

Evaluation of Intestinal Helminth Infection Among Stunting Children Under Five Years of Age in Bendung Village, Kasemen District, Banten: A Cross-Sectional Study

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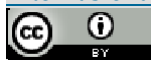
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ABSTRACT

One of the risk factors for stunting is intestinal helminth infection. Soil-Transmitted Helminth (STH) is the most common worm that infects the human intestine. Evaluation of the relationship between intestinal helminth infection and stunting in children under five years will be carried out in Bendung Village, Kasemen District, Banten. This research is a cross-sectional study conducted in Bendung Village, Kasemen District, Banten. Intestinal helminth infections were examined using the Kato-Katz method. Socioeconomic status is measured based on the Kuppuswamy's socioeconomic scale. Immunization status is obtained from the Mother & Child Card (KIA). The statistical analysis used was bivariate Chi-Square and Fisher's Exact tests. The prevalence of stunting among 12-59 months children in Bendung Village, Kasemen District, Banten was 48.6%. The prevalence of intestinal helminth infection was 41.7% (each species *A. lumbricoides* 33.3%, *T. Trichiura* 1.4%, hookworm 1.4%, mixed infections of *A. lumbricoides* and *T. Trichiura* 1.4%, mixed infections of *A. lumbricoides* and hookworm 1.4%). Intestinal helminth infection were significantly associated with stunting in children under five years. The results of this study indicate a high rate of stunting and intestinal helminth infection in children under five years in Bendung Village. Intestinal helminth infection has a negative impact on the growth of children under five years.

INTRODUCTION

Toddlers are children under 5 years old who are children aged 1-3 years (toddlers) and 3-5 years, preschool children. (Lestari NT, 2017) Stunting is a growth and development disorder in children, which is marked by length or height below standard. (Perpres RI, 2021) Stunting is found in countries with middle to lower per capita income, including Indonesia. Around 83.8 million stunting children live in South and Southeast Asia. (Mulyaningsih T, 2021) In 2021, the prevalence of stunting in toddlers in Indonesia was 24.4%, while the prevalence in Banten Province was 24.5%, and in Serang City at 23.4 %. The stunting prevalence is greater than the standard set by the WHO (World Health Organization), which is 20%. The prevalence of stunting in the city of Serang is included in the yellow category. (Kemenkes, 2021) Kasemen District ranks the highest ranking of stunting prevalence in toddlers at 22.9%. In addition, Bendung Village became a village in Kasemen District with the highest stunting prevalence of 32.2%. (Trasia RF, 2022)

Based on the WHO framework about stunting in children, several risk factors of stunting in Indonesia, namely the nutritional status of the mother, the practice of breastfeeding, the practice of providing assistance food, exposure to infection (including worm infections), and other factors such as household socioeconomic status, education, access to health services, immunization status, sanitation facilities, as well as the availability of clean water. (Beal T, 2018) worms transmitted through soil or soil-transmitted helminth (STH), namely *Ascaris Lumbricoides*, *Trichuris Trichiura*, *Acylostoma Duodenale*, and *Necator Americanus* (Mining Worm) is the most common worm that infects human intestine. (Yoseph A, 2020)

Research Mationg et al, in the Philippines and research Hamed et al. In Turkey, reports that there is a relationship between intestinal worm infections and stunting in school children. (Mationg MLS, 2021) Yoseph & Beyene Research in Boricha Worlda, Southern Etiopia reports that there is a positive relationship between intestinal worm infections and stunting in toddlers aged 6-59 months, and Infection of intestinal worms causes or worsens malnutrition. (Hamed A, 2020) Research Djuardi et al. In Nangapanda, East Nusa Tenggara, Indonesia, reports that intestinal worm infections have no relationship with stunting in preschool-age children. (Djuardi Y, 2021) Research on stunting risk factors has been carried out, but the relationship between intestinal worm infections (STH groups) and stunting is still limited and debated. Thus, this study needs to be carried out to evaluate the relationship between intestinal worm infections (STH groups) with stunting in toddlers in other locations, namely Bendung Village, Kasemen District.

Immunization can help prevent children from pathogenic exposure, and incomplete immunizations make toddlers' immunity to be weak. (Theresia GN, 2022) Immunization status is also one of the direct causes of stunting in toddlers. (Mianna R, 2020) Research Danso & Appiah in Ghana reports that there is a significant relationship between immunization status and stunting in toddlers aged 1-5 years. (Danso F, 2023) While researching Diva et al. In Sukamulya, Bandung, Indonesia reports that immunization status has no

relationship with stunting in toddlers aged <1 years - 4 years. (Diva JA, 2023) One of the risk factors for stunting is the difficulty of access to nutritious food due to quite expensive prices. Limited access can be influenced by the socioeconomic status of the family. (Rokhman A, 2020) Low socioeconomic status is related to the incidence of stunting in toddlers. (Al Mansoob, 2018) Therefore, research to evaluate the relationship of other factors (immunization status and socioeconomic status) with stunting in toddlers at this location is necessary.

Bendung Village, Kasemen District, Banten was chosen as a place of research because it ranks the highest prevalence of stunting in toddlers in the city of Serang. In addition, in 2018 the coverage of healthy homes in Bendung Village only reached 32.7% and in 2017 basic sanitation access (latrine) only reached 45.19%. (Kusuma AN, 2020) The unavailability of sanitation facilities causes water and food contamination with human waste due to defecation carelessly associated with intestinal worm infections. (Bernynda Z, 2018)

Previous research conducted by Annisa et al (2019), and Sari et al (2019), in the working area of the Puskesmas Kilasah, Kasemen District, Serang only reported the relationship between mother's knowledge and exclusive breastfeeding with stunting. Therefore, a discussion of the evaluation of the relationship between worm infection The intestine (STH group), immunization status, and socioeconomic status with stunting in toddlers in Bendung Village, Kasemen District became a novelty in this study.

LITERATURE REVIEW

Stunting is a condition of failure to thrive in children due to chronic malnutrition, recurrent infections, and inadequate stimulation, especially in the first 1,000 days of life (from pregnancy to age 2 years). Stunting is characterized by a child's height being shorter than the standard for their age according to the WHO growth curve.

METHODOLOGY

This research is an analytical observative study using a cross-sectional study design. This study aims to evaluate the relationship between intestinal worm infections, immunization status, and socioeconomic status as an independent variable, with stunting as a dependent variable, in toddlers in Bendung Village, Kasemen District, Banten at the same time. This research was conducted in May 2023 until November 2023 (7 months). This study was conducted in Bendung Village, Kasemen District, Banten which is the working area of the Serang City Puskesmas with the highest prevalence of 32.2% stunting. In addition, examination of toddler feces samples will be carried out at the Parasitology Laboratory, Faculty of Medicine, Sultan Ageng Tirtayasa University.

The affordable population in this study was all toddlers aged 12-59 months who were recorded by the Puskesmas Kilasah, both toddlers who experienced stunting and not stunted. The sample of this study was a toddler recorded by the Puskesmas Kilasah who was chosen as the subject of the

research and meets the inclusion criteria. The sampling technique used, is the simple random sampling method. The minimum sample to be taken is calculated using the proportion comparison test formula. Type I error of 5%, type II error of 20%, toddlers aged 12-59 months infected with intestinal worms and experience stunting of 6%, toddlers aged 12-59 months that are not infected with intestinal worms and experience stunting by 33%, and The minimum proportion difference that is considered meaningful of 27%, then the minimum sample size for each group is 49.

Data regarding stunting in toddlers is secondary data obtained from the Puskesmas Kilasah, Kasemen District, Serang City, Banten. Stunting data in toddlers are obtained from the measurement of the length of the body/ height of the toddler in the same month as the research. In addition, stunting is determined based on the graph or Z-Score table of body length/height according to WHO age. Taking stunting data to toddlers starts with giving ethics permits and research permits to the Puskesmas Kilasah. If the permit has been obtained, the researcher will take a list of the names of all toddlers registered at the Kilasah Health Center and conduct sampling techniques. Based on the results of the randomization, toddlers who became the subject of the research were then seen the results of measurement of body length/height in the same month as the research implementation. Toddler body length/height plotted on a graph or Z-Score table body length/height according to age or according to the sex of the toddler.

RESEARCH RESULTS

There were 92 participants from 3 posyandu, namely Paprika Posyandu in Sungak Village, Cucumber Posyandu in Pelopor Village, and Posyandu Carrots in Tegal Duhur Village who met the requirements to take part in this research. Of the 92 participants, all participants have completed the questionnaire, 3 participants were excluded for taking worm medicine in the last 3 months, and 17 participants did not collect feces. Demographic characteristics of research participants are displayed in Table 1.

The study participants were dominated by male toddlers (56.9%). Most participants aged 12-23 months (28.8%) and 24-35 months (28.8%) with an average age (standard deviation) of toddlers were 33.8 +/- 13.8 months. Most fathers and mothers are elementary school graduates (68.1% and 73.6% each), with the father's work being a freelance daily laborer or doing basic work (59%), and the mother's work is not working or housewives (94.4%). Half of toddlers come from families with a family income of <Rp1,300,000 (50%).

Table 1. Demographic and Socioeconomic Characteristics in Toddlers

Characteristic	Count (n)	Percentage (%)
Gender		
Boys	41	56,9
Girls	31	43,1
Age (months)		

12 – 23	20	27,8
24 – 35	20	27,8
36 – 47	17	23,6
48 – 59	15	20,8
Father Education		
Illiterate	1	1,4
SD	49	68,1
SMP	14	19,4
SMA	7	9,7
D1	1	1,4
Father Occupation		
Basic jobs (driver, waiter, <i>freelancer</i>)	59	81,9
Factory and machine labor	2	2,8
Merchants and artisans	7	9,7
Farmers and fishermen	1	1,4
Private and civil servants	3	4,2
Mother Education		
Illiterate	3	4,2
SD	53	73,6
SMP	12	16,7
SMA	4	5,6
Mother Occupation		
Not working	68	94,4
Basic jobs (driver, waiter, <i>freelancer</i>)	2	2,8
Private and civil servants	2	2,8
Family Income		
< Rp1.300.000	36	50
Rp1.300.000 – Rp3.900.000	34	47,2
Rp3.900.000 – Rp6.500.000	2	2,8

Toddler height measurement data in May 2023 (the same month as data collection) owned by the Local Health Center and the results of the plotting on the height/ body length graph to the age of WHO based on sex show that 35 children under five experience stunting (48.6%) and 37 toddlers have a height/length of body to normal age (51.4%). There are 64 toddlers who do not get a complete dose of basic immunization, while only 8 toddlers have received a complete dose of basic immunization (11.1%). Almost all toddlers come from families with the lower category socioeconomic status (95.8%). Based on stool examination using the kato-katz method, an STH infection was found in 30 toddlers (41.7%). Infection is caused by a single infection *A. lumbricoides* (33.3%),

hookworms (4.2%), or *T. Trichiura* (1.4%). Also found mixed infections between *A. lumbricoides* and hookworms (1.4%), as well as mixed infections between *A. Lumbricoides* and *T. Trichiura* (1.4%) (Table 2)

There is a statistically significant relationship with a $p < 0.05$ value between intestinal worm infections and stunting (Table 3) in the chi-square test results. The proportion of stunting is higher in toddlers without intestinal worm infections than in toddlers infected with intestinal worms.

Table 2. The Relationship between Intestinal Worm Infection and Stunting in Participants Under Five

	Cases of <i>Stunting</i>		Total	P value
	<i>Stunting</i>	Normal		
Intestinal Worm Infection				
Positive	10 (33,3%)	20 (66,7%)	30 (100%)	
Negative	25 (59,5%)	17 (40,5%)	42 (100%)	0,028*
Total	35 (48,6%)	37 (51,4%)	72 (100%)	

*) *Chi-Square* Test

This study also analyzed the relationship between sex and intestinal worm infection, as well as the relationship between age and intestinal worm infections using the chi-square test. The test results show that there is no statistically significant relationship between age and intestinal worm infection with a value of $P = 0.966$. The proportion of intestinal worm infections is higher in toddlers with a group of 36-47 months at 47.1%. The proportion of intestinal worm infections in toddlers with groups aged 12-13 months, 24-15 months, and 48 - 59 months is 40%.

Table 3. The Relationship between Immunization Status and Socioeconomic Status with Stunting in Participants Under Five

	Cases of <i>Stunting</i>		Total	P value
	<i>Stunting</i>	Normal		
Imunisation status				
Complete	33 (51,6%)	31 (48,4%)	64 (100%)	0,262**
Incomplete	2 (25%)	6 (75%)	8 (100%)	
Socioeconomic status				
Low	35 (50,7%)	34 (49,3%)	69 (100%)	0,24**
Middle	0 (0%)	3 (100%)	3 (100%)	

The results of the analysis of the Chi-Square test between the sex and intestinal worm infection showed that there was no statistically significant relationship between the two variables with the value of $P = 0.059$. The proportion of intestinal worm infections in toddlers is male at 51.2%, while the proportion of intestinal worm infections in female toddlers is 29%.

DISCUSSION

In the statistical analysis the Chi-Square test was conducted to see the ratio of the proportion between immunization status and stunting. Based on the test conducted, there are 2 cells ($> 20\%$) having Expected Count <5 , so the Fisher Exact test is carried out. There is no statistically significant relationship based on the Fisher Exact test ($P > 0.05$). The proportion of stunting in toddlers with incomplete immunization status is 51.6% while stunting in toddlers with a complete immunization status of 25%.

In the statistical analysis the Chi-Square test was conducted to see the comparison of the proportion between socioeconomic status and. Based on the test conducted, there are 2 cells ($> 20\%$) having Expected Count <5 , so the Fisher Exact test is carried out. The test results show that there is no statistically significant relationship between socioeconomic status and stunting ($P > 0.05$). The proportion of stunting in toddlers who come from families with socioeconomic status below 50.7% and no stunting toddlers from families with medium socioeconomic status.

In this study also conducted separate analyses of the socioeconomic status components, including father's education, mother's education, father's work, mother's work, and family income. The Chi-Square test shows that there is no statistically significant relationship between the father's education and stunting in toddlers with a value of $P = 0.884$. The proportion of stunting toddlers to fathers with illiteracy and elementary school levels is 48.1%, while toddlers stunted in fathers with junior high, high school, and D1 education levels of 50%. In this study, no toddlers came from fathers with education levels D2, D3, S1, and S3.

The Chi-Square test results also show that there is no statistically significant relationship between the level of maternal education and the incidence of stunting in toddlers with the value of $P = 0.313$. The proportion of toddlers who experience stunting at the education level of illiteracy & elementary school is 51.8% and stunting toddlers with the education level of junior high and high school mothers of 37.5%. In this study, no toddlers came from mothers with tertiary education levels.

The Chi-Square test also shows that there is no statistically significant relationship between father's work and stunting in toddlers with a value of $P = 0.845$. The proportion of stunting in toddlers with the category of not working and basic jobs of 49.2%, while stunting toddlers with other categories of work (including, farmers and fishermen, factory and machine workers, private employees and civil servants, traders and craftsmen) of 46, 2%.

Likewise, the work of the mother and stunting in toddlers showed that there was no significant relationship between the two variables based on the Fisher Exact test with the value of $P = 0.618$. The proportion of stunting in toddlers with mothers who do not work (housewives) is 50% while stunting in toddlers with mothers who work at 25%.

The Chi-Square test between family income and stunting in toddlers showed no significant relationship between the two variables with the value of $P = 0.238$. The proportion of toddlers who experience higher stunting in

toddlers who come from families with a family income <Rp1,300,000 amounted to 55.6%, compared to stunting toddlers from families with a family income of Rp1,300,000 - Rp6,500,000 at 41.7%.

Nearly half (41.7%) of toddlers in Bendung Village are infected with intestinal worms, in this case, STH infection. Research in Nangapanda, East Nusa Tenggara, Indonesia in toddlers aged 12-59 months shows a high prevalence of STH infection, which is 58.8%. The high prevalence of STH infection can occur due to the absence of adequate sanitation facilities so that it can pollute water and soil which is a risk factor for STH infection. In addition, STH infection can be caused by a lack of food cleanliness. Toddlers are vulnerable to being infected with STH because it still depends on parents or other people who care for them. Lack of food cleanliness during preparation and consuming food as a result of the low level of education or lack of knowledge possessed by caregivers can be a risk factor for toddlers infected with STH. different from research conducted in Central Lombok, West Nusa Tenggara, Indonesia in toddlers aged 6-59 Months, which found that the prevalence of STH infection was only 11.17%. Differences in the prevalence between this study and both previous studies can be caused by differences in the geographical conditions of the study location. STH infection can be influenced by climate and environmental conditions, including surface temperatures, rainfall, regional height, and soil types that can facilitate the transmission of STH infection.

CONCLUSIONS AND RECOMMENDATIONS

Stunting prevalence in toddlers 12-59 months in Bendung Village, Kasemen District, Banten is 48.6%. The prevalence of STH infection in toddlers 12-59 months in Bendung Village, Kasemen District, Banten is 41.7%. The highest prevalence is caused by *A. lumbricoides* (33.3%), then hookworms (4.2%), *T. Trichiura* (1.4%), Mixed *A. Lumbricoides* infection + hookworms (1.4%), and mixed infection *A. Lumbricoides* + *T. Trichiura* (1.4%). Found a significant relationship between STH infection and stunting in toddlers with a higher stunting proportion in infants who are not infected with STH. In this study there was no significant relationship between immunization status and stunting in toddlers, and there was no significant relationship between socioeconomic status and stunting in toddlers.

ADVANCED RESEARCH

This further study aims to better understand the relationship between STH infection and stunting and to find more effective intervention strategies. With a combination of long-term research, intervention trials, biological analysis, and environmental approaches, it is hoped that more comprehensive solutions can be found to reduce the prevalence of stunting in children.

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