |
| 2. URI | | | | | | | | |
| Yes | 72 | 39,3 | 111 | 60,7 | 183 | 100 | 0,004 | 1,8 (1,2-2,7) |
| No | 69 | 26,1 | 195 | 73,9 | 264 | 100 | | |
| 3. Worm infection | | | | | | | | |
| Yes | 10 | 41,7 | 14 | 58,3 | 24 | 100 | 0,38 | 1,6 (0,7-3,7) |
| No | 131 | 31,0 | 292 | 69,0 | 423 | 100 | | |
| 4. Measles | | | | | | | | |
| Yes | 13 | 36,1 | 23 | 63,9 | 36 | 100 | 0,67 | 1,2 (0,6-2,5) |
| No | 128 | 31,1 | 283 | 68,9 | 411 | 100 | | |

According to the table, toddlers with a history of diarrhoea have a 0.000 chance of developing stunting, which is 0.004 times lower than that of toddlers with a history of upper respiratory infections (URI).

TABLE 6 Stunting Distribution Based on Pregnancy History and Pregnancy Output

| Veriabel | Stunting | | Normal | | Total | | P | OR (95% CI) |
|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | N | % | | |
| 1. Fe Consumption | | | | | | | | |
| No | 31 | 40,3 | 46 | 59,7 | 77 | 100 | 0,005 | |
| Yes, not Routine | 104 | 32,2 | 219 | 67,8 | 323 | 100 | | |
| Routine | 6 | 12,8 | 41 | 87,2 | 47 | 100 | | |
| 2. Pregnancy supplemen-tary feeding | | | | | | | | |
| No | 129 | 31,2 | 285 | 68,8 | 414 | 100 | 0,34 | |
| Yes, not finished | 10 | 43,5 | 13 | 56,5 | 23 | 100 | | |
| Yes, finished | 2 | 20,0 | 8 | 80,0 | 10 | 100 | | |
| 3. Maternal UAC | | | | | | | | |
| Deficient | 3 | 18,8 | 13 | 81,2 | 16 | 100 | 0,41 | 0,5 (0,1-1,7) |
| Normal | 133 | 31,7 | 286 | 68,3 | 419 | 100 | | |
| 4. Birth length | | | | | | | | |
| Deficient | 24 | 53,3 | 21 | 46,7 | 45 | 100 | 0,02 | 2,8 (1,5-5,2) |
| Normal | 133 | 28,9 | 278 | 71,1 | 391 | 100 | | |
| 5. Birth weight | | | | | | | | |
| Deficient | 5 | 29,4 | 12 | 70,6 | 17 | 100 | 1,0 | 0,9 (0,3-2,6) |
| Normal | 135 | 31,5 | 294 | 68,5 | 429 | 100 | | |

. This table's findings indicate that stunting is 2.28 times more common in children with low birth length than in those with normal birth length.

TABLE 7 Stunting Distribution Based on Baby Care History

| Veriabel | Stunting | | Normal | | Total | | P | OR (95% CI) |
|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | N | % | | |
| 1. Basic Immunization | | | | | | | | |
| No | 94 | 42,1 | 129 | 57,8 | 223 | 100 | 0,00 | 2,7 (1,8-4,2) |
| Complete | 47 | 21,0 | 177 | 79,0 | 224 | 100 | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2. IMD<br>No<br>Yes | 31<br>110 | 30,7<br>31,8 | 70<br>236 | 69,3<br>78,2 | 101<br>346 | 100<br>100 | 0,93 | 0,9 (0,6-1,5) |
| 3. Exclusive breast-feeding<br>No<br>Yes | 99<br>42 | 39,3<br>21,5 | 153<br>153 | 60,6<br>78,5 | 252<br>195 | 100<br>100 | 0,00 | 2,4 (1,5-3,6) |

According to Table 7, toddlers who have received basic Immunizations have a risk of 0.000 for stunting, which is 93 times lower than the risk for toddlers who receive early initiation of breastfeeding (IMD).

TABLE 8 Stunting Distribution Based on the Smoking Habits of the Head of the Family

| Veriabel | Stunting | | Normal | | Total | | P | OR (95% CI) |
|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | N | % | | |
| 1. Smoking<br>Yes<br>No | 127<br>14 | 34,0<br>18,9 | 246<br>60 | 66,0<br>81,1 | 373<br>74 | 100<br>100 | 0,011 | 2,2 (1,2-4,1) |
| 2. Total cigarettes<br>>1 pack<br>1 pack<br>< 1 packs | 57<br>32<br>38 | 47,1<br>31,7<br>25,2 | 64<br>69<br>113 | 52,9<br>68,3<br>74,8 | 121<br>101<br>151 | 100<br>100<br>100 | 0,010 | |
| 3. Total cigarettes<br>>1 packs<br><1 pack | 57<br>38 | 46,7<br>24,7 | 65<br>116 | 53,3<br>75,3 | 122<br>154 | 100<br>100 | 0,000 | 2,7 (1,6-4,4) |
| 4. Total cigarettes<br>>1 packs<br>1 pack | 57<br>32 | 46,7<br>31,7 | 65<br>69 | 53,3<br>68,3 | 122<br>101 | 100<br>100 | 0,032 | 1,9 (1,1-3,3) |
| 5. Total cigarettes<br>1 pack<br><1 pack | 32<br>38 | 31,7<br>24,7 | 69<br>116 | 68,3<br>75,3 | 101<br>154 | 100<br>100 | 0,28 | 1,4 (0,8-2,4) |

According to this table's findings, children of smokers are 2.2 times more likely to have stunting than children of non-smokers.
A multivariate test employing the Logistic Regression Equation is carried out to determine the most important factors influencing stunting in toddlers in Pidie Regency, as shown in the following table:

TABLE 9 Logistic Regression Test Results of the Stunting Determinant Factors in the final stage.

| Variable | Exp(B) | SE | 95% CI | P, value |
|---|---|---|---|---|
| Cooking Utensils Cleanliness | 4,96 | 0,49 | 1,88 – 13,06 | 0,001 |
| Fish Consumption Habits | 1,91 | 0,24 | 1,20 – 3,05 | 0,006 |
| Diarrhea Case | 3,18 | 0,40 | 1,46 – 6,92 | 0,003 |
| URI | 2,11 | 0,23 | 1,33 – 3,33 | 0,001 |
| Worm infection | 2,74 | 0,58 | 0,87 – 8,64 | 0,084 |
| Fe Consumption during Pregnancy | 1,97 | 0,24 | 1,22 – 3,17 | 0,005 |
| Birth length | 2,42 | 0,34 | 1,24 – 4,72 | 0,009 |
| Completed Basic Immunization | 2,23 | 0,25 | 1,38 – 3,63 | 0,001 |
| Exclusive breastfeeding | 1,81 | 0,25 | 1,12 – 2,93 | 0,016 |
| Family Smoking Habits | 1,80 | 0,35 | 0,90 – 3,61 | 0,096 |

The final logistic regression model test revealed that the cleanliness of the cooking utensils used by toddlers, fish consumption habits, diarrhoea, URI, not taking Fe tablets regularly during pregnancy, birth length, complete basic immunization, and exclusive breastfeeding were the most significant factors contributing to stunting in the Pidie district.

## DISCUSSION

Cooking utensils, household floors, and family latrines are factors that determine access to clean water and sanitation and affect stunting. Children are exposed to contamination when family latrines are owned and poor facilities are used, which promotes the spread of fecal-borne pathogens and raises the incidence of illnesses. Stunting is caused by recurrent illnesses in children and is exacerbated by inadequate sanitation and hygiene (Ahmadi et al, 2020 (Lobo et al, 2020). Children who are permitted to play on earth may develop diarrhoea because unwaterproofed earth floors serve as breeding grounds for germs (Samiyati,2019). Children with diarrhoea and other infectious diseases may experience nutrient loss and malabsorption, leading to stunted growth (Fadilah et al, 2020).

The increased prevalence of stunting in children is linked to fish consumption. Studies reveal that children who eat fish two or three times a week are more likely to be stunted than those who eat fish every day. These findings corroborate earlier studies that connected fish consumption to stunting. Compared to freshwater fish, saltwater fish such as tuna, snapper, mackerel, and dencis have higher levels of calcium, zinc, and iron (Rachim A et al, 2017; Ernawati F et al, 2016; Sari et al, 2016).

Stunting is a direct result of several factors, including infectious diseases. Nutritional requirements and infectious diseases are intricately linked and cannot be separated. The presence of infectious diseases will exacerbate malnutrition. On the other hand, undernourished children are more vulnerable to infectious diseases (Adianta & Nuryanto, 2009).

Pregnancy outcomes also suggest a connection between birth length and stunting, and pregnancy history has demonstrated a link between iron consumption and stunting. This study lines up with research by Kundarwati (2019), Kundarwati et al, (2022), and Bingan E (2019).

Babies born short must reach their full height, but this is often not achieved with adequate nutrition, which puts them at risk of malnutrition (Sugihantono et al., 2020). Furthermore, short babies often remain short as adults (Negrato and Brito, 2014; Lukman et al, 2021).

In this study, a history of exclusive breastfeeding and complete basic immunizations were the factors that determined stunting based on infant care. These findings are consistent with studies conducted in Aceh Besar that found a link between stunting and incomplete immunization histories among infants (Raisah et al, 2022; Sandra et al, 2021; Mianna & Harianti, 2020). Another factor linked to stunting is a child's history of exclusive breastfeeding. These findings support earlier research linking stunting to exclusive breastfeeding (Sampe et al, 2020; Handayani et al, 2019). From birth to six months of age, exclusively breastfeeding can strengthen an infant's immune system and help prevent many infectious diseases. Numerous antibodies found in breast milk can dramatically boost the expression of Natural Resistance-Associated Macrophage Protein 1 (NRAMP1) and mRNA levels, thereby strengthening immunity (Fatimah et al, 2021; Wahyuni et al, 2020).

Additionally, the study discovered a link between stunting and family smoking. These findings support Zendari et al.'s study, which discovered a connection between smoking and stunting. In Indonesia, the prevalence of stunting among children under five may rise due to smoking habits among children 15 years of age and older (Wardani et al, 2020; Hasanah et al, 2020; Nadhiroh et al, 2020).

The results of the multivariate analysis were similar to those proposed by Ty Beal et al., which found that the most influential factors contributing to stunting in Indonesia were lack of exclusive breastfeeding, short birth length (Beal et al., 2018), infectious diseases (such as diarrhea, acute respiratory infections, micronutrient deficiencies, and inadequate iron intake during pregnancy) (Budiastutik & Nugraheni, 2018), and inadequate hygiene and sanitation (Vaivada et al., 2020). Nonetheless, it is generally similar to the factors that affect it, allowing for a comprehensive, multi-sector, community-based approach to prevention (Tahangnacca, Amiruddin, & Syam, 2020).

## CONCLUSION

Children who are not exclusively breastfed, those born shorter than 48 cm, those who have contracted infectious diseases within the last six months (such as diarrhea and acute respiratory infections), and those who have not received all recommended basic Immunizations are the most significant factors. These are the most important variables that affect stunting incidence in Pidie Regency. The prevalence of stunting is also significantly influenced by the practice of serving meat or fish as side dishes and by the cleanliness of the cooking utensils used for young children. Additionally, the incidence of stunting is significantly influenced by maternal factors during pregnancy, including irregular or nonexistent Fe tablet consumption.

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