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Home Environmental Health: Relationship with Stunting in Bandar Lampung

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Stunting is a short and very short body condition based on age with height <-2 SD from the WHO child growth standards nutritional status table. Factors affecting nutritional problems in Indonesia consist of internal and external factors. This study aims to determine the relationship between home environmental health with stunting in the city of Bandar Lampung. The study was conducted in July - December 2019 in Bandar Lampung City using a case-control design. Research respondents numbered 106 people who were selected using purposive sampling, then observing the environmental health conditions reviews of their homes. The results of the study were processed and analysed descriptively and analytically to obtain a pattern and strong relationship between home environmental health with stunting in the city of Bandar Lampung. The results showed a relationship between physical facilities and household sanitation facilities with stunting with pv: 0043 and 0:02. The interaction between clean water facilities and wastewater disposal facilities has a strong dominant relationship to the risk of stunting with pv: 0.033 and OR: 122.617. Based on reviews of these results, improving the quality of home environmental health must be done to minimise the risk of stunting in Bandar Lampung City.

Keywords: *Environmental Health of House, Stunting.*

Introduction

Stunting is a body state that is short and very short for age by height that is below minus two standard deviations (<-2 SD) from a table of nutritional status WHO child growth standards (Manary and Solomons, 2009). Stunting is one of the nutritional problems that occur in infants early in life (UNICEF, 2017), thus used as an indicator to illustrate the problems of nutrition to be able to reveal the root cause (Proverawati & Wati, 2011). Stunting is considered as an irreversible growth disorder that is mostly influenced by inadequate nutritional intake and recurrent infections during the first 1,000 days of life (WHO, 2017).

Stunting that occurs in infants can provide long-term effects that become adult stunting, and have an impact on cognitive development, school performance, productivity as adults, as well as impact on the offspring. Moreover, stunting renders infants at risk of metabolic disorders and chronic diseases when adults (Dewey & Begum, 2011). There is also the argument that toddler stunting can delay maturity structure and function of the parts that play a role in the formation of the brain that have an impact on cognitive development, thus stunted toddlers will have less attention and memory capacity (Kar, 2008).

Based on the Global Nutrition Report 2014, Indonesia was included in 17 countries among 117 countries that show three nutritional problems, namely 37.2% stunting, wasting 12.1%, and 11.9% overweight in infants (Achadi, 2015). According to WHO, the prevalence of stunting in children under five years during 2015 – 2017 has Indonesia as the third-highest in the Southeast Asian region / South-East Asia Regional (SEAR), with an average of 36.4% (Kemenkes RI, 2018).

The high prevalence of stunting indicates nutritional problems in Indonesia are still a chronic problem. Many factors affect the nutritional problems in Indonesia, consisting of internal factors; genetic, obstetric, race, age, sex, and chromosomal abnormalities, and external factors; namely nutrition, medicine, the environment and infectious diseases (Supariasa, 2014; Setiawan et al., 2018). There is another opinion that states that stunting in Indonesia is related to the factor of "In", i.e., race, genetics, age, sex, and chromosomal abnormalities, and the factor “Affairs”, which factors before birth – the nutritional status of pregnant women, abnormal mechanical foetal position, toxic substances/chemical/pharmaceuticals, radiation, infectious diseases, immunological disorders, and psychological condition of the mother: and factors after birth –children's nutritional status, socio-cultural families and communities, socio-economic status, climate, physical exercise, hormonal, labour factors, psychological, parenting and stimulation (Istiany & Rusilanti, 2014).

The environment is one risk factor for stunting (Renyoet, 2013). The environment is everything that was around human life. In the case of stunting in children under five, the environment in question is a home environment that may affect the incidence of stunting includes the physical condition of the house, the sanitary condition of the house, and sanitation facilities.

Based on the results of Riskesdas and Nutritional Status Monitoring (PSG), cases of stunting in 2015 - 2018 tended to increase. Stunting cases nationally in 2015 by 29%, in 2016 by 27.5%, amounting to 29.6% in 2017 and 2018 by 30.8%. Cases of stunting in Lampung in 2015 by 22.7%, in 2016 by 24.8%, in 2017 31.6%, and 2018 amounted to 27.28%. While cases of stunting in Bandar Lampung in 2015 by 22%, in 2016 by 22.3% and in 2018 amounted to 23.39% (Kemenkes RI, 2016; Kemenkes RI, 2017; Kemenkes RI, 2018; Kemenkes RI, 2018; Kadinkes Lampung Province, 2019).

Based on these data, it appears the trend is to increased cases of stunting, both at the national level, Lampung province, as well as in the city of Bandar Lampung. When compared with the case of stunting limits set by the WHO of 20%, then the case of stunting in Indonesia is still a public health problem that should receive serious attention from the government. (Kemenkes RI, 2016; Kahfi, 2015).

This study aims to determine the relationship between the health of the home environment with the incidence of stunting in children under five in Bandar Lampung 2019.

Methods

Research conducted July-December 2019 in the city of Bandar Lampung, using quantitative methods to the design of the case-control study because the researchers wanted to see the relationship between the environmental health of the home with incident cases of stunting among children under five in Bandar Lampung in 2019.

The study population was all infants aged 12-59 months who reside in the region of Bandar Lampung as many as 40,683 people, with the number of infants who recorded as short and very short as many as 2,060 people. A large sample is determined based on the formula of the samples (Lemeshow, 1990), and refers to the stunting research conducted by Wellina (2016), the obtained value of P2 at 0.149 and OR 3.63 value. This earned a sample size 53. This study uses the ratio between the number of cases with the amount of control of 1:1 to obtain the samples in a case group of 53 and the sample in the control group of 53, so that sample size in this study was 106. While election samples use a purposive sampling unit.

The data collection is done by observation of the homes of respondents using a questionnaire and checklist instrument. A survey was used to obtain data on the general data of respondents. In contrast, the checklist is used to collect data about the condition of the house and the conditions of physical sanitation facilities existing in the respondent's home.

Data processing and analysis were done descriptively to determine the frequency distribution of each variable, and analytically using chi-square test and logistic regression using an alpha of 0.05 to obtain stronger indications of the pattern of the relationship between home environmental health factors and stunting in Bandar Lampung.

Results

Univariate analysis

Table 1. Frequency Distribution of Respondents by Sub-Variable Physical Facilities Houses in Bandar Lampung in 2019

No.	Sub-Variable Physical Facilities Home	Frequency	
		n	%
1	Floor		
	a. Marble / Ceramics / Tile	37	34.9
	b. Cement	66	62.3
	c. Board	1	0.9
	d. Soil	2	1.9
2	Wall		
	a. Permanent (brick)	74	69.8
	b. Semi-Permanent (mostly brick)	16	15.1
	c. Non-Permanent (board / geribik)	16	15.1
3	Palate		
	a. Gypsum / GRC / Triplex	43	40.6
	b. Geribik / Plastics	1	0.9
	c. Not having a ceiling	62	58.5
4	Ventilation		
	a. Extensive natural ventilation openings ≥ 10% of the floor area of the house	58	54.7
	b. Extensive natural ventilation openings <10% of the floor area of the house	48	45.3
5	exposure		
	a. Intense natural light in every corner of the house sufficient	34	32.1
	b. Intense natural + artificial light in every corner of the house sufficient	56	52.8
	c. Intense natural + artificial light in every corner of the house is not sufficient	16	15.1

Based on Table 1, we can know the mean physical quality of the houses of 106 infants who were sampled in this study, and it appears that as many as 37 infants (34.9%) of them inhabit a house with a floor that is eligible because it is made of marble/ceramic/tile. 74 toddlers (69.8%) inhabit the house with qualified walls because they are made of brick. 43 infants (40.6%) inhabit the house with a ceiling (ceiling) are eligible because they are made of gypsum / GRC / plywood. 58 infants (54, 7%) inhabit a house with ventilation qualifying for large natural ventilation openings ≥ 10% of the floor area of the house. 90 infants (84.9%) inhabit houses with lighting qualifying because its intense natural light, or supplemented with artificial light sources, can be sufficient to illuminate every corner of the house.

For variable rate homes, physical means can be made by combining all of the sub-variables of home physical means provided that the house's physical facilities would qualify if all sub-variables are also eligible. The results are shown in Table 2.

Table 2. Frequency Distribution of Respondents through Physical Houses in Bandar Lampung in 2019

No.	Physical Facilities Home	Frequency	
		n	%
1	Qualify	19	17.9
2	Not eligible	87	82.1

Based on Table 2, it can be seen that of 106 children who sampled this study, 87 infants (82.1%) inhabit a home with home physical means that do not qualify, and 19 toddlers rest (17.9%) inhabit a house with the infrastructure a qualified home.

Table 3. Frequency Distribution of Respondents by Sub Variable Means Sanitary House in Bandar Lampung in 2019

No.	Variable Means Sanitation Sub Houses	Frequency	
		n	%
1	Clean water supply		
	a. PDAM	10	9.4
	b. Well (Drill/dig)	86	81.1
	c. Buy at merchants around the water	1	0.9
	d. hitch to a neighbour's	7	6.6
	e. more	2	1.9
2	disposal of faeces		
	a. Goose Neck + Septic Tank	105	99.1
	b. public toilets	1	0.9
3	Wastewater disposal		
	a. absorption holes	4	3.8
	b. Join with pit latrines home	3	2.8
	c. Sewer city (syrinx)	87	82.1
	d. carelessly	12	11.3
4	Waste disposal		
	a. Transported sanitary service	60	56.6
	b. burnt	46	43.4
5	Vector control		
	a. Wiring mosquitoes in ventilation	15	14.2
	b. The use of insecticides	21	19.8
	c. The use of mosquito nets	40	37.7
	d. There are no control efforts	30	28.3
6	sanitary Food		
	a. 6 whole food sanitation principles applied	18	17.0
	b. 6 principles of food sanitation partially implemented	66	62.3
	c. 6 food sanitation principles are not applied	22	20.8

Based on Table 3, it can be seen from the quality of house sanitation facilities of 106 children who sampled this study, it appears that as many as 96 infants (90.5%) of them inhabit an eligible house with clean water supply facilities that use taps or wells (dug / drill), 105 infants (99.1%) inhabit a qualified house with excreta disposal facilities that use gooseneck including septic tanks, 91 infants (85.9%) inhabit an eligible house with wastewater disposal suitable for absorption holes or city sewerage, 60 infants (56.6%) inhabit a house with garbage disposal facilities that are eligible for garbage transported by regular janitors, 55 infants (51,9%) inhabit a home using vector control are eligible by installing wire gauze on the vent holes or use mosquito nets when sleeping, and 18 infants (17.0%) inhabit the eligible house with food sanitation facilities for implementing food sanitation measures at home.

For variable rate homes, sanitation facilities can be made by combining all of the sanitation sub-variables houses with the provision that the sanitation homes will qualify if all sub-variables are also eligible. The result is shown in Table 4.

Table 4. Frequency Distribution of Respondents through Sanitation House in Bandar Lampung in 2019

No.	Means Sanitation House	Frequency	
		n	%
1	Qualify	10	9.4
2	Not eligible	96	90.6

Based on Table 4, it can be seen that of 106 children who sampled this study, a total of 96 infants (90.6%) inhabit a home with home sanitation facilities that are not eligible, and the remaining 10 infants (9.4%) inhabit homes with sanitation of a qualified home.

Bivariate analysis

Table 5. Frequency Distribution of Respondents by Physical Facilities Home And Genesis Stunting In Bandar Lampung 2019

variables		Case		Control		*p*-Value	OR (95% CI)
		n	%	n	%		
Floor	TMS	40	75.5	29	54.7	0.042	2.546 (1.114 to 5.823)
	MS	13	24.5	24	45.3		
Wall	TMS	22	41.5	10	18.9	0.020	3.052 (1.267 to 7.347)
	MS	31	58.5	43	81.1		
Palate	TMS	40	75.5	23	43.3	0.002	4.013 (1.752 to 9.191)
	MS	13	24.5	30	56.6		
Ventilation	TMS	32	60.4	16	30.2	0.003	3,524 (1.577 to 7.876)
	MS	21	39.6	37	69.8		
exposure	TMS	13	24.5	3	5.7	0.015	5.417 (1.443 to 20.326)
	MS	40	75.5	50	94.3		
Physical Facilities Home	TMS	48	90.6	39	73.6	0.043	3.446 (1.141 to 10.406)
	MS	5	9.4	14	26.4		

According to Table 5, it can be seen that the variable Physical Facilities The House has a statistically significant relationship with the occurrence of stunting with pv of 0.043 and OR of 3.446. Similarly, if viewed under the sub-variable, the fifth sub-variable has a relationship that is statistically significant with the incidence of stunting. Which are: sub-variable House Floor (pv: 0.042), Wall House (pv: 0.020), Ceiling House (pv: 0.002), Ventilation House (pv: 0.003), and Lighting Home (pv: 0.015).

Table 6. Frequency Distribution of Respondents through Sanitation Home And Genesis Stunting In Bandar Lampung 2019

variables		Case		Control		*p*-Value	OR (95% CI)
		n	%	n	%		
SAB	TMS	8	15.1	2	3.8	0.097	4.533 (0.915 to 22.465)
	MS	45	84.9	51	96.2		
disposal of Feces	TMS	1	1.9	0	0.0	1.000	
	MS	52	98.1	53	100.0		
Wastewater disposal	TMS	12	22.6	3	5.7	0.026	4.878 (1.289 to 18.460)
	MS	41	77.4	50	94.3		
Waste disposal	TMS	25	47.2	21	39.6	.557	1,361 (0.630 to 2.940)
	MS	28	52.8	32	60.4		
Vector control	TMS	32	60.4	19	35.8	0.020	2.727 (1.242 to 5.986)
	MS	21	39.6	34	64.2		
sanitary Food	TMS	49	92.5	39	73.6	0.020	4.397 (1.340 to 14.428)
	MS	4	7.5	14	26.4		
Means Sanitation House	TMS	52	98.1	44	83.0	0.020	10.636 (1.296 to 87.261)
	MS	1	1.9	9	17.0		

Based on Table 6, it can be seen that the variable Sanitation Facilities Houses have a statistically significant relationship with the occurrence of stunting with pv 0.02 and OR at 10.636. But when viewed under sub-variable, there are three sub-variables unrelated statistically substantial with the incidence of stunting, which are sub-variable Clean Water Facility (pv: 0.097), Means Disposal of Faeces (pv: 1.000), and the Means of waste disposal (pv: 0.557). At the same time, three other sub-variables have a statistically significant relationship with the occurrence of stunting, which are; sub-variable Waste Water Disposal Facility (pv: 0.026), Support Vector Control (pv: 0.020), and the Food Sanitation Facilities (pv: 0.020).

Multivariate analysis

Multivariate analysis uses multiple logistic regression tests (binary logistic regression) through several stages, namely the selection of multivariate bivariate, multidimensional modelling construct, test confounding, and interaction test, and compiles the final multivariate modelling. The final model obtained multivariate models included some confounding variables and one variable interaction between the variables of the water systems in variable wastewater disposal. The final multivariate model is shown in Table 7.

Table 7. Final Multivariate Logistic Regression Models

variables	*p-value*	OR	CI (95%)
Wall	0.383	1.630	0.544 to 4.881
Palate	0,024	3.101	1.164 to 8.262
Ventilation	0.079	2.485	0.899 to 6.868
exposure	.409	1.968	0.394 to 9.822
Clean water	0.258	0.114	0.003 to 4.908
Wastewater disposal	0.222	0.079	0.001 to 4.646
Vector control	.150	2.042	0.772 to 5.399
Water * Disposal of Wastewater	0,033	122.617	1.489 - 1.016E4

Based on Table 7, it can be seen that the final model of multivariate analysis, where the variable ceiling (p-value = 0.024 and OR = 3.101) is the variable that was significantly associated statistically with control of other variables on the occurrence of stunting in children under five in Bandar Lampung, while the other variables are confounding variables, so will be retained in the final model. Besides, the last multivariate models also include variables of interaction between the variables of water with sewage disposal variable produces a very dominant influence was statistically significant for the occurrence of stunting among children under five in the city of Bandar Lampung after the effect of other variables are controlled.

Discussion

Table 5 chi-square test results obtained value of p = 0.043 (pv <0.05), meaning that there is a statistically significant relationship between the variables of home physical means with the incidence of stunting in children under five in Bandar Lampung with an OR of 3.446. It means that children who inhabit a home with home physical means that do not qualify have 3.446 times greater risk of experiencing incidence of stunting compared to children who inhabit a house by physical means qualified home.

House environmental factors determine the genetic potential to achieve optimal toddlers. If the environmental conditions are less supportive or ugly, the optimal genetic potential is not reached. Tanner in Fikawati et al. (2017) expressed human growth results from an interaction between genetics/heredity with the environment. One cannot achieve the growth determined by genetic default if it is in an environment that is inadequate, even though the genetic blueprint determines that he/she should have grown tall. Alamsyah stated that the house is one of the basic human needs, which serves as a residence or dwelling. According to WHO, the house is a physical structure or building for shelter, where the environment is useful for physical and mental health and social situation both for the health of families and individuals (Alamsyah & Muliawati, 2013). Thus, it can be said that a healthy home is a house with all the requirements that are fulfilled. A place to grow a healthy life physically, mentally, and socially for all members of the family can achieve the growth that is determined by genetic congenital optimalisation.

According to Natalia Puspitawati (2011), matters relating to health in the home environment are firstly, ventilation. Housing that did not meet health requirements to facilitate ventilation enabled the transition of disease and affected the health of occupants. Secondly: lighting. Lighting sufficient for lighting the room in the house is a human health need. Brightness can be obtained from the exposure of sunlight, the lighting of the sun coming in through the window. Other objects should not obstruct cracks and parts of the house exposed to the sun. Thirdly: the walls. The walls of the house must be clean, dry, and healthy. Fourthly: occupant density. The risks posed by the density of occupancy of the home affecting disease (Puspitawati & Sulistyarini, 2011).

Table 6 obtained chi-square test results obtained by value $p = 0.020$ ($pv < 0.05$), meaning that there are statistically significant relationships between the variables of home sanitation facilities with the incidence of stunting in children under five in Bandar Lampung with an OR of 10.636. It means that children who inhabit a home with home sanitation facilities that are not eligible to have 10.636 times greater risk for experiencing incidence of stunting compared to children who occupy the home where home sanitation facilities are suitable.

Sanitation in the home has a dominant role in the provision of an environment that supports children's health and growth processes. Weak sanitation causes younger toddlers' infectious disease, which can ultimately affect the nutritional status of children (Wulandari et al., 2019). Sanitation is closely related to the availability of clean water, availability of restrooms, wastewater management, waste management, vector control, and the cleanliness of food equipment. Soekirman (2000), states that the higher the availability of water for daily needs, then the smaller the child's risk for the disease of malnutrition. The level of sanitation in the home environment is determined by a wide range of possibilities that the environment plays a role in as a breeding agent of life, and the level of an unhealthy environment can be measured when clean water is lacking, the disposal of wastewater does not meet the health requirements, the absence of the provision and utilisation of household landfill which meet the health requirements and lack of regulation of food control.

This research is in line with previous research that shows the number of family members, number of children, the family economy, low birth weight, the age of the child, the mother's education, and environmental sanitation (drinking water) are potent causes of malnutrition in children. Households without available fresh water have 4 (four) times higher stunting compared to houses with clean water supply (Bomela, 2009).

Also, in line is research conducted by Brigitte Sarah Renyoet (2013), stating that there is a significant correlation between the cleanliness/hygiene and environmental sanitation with stunting incidence of children between the ages of 6-23 months, with p = 0.000.

Also, research conducted by Kusumawati (2015), who studied the cases of stunting in Puskesmas Kedungbanteng Banyumas in 2013, states that sanitary home environment is a risk factor for the incidence of stunting in children under five.

Then in table 7, visible results multivariate analysis using multiple logistic regression shows the interaction between the variables of the water systems in variable wastewater disposal produces the most dominant influence to pose a risk of stunting in children under five in Bandar Lampung with pv = 0.033 and OR = 122.617. It means that the house having water supply and wastewater facilities that are not eligible places toddlers at risk of stunting 122.617 times greater than a home with clean water and wastewater facilities that qualify as the influence of other variables are controlled.

It occurs because there are still homes that have the disposal of wastewater that does not meet the requirements; namely, 3 houses (2.8%) of wastewater discharged through the home's sewer, and 12 apartments (11.3%) carelessly dispose of wastewater that is in the backyard of the house. While 87 other houses (82.1%) had dumped wastewater into the city sewer, and 4 houses (3.8%) had an infiltration pit.

The majority of respondents (85.9%) had not dumped wastewater into the city's waterways and infiltration hole. Still, it does not guarantee the respondent discharged wastewater poses no health risks, because it also depends on the quality of wastewater disposal facilities. This study was limited to examining the ownership of the means without considering the quality of facilities, good quality of construction and quality of distance, or whether the wastewater has flowed into the sewers of the city and infiltration holes. But if the distance of the sewer from the absorption holes is less than 10 meters, clean water facilities or the construction of the channel is not watertight. It can pose a risk of contamination of clean water sources resulting in significant morbidity risk for the occupants of the house.
The results are consistent with the results of Orivaldo Florencio de Souza that examines stunting in children under 60 months in two cities in the state of Acre, Brazil, where the research results show that when open wastewater is near the home environment it poses a risk of stunting in children under five (Souza, 2012).

The result of this study is strengthened by the fact that 86 houses (81.1%) of the houses accessed clean water through wells. However, research is limited to only investigate the ownership of the means of a source of clean water; there was no research on the quality of construction facilities, and the quality of the water. So, if the well does not qualify in terms of distance to the sources of pollution and does not qualify as a sound physical construction, then it can raise the risk of contamination of well water that may pose a disease risk for the occupants of the house.

The results are consistent with the results of research that examines Fernandes's stunting in children in Angola. The results suggest that the quality of water consumed by the public influences the incidence of stunting in Angola, where children who live in households whose water supply comes from polluted rivers or lakes are more likely to suffer stunting (Fernandes, 2017).

Conclusion

The existence of the statistically significant relationship between physical facilities and house/ home sanitation with an incidence of stunting in the city of Bandar Lampung has a pv of 0.043 and OR of 3.446. As well as the interaction between the water systems in wastewater disposal related to the occurrence of stunting in the Bandar Lampung city with pv of 0.033 and OR for 122.617. We recommend cooperation with the local health clinic and the school in holding counselling once a month, the urban village for advertising in the form of posters in strategic areas, with the community and religious leaders to educate, activities of cooperation to improve the health of the home environment, and conducting rehabilitation programs for wells.

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