ORIGINAL ARTICLE

# Environmental Risk Determinants Associated With Stunting in Children in Tasikmalaya, Indonesia: A Public Health Surveillance-based Retrospective Studies

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## ABSTRACT

**Introduction:** Globally, by 2020, 155 million children under five will be stunted. Indonesia is one of the countries contributing to Southeast Asia's third-highest incidence of stunting, reaching 36.4%. West Java Province has a stunting prevalence of 31.2% with Tasikmalaya Regency ranked 5th with a prevalence of 24.4%. Cipatujah Public Health Center has the 4th highest prevalence in Tasikmalaya Regency at 21.4%. The purpose of this study was to analyze the environmental risk determinants of stunting in the Cipatujah Public Health Center based on Surveillance data period 2021-2023. **Materials and methods:** The research design was Retrospective Cohort period 2021-2023. The study sample was 257 respondents who met the inclusion criteria taken by total sampling. The research instrument used was a checklist sheet. The statistical analysis used was Chi-square. **Results:** The risk of toilet facilities and the incidence of stunting (p-value=0.001, RR = 5.407, CI 95%=2.784-10.50). Water quality (p-value= 0.001, RR= 4.688, CI = 95% 2.513-8.745). **Conclusion:** There is a relationship between environmental risk determinants and the incidence of stunting in children aged 24 months in the Cipatujah Health Center Working Area, Tasikmalaya Regency in 2023. For families, it is necessary to improve basic sanitation that meets the household's requirements to create the application of clean and healthy living behavior.
*Malaysian Journal of Medicine and Health Sciences* (2024) 20(SUPP9): 150-154. doi:10.47836/mjmhs20.s9.24

**Keywords:** Stunting, Toilet facilities, Water quality, Environmental risk determinants, Nutritional status

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## INTRODUCTION

Stunting is still a global public health problem, in 2020 the number of cases of more than 149 million (22%) children under five worldwide experienced stunting(1). Stunting is a nutritional health problem that indicates linear growth failure in children aged 24-59 months caused by chronic malnutrition and recurrent infections during the first 1000 days of life. It is characterized by height-for-age or length-for-age on the World Health Organization growth curve scale of less than -2 standard deviations (2). As linear growth in children is the most accurate indicator of nutritional status to assess child health and well-being, stunting is currently a major issue worldwide, including in Indonesia(3).

The World Health Organization (2018), reported that Indonesia is one of the countries contributing the third highest incidence of stunting in Southeast Asia, reaching 36.4% from 2005-2017. According to the Basic Health Research report, the prevalence of stunting in Indonesia increased from 2016 to 2018, namely 27.5% in 2016, 29.6% in 2017, and 30.8% in 2018(4).

Historically, research on stunting has focused on dietary intake, but a growing body of evidence points to the critical role of the natural and physical environment in child health. The interaction between environment and nutrition presents an interesting dynamic, where interactions between environmental factors and nutritional status can lead to changes in health status (5) (6). Infectious diseases such as diarrhea, Environmental Enteric Dysfunction, and intestinal worms are increasing as a result of factors contributing to poor environmental sanitation. These factors include the use of unsanitary toilet facilities s, use of unclean water sources, and poor handwashing practices. These conditions can lead to impaired linear growth and can increase mortality in children under five(1). As a health issue, stunting in Indonesia is a national public health problem that must be taken seriously. According to the findings of the Basic Health Research (2018), the prevalence of stunting varies across 34 provinces in Indonesia. According to research by the Ministry of Health, stunting caused by the absence of clean water and poor sanitation reaches

60%, while that caused by malnutrition is "only" 40%. Therefore, Indonesia has set access to clean water as one of the goals of the Sustainable Development Goals (SDGs) with a target of 2030(7).

According to the Ministry of Health's Data and Information Center (2019), West Java Province ranks 18th out of 33 provinces in Indonesia for stunting prevalence, at 31.2%. With a prevalence of 24.4%, Tasikmalaya District is ranked fifth in West Java Province for stunting. With 21.4%, Cipatujah sub-district is fourth in Tasikmalaya district in terms of prevalence. This sub-district is a priority sub-district in the Tasikmalaya Regency government's accelerated stunting reduction plan for 2024 because it has not met the World Health Organization target of 20% and the Strategic Planning target of 14% for 2016-2021(8). Based on this description, researchers are interested in analyzing the environmental risk determinants of stunting in children aged 24 months in the Cipatujah Health Center working area, Tasikmalaya Regency in 2023.

## MATERIALS AND METHODS

### Study Design

This study is a quantitative study with an analytic observational approach. The research design used is Retrospective Cohort period 2021-2023. The exposure in this study is a determinant of environmental risk which includes toilet facilities and water quality in 2021. The effect is the incidence of stunting in toddlers aged 24 months in 2023.

### Study Setting

The setting of this research is the Cipatujah Public Health Center working area, Tasikmalaya Regency, West Java Province, Indonesia in 2023. The Cipatujah District area was chosen because in 2023 it will still have a prevalence of 21.4%, which is the 4th highest in Tasikmalaya Regency, Jawa Berat Province, Indonesia.

### Participants

The sampling technique in this study was total sampling with a research sample of 257 respondents who met the inclusion criteria. The inclusion criteria in this study are complete respondent data including characteristics, results of measurements of body weight and height, children aged 24 months from January to April 2023, and data collected for environmental risk determinants (family toilet facilities risk level and water quality) in the January-December 2021 period.

### Data Collection

The data studied were environmental risk determinants (family toilet facilities risk level and water quality) which could be observed from the Cipatujah environmental health register and the incidence of stunting which was observed from the Community-Based Nutrition e-Recording and Reporting data period 2021-2023. Toilet facilities are the quality of fulfilling the latrine requirements owned by the respondent's family based on the standards and health requirements of latrine buildings in 2021. Water quality is the Pollution Index for the quality of meeting clean water requirements obtained from checking the quality of the water used by respondents in 2021. Stunting is a condition of short stature in children aged 24 months based on the results of measurements of height according to age recorded on the Nutrition e-Recording and Reporting data Cipatujah Public Health Center 2023.

### Analysis of Data

The statistical analysis in this study was univariate and bivariate with Chi-square test. The instrument used in data collection was a checklist sheet.

### Ethical Clearance

The study was approved by the Sekolah Tinggi Ilmu Kesehatan Kuningan Ethical Review Committee, reference number 113/EP/STIKKU/2023

## RESULTS

### Univariate Analysis

Based on the characteristics of a total of 257 respondents consisting of 150 men (51.36%), and 107 women (41.63%) The sample of toddlers aged 2 years in January-April 2023 consisted of 59 people in January, 89 people in February, 61 people in March and 48 people in April 2023. According to the findings of the univariate analysis of the family toilet facilities risk level shows that most of the unhealthy toilet facilities are 58.8%, most of the water quality does not meet the quality standards as much as 55.6% and almost half of the incidence of stunting in children aged 24 months was 30.4%nas shown in Table I.

**Table I: Univariate Analysis for Correlation Study**

| Variable | | n(%) |
|---|---|---|
| **Independent Variable** | | |
| Family Latrine Risk Levels | Unhealthy latrine | 151(58.8) |
| | Healthy latrine | 106(41.2) |
| Water Quality | Does not meet quality standards | 141(55.6) |
| | Meet quality standards | 133(44.4) |
| **Dependent Variable** | | |
| Incidence of Stunting | Stunting | 78(30.4) |
| | Not Stunting | 179(69,6) |
| | | 257(100) |

### Bivariate Analisis

Based on Ttable II, it can be explained that out of 151 respondents (100%) who had unhealthy toilet facilities s, almost half experienced stunting, namely 65 respondents (43.1%). Meanwhile, of the 106 respondents (100%) who had healthy toilet facilities s, most did not experience stunting, namely 93 respondents (87.7%).

**Table II: Bivariate Analysis**

| Variable | Incidence of Stunting | | | | Total | p-value | RR | 95%CI |
|---|---|---|---|---|---|---|---|---|
| | Stunting | | Not Stunting | | | | | |
| | F | (%) | F | (%) | | | | |
| **Family Latrine Risk Levels** | | | | | | | | |
| Unhealthy latrine | 65 | (43.1) | 86 | (56.9) | 151 | 0.001 | 5.40 | 2.784 - 10.50 |
| Healthy latrine | 13 | (12.9) | 93 | (87.7) | 106 | | | |
| **Water Quality** | | | | | | | | |
| Does not meet quality standards | 62 | (43.4) | 81 | (56.6) | 143 | 0.001 | 4.68 | 2.513 – 8.745 |
| Meet quality standards | 16 | (14.1) | 98 | (85.9) | 114 | | | |

* Significant < 0.05

Based on the results of the Chi Square statistical test, H0 is rejected and Ha is accepted, meaning "There is a significant relationship between the risk of family toilet facilities s and the incidence of stunting in the working area of the Cipatujah Public Health Center, Tasikmalaya District in 2023". Based on bivariate analysis, the Risk Relative value that the risk of family toilet facilities s can be stated as a cause of stunting. Thus, respondents who have unhealthy toilet facilities have a 5.407-fold chance of experiencing the risk of stunting. The results showed a CI range of 2.784-10.501 which means there is a relationship because it exceeds 1.

It can be explained that out of 143 respondents (100%) who have water quality that does not meet quality standards, almost some of them experience stunting, as many as 62 respondents (43.4%). Whereas from 114 respondents (100%) who had water quality that met quality standards, most did not experience stunting, namely 98 respondents (85.9%).

Based on the results of the Chi Square statistical test, H0 is rejected and Ha is accepted, meaning that "There is a significant relationship between water quality and the incidence of stunting in the working area of the Cipatujah Public Health Centre, Tasikmalaya district in 2023". Based on bivariate analysis, the Risk Relative that water quality can be stated as a cause of stunting. Thus, respondents who have water quality that does not meet quality standards have a 4.688-fold chance of experiencing the risk of stunting. The results showed a CI range of 2.513 - 8.745 which means there is a relationship because it exceeds 1.

## DISCUSSION

Based on the results of bivariate analysis, the proportion of 24-month-old children who have stunted nutritional status is more in families with unhealthy toilet facilities access, which is equal to (58.7%) than families with healthy toilet facilities access (41.3%). The results of statistical analysis show that toddlers from households with unhealthy toilet facilities access have a 5.407 times risk of being stunted compared to toddlers from households with healthy toilet facilities access. This is in accordance with research Hasan & Kadarusman, 2019, access to healthy toilet facilities s is associated with the incidence of stunting in East Lampung Regency, meaning that households that do not have access to healthy toilet facilities s have a risk of having stunted toddlers 5.25 times to suffer stunting compared to families who have access to healthy toilet facilities (9).

In the study area, there are still many public toilet facilities s built on riverbanks and near fish ponds. The ownership of toilet facilities s in the community around the river in the study area is inadequate, resulting in decreased river water quality. The availability of family toilet facilities s is very important, especially to prevent diseases from environmental pollution and water sources. Open defecation behavior can increase the incidence of diarrhea, especially if the source of drinking water consumption comes from river water or wells that are close to the disposal of feces in households without septic tanks. If open defecation behavior occurs repeatedly, then the incidence of diarrhea will also be repeated. And if this happens to children under 24 months of age continuously, the long-term effect of this behavior is stunting(10). This is in accordance with research by Rahman, et al, 2020 which revealed that the practice of defecating in the open is associated with the incidence of stunting in children under five in India (11). This behavior causes environmental pollution due to the spread of disease-carrying vector agents such as E. coli bacteria. If the E. coli bacteria are touched by children who in the process of growth have the behavior of putting fingers in the mouth, causing children to swallow a number of E. coli bacteria that can infect the intestines. The condition of intestinal infection in the form of diarrhea can affect the nutritional status of children by reducing appetite, disrupting the absorption of nutrients which causes children to experience malnutrition and growth disorders (12). Repeated infectious diseases experienced since infancy cause the child's body to always need more energy to fight the disease. If this need is not balanced with adequate intake, the child will experience malnutrition and eventually experience stunting.

The results showed that most households' access

to clean water in the study area did not meet quality standards (55.7%) while those that did met quality standards (44.3%). Statistical analysis showed that 24-month-old children from households whose water quality did not meet the requirements had a 4.688 times greater risk of stunting than those from households with water quality that met the quality standards. In accordance with research conducted in lower-middle-income countries which shows that improving access to and quality of clean water can increase the Z-score of children's height-for-age. In addition, increasing access and quality of clean water also reduces the risk of stunting by 13%(13). Similar results were obtained in Ethiopia by Abate, et al, 2019 which showed that clean water, sanitation and hygiene were strong predictors of stunting(14).

The study area is a coastal area facing the Indian Ocean, where there are two large rivers that flow and meet at the mouth of the south coast. Therefore, the majority of people in the study area (58.70%) use river water as raw water for their daily needs (bathing, washing clothes and cooking utensils or eating and drinking). There are also some residents who still use well water for drinking purposes. Based on field observations, river water can be sufficient in quantity to fulfill daily needs, but in quality it is not suitable for use. Consumption of river water or well water is a direct risk of stunting. This is because river water or well water contains vector agents as carriers of disease, such as *E. coli* bacteria that cause diarrhea. The study area has the potential for river pollution because open defecation behavior is relatively high. Observations in the study area found *E. coli* bacteria contamination in most water supplies. Water pollution in water quality that does not meet the quality standards in the study area, 93.6%, was found to have high *E. Coli* bacteria content of more than 50 coliforms in the water quality test. The high number of *E. Coli* is due to the domestic waste of people who still use floating toilets or toilet facilities s in the river.

The constraints felt by the research community in providing clean water facilities are the cost and difficulty of obtaining clean water sources during the dry season. This is likely due to the lack of water catchment areas, where most of the land is coastal and some is used as rice fields and gardens. Therefore, during the dry season, water reserves are not stored properly. This can be overcome by increasing cooperation between the village government and the district government through the National Program for Community-Based Water Supply and Sanitation. Another way is to build a rainwater harvesting system, so that during the dry season there are still water reserves that can be processed and used by the community.

According to the researcher's assumption, it is necessary to improve basic sanitation that meets the requirements in households in order to create the application of clean and healthy living behavior. The implementation of clean and healthy living behaviors can be carried out with the help of various parties and across sectors. The Cipatujah Public Health Center is expected to make efforts to improve community sanitation to meet the requirements of healthy family toilet facilities s and water quality that meets quality standards, so that all aspects of basic household sanitation meet the requirements. And the community is also expected to implement clean and healthy living behaviors in daily household life. To fulfill the maintenance of good toilet facilities s, it is necessary to provide sufficient management facilities, because without facilities, the family toilet facilities management effort cannot be carried out. For this reason, the local government also needs to provide toilet facilities management tools such as cleaning equipment, sewers and other facilities. In addition, a water pollution control strategy is needed by changing people's perceptions of the status of river water pollution and the need to provide wastewater treatment facilities either through the construction of wastewater treatment plants. The researcher's assumption is reinforced by the research of Hasan & Kadarusman, 2019 which shows that there is a significant relationship between the level of risk of family toilet facilities s and the incidence of stunting in children, namely with healthy toilet facilities s as much as 40.0%. with a medium risk level of 60.0% and with a high risk level of 16.7% (9).

## CONCLUSION

Based on the results of data analysis and discussion that has been carried out in this study, it can be concluded that there is a significant relationship between environmental determinants (the level of risk of family toilet facilities s and water quality) and the incidence of stunting in the Cipatujah Health Public Center working area, Tasikmalaya Regency in 2023. The strength of this study is that it measures in a retrospective cohort environmental risk factors which are intermediary factors in the incidence of infection in toddlers and thus the risk of stunting. The weakness of this research is that only two variables were studied so the contribution of other variables to the occurrence of stunting could not be analyzed.

## ACKNOWLEDGEMENT

This work is supported by Institute of Health Science Kuningan and Cipatujah Public Health Center Tasikmalaya, Indonesia.

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