Annals of Case Reports and Clinical Studies
Case Report (ISSN: 2834-5673)

The Relationship Between Stunting Incidences in Pre-School Children and History of Pesticide Exposure in Farming Families in Gedong Tataan District, Pesawaran Regency

Winda Trijayanthi Utama[1,2*], Sutarto[2], Ratna Dewi Puspita Sari[3]

[1]Environmental Science Study Program/Postgraduate Doctoral Study Program, Universitas Lampung, Indonesia

[2]Community Medicine and Public Health Division/Faculty of Medicine, Universitas Lampung, Indonesia

[3]Department of Obstetrics and Gynecology/Faculty of Medicine, Universitas Lampung, Indonesia

Citation: *Winda Trijayanthi Utama, Sutarto, Ratna Dewi Puspita Sari. The Relationship Between Stunting Incidences in Pre-School Children and History of Pesticide Exposure in Farming Families in Gedong Tataan District, Pesawaran Regency. Ann Case Rep Clin Stud. 2024;3(1):1-7.*

Received Date: 16 February, 2024; **Accepted Date:** 05 March, 2024; **Published Date:** 08 March, 2024

***Corresponding author:** Winda Trijayanthi Utama, Environmental Science Study Program/Postgraduate Doctoral Study Program, Universitas Lampung, Indonesia

ABSTRACT

Stunting is short stature according to age which is the result of not fulfilling nutritional needs over a long period of time. Stunting events can occur due to less than optimal nutritional intake during the first 1000 days of birth as well as exposure to high levels of pesticide exposure. Research on the effect of history of pesticide exposure on the incidence of stunting in farming families in Gedong Tataan District, Pesawaran Regency. The design of this research is observational analytics with a case-control approach. 294 respondents participated in this research, consisting of 147 case groups and 147 control groups. The sampling technique in this research used simple random sampling. Research data was collected using a questionnaire to assess pesticide exposure. Data were tested using the chi-square test with 95% CI (α=5%). The research results showed that 26.5% of pre-schoolers were exposed to high levels of pesticide exposure. There was an effect of pesticide exposure on stunting (p = 0.001) with an odds ratio (OR) calculation of 3.8. There is an influence between exposure to pesticides and the incidence of stunting.

Keywords: Nutrition; Stunting; Exposure; Pesticides

INTRODUCTION

Stunting is short stature according to age which is the result of not meeting nutritional needs over a long period of time. This lack of nutritional needs can occur due to a complex interaction of household, environmental, socio-economic, and cultural influences [1]. The incidence of stunting shows that suboptimal nutritional intake during the first 1000 days of birth not only has an impact on growth but also other important body functions, such as brain development and the immune system so nutritional intake in this period determines an individual's potential for survival in terms of risk of morbidity and mortality, school performance, earning potential as well as physical strength.

The global incidence of stunting according to the World Health Organization (WHO) in 2013 was 161 million pre-schoolers. Looking at the continent level, in 2013 the Asian continent had a stunting prevalence of 25% and the African continent had a stunting prevalence of 34%. Meanwhile, at the country level, there are variations in the incidence of stunting in children, ranging from countries with low stunting prevalence, namely below 20%, to high stunting prevalence, namely above 40%. High stunting prevalence rates appear in countries such as Timor Leste, Burundi, and Niger, as well as sub-Saharan African countries, South Asia, Central Asia, and Southeast Asia including Indonesia.

Stunting in Indonesia is a health problem that is the focus of the government's 2015-2019 health development program in addition to reducing maternal and infant mortality rates, controlling infectious diseases, and controlling non-communicable diseases. The prevalence of stunting according to basic health research in 2013 shows that 37.3% of children suffer from stunting or the equivalent of almost 9 million pre-schoolers experiencing stunting. There was a decrease in the prevalence of stunting in 2018, namely to 30.8%, which was obtained from the results of basic health research in 2018, and in 2021, the prevalence of stunting in Indonesia decreased again to 24.4%, which was obtained from data from the 2021 Indonesian nutritional status survey. The decline in the prevalence of stunting from year to year shows that the handling of stunting in Indonesia is quite good, however, the many factors that cause stunting are obstacles in efforts to reduce the prevalence of stunting so that it can be even lower. The many factors of stunting can be proven by the large disparities in stunting prevalence across provinces. Therefore, to create an even more significant reduction in stunting prevalence, interventions that are appropriate to community characteristics are very necessary.

The WHO framework categorizes the direct causes of stunting into elemental factors and sub-element factors. Element factors can be household and family factors which have sub-elements of mother and home environment factors, the next element factor is inadequate complementary feeding which has sub-elements of poor quality food, inadequate practices, and food and water safety. The breastfeeding element factor has sub-element factors of inadequate breastfeeding practices and the infection element factor has clinical and subclinical infection sub-element factors. Other factors may include economics, politics, health and healthcare, public education, agricultural culture, food systems, sanitation, and the environment.

Environmental factors are one of the factors causing stunting. An environment that contains dangerous chemicals can cause growth disorders, one of which is pesticides. Pesticides are chemicals often used in agriculture that can disrupt hormone function, namely Endocrine Disrupting Chemicals (EDCs). Exposure to pesticides can also result in structural and functional changes in the gastrointestinal tract which include impaired mucosal immunity, impaired nutrient absorption, and impaired growth. Alim (2018) conducted research on the history of pesticide exposure to stunting in children aged 2-5 years in Wanayasa District, which is an agricultural area. In this research, it was found that preschoolers who were exposed to pesticides were 4.21 times more likely to suffer from stunting, with the higher the level of pesticide exposure in children, the higher the risk of stunting [3].

Based on data from the 2021 Indonesian nutritional status survey, the prevalence of stunting in Indonesia varies greatly, from the province with the highest stunting prevalence, East Nusa Tenggara Province, namely 37.8% to the province with the lowest stunting prevalence, Bali Province, namely 10.9%. The prevalence of stunting in Lampung Province is 18.5%, which is lower compared to national stunting data. This is a good thing, therefore the achievement of a low stunting prevalence of less than 20% must be maintained.

RESEARCH METHODS

The research design used was observational analytical-descriptive research with a cross-sectional approach. This research method is used to analyze the relationship between dependent and independent variables, as well as describe and illustrate a phenomenon that occurs in society. The population in this study were preschool children who experienced stunting in Gedong Tataan District, Pesawaran Regency. There were 294 respondents who took part in this study, consisting of 147 case groups and 147 control groups. The sampling technique in this research used simple random sampling. Research data was collected using a questionnaire to assess pesticide exposure.

RESULTS AND DISCUSSION

This research was carried out in Gedong Tataan District, Pesawaran Regency. The data collection process began with briefing the village midwife as enumerator regarding sample selection and how to take the questionnaire. The research continued by requesting secondary data from the Community Health Center. It was found that 183 pre-schoolers experienced stunting out of 459 pre-schoolers and continued with population adjustments based on inclusion and exclusion criteria. A total of 294 respondents were obtained consisting of 147 case groups and 147 control groups who were selected using simple random sampling techniques with the note that the control group was taken according to the number of case groups in each village. Of all the respondents obtained, all met the inclusion criteria and did not have any exclusion criteria. Data collection was carried out by visiting the respondent's house to carry out anthropometric measurements on pre-schoolers using a stadiometer followed by filling out a questionnaire about pesticide exposure. Food security and home yard land use were carried out using interview techniques and some were filled in by the respondents themselves.

Table 1: Characteristics of Pre-schoolers in the District.

Characteristics	Frequency (n)	Percentage (%)
Age group (Months)		
24-35	106	36,1
36-47	115	39,1
48-59	73	24,8
Total	294	100
Gender		
Male	151	51,4
Female	143	48,6
Total	294	100
Nutritional Status (H/A)		
Severely Stunted	126	42,9
Stunted	21	7,1
Normal	139	47,3
Tall	8	2,7
Total	294	100

In this study, based on age group, most of the respondents were in the 36-47-month range, namely 115 respondents (39.1%). The majority of respondents' gender were male, namely 151 respondents (51.4%), but it was not much different from female respondents. Determining the nutritional status of height according to age using the Minister of Health of the Republic of Indonesia regulation number 2 of 2020 concerning child anthropometry, it was found that the majority of respondents were in the normal category, namely 139 (47.3%),

followed by severely stunted pre-schoolers with 126 pre-schoolers (42, 9%) and the fewest respondents in the high category were 8 pre-schoolers (2.7%).

Table 2: Frequency Distribution of Respondents According to Stunting.

Stunting Incidence	Frequency (n)	Percentage (%)
Stunting	147	50
Non-Stunting	147	50
Total	294	100

Based on Table 4, it is known that the group of pre-schoolers who experienced stunting was 147 (50%) the same as the group of pre-schoolers who did not experience stunting, namely 147 (50%).

Table 3: Frequency Distribution of Respondents According to Pesticide Exposure.

Pesticide Exposure	Frequency (n)	Percentage (%)
High Exposure	78	26,5
Low Exposure	216	73,5
Total	294	100

Based on Table 3, it is known that there are fewer pre-schoolers exposed to pesticides with high levels of pesticide exposure, namely 78 pre-schoolers (26.5%) compared to pre-schoolers who are exposed to pesticides with low levels of pesticide exposure, namely 216 respondents (73.5%).

Table 4: The Effect of Pesticide Exposure on Stunting Incidence.

Stunting incident						
Pesticide Exposure	**Stunting**		**Non-Stunting**		**OR 95% CI**	***p-value***
	n	**%**	**n**	**%**		
High Exposure	57	38,8	21	14,3		
Low Exposure	90	61,2	126	85,7	3,8 (2,152 to 6,711)	0,001
Total	147	100	147	100		

Based on the research results, it was found that in the group of pre-schoolers who experienced stunting, there were more pre-schoolers who experienced exposure to pesticides with a high level of exposure, namely 57 (38.8%) compared to pre-schoolers who did not experience stunting who experienced high pesticide exposure, namely 21 (14.3%). Meanwhile, in the group of pre-schoolers who were not stunted, more people experienced low pesticide exposure, namely 126 (85.7%) compared to stunted pre-schoolers who experienced low pesticide exposure, namely 90 (61.2%). Bivariate analysis was carried out using the chi-square test and obtained a p-value = 0.001 ($p < \alpha$). Thus, it can be concluded that there is an influence of pesticide exposure on stunting in Kelumbayan District. The OR value obtained was 3.8 (CI 95% 2.152- 6.711), meaning that pre-schoolers who were exposed to pesticides with a high exposure level of 3.8 were at risk of experiencing stunting compared to pre-schoolers who were exposed to pesticides with low exposure.

Correlation between Pesticide Exposure and Stunting Events

Based on the research results obtained in the group of pre-schoolers who experienced stunting, there were more pre-schoolers who experienced exposure to pesticides with a high level of exposure, namely 57 (38.8%) compared to pre-schoolers who did not experience stunting who experienced high pesticide exposure, namely 21

(14.3%). Meanwhile, in the group of pre-schoolers who were not stunted, there were more people who experienced low pesticide exposure, namely 126 (85.7%) compared to stunted pre-schoolers who experienced low pesticide exposure, namely 90 (61.2%). Bivariate analysis was carried out using the chi-square test and obtained a p-value = 0.001 ($p < \alpha$). The results of this research are in line with the results of research by Alim (2018) regarding the history of pesticides as a risk factor for stunting among pre-schoolers in Wayanasa District, stating that the group of stunted pre-schoolers were also more likely to be exposed to pesticides with a high level of exposure, namely 24 pre-schoolers (66.7%) while in the group pre-schoolers who are not stunted also have more pre-schoolers who are exposed to pesticides with a low level of exposure, namely 35 pre-schoolers (60.3%). Pesticides that enter the body can reduce TRH and TSH production by affecting the hypothalamus and anterior pituitary gland. The mechanism that occurs is that pesticides cause a buildup of cholinergic compounds, which stimulate nicotinic and muscarinic receptors in the brain, sympathetic system, parasympathetic system, and somatic system. In the preoptic area of the hypothalamus, there are several nicotinic receptors that bind to acetylcholine to release somatostatin. This increase in somatostatin production suppresses TRH and TSH, resulting in decreased thyroid hormone secretion.

Thyroid hormone is an important hormone for postnatal growth. The mechanism by which this occurs is that thyroxine is converted into triiodothyronine in peripheral tissues and is considered a physiologically active hormone. Thyroid hormone receptor expression has been demonstrated in the resting and proliferative zones of the growth plate. Local mechanisms that occur include chondrocyte maturation, cartilage matrix synthesis, mineralization, and degradation. Hypothyroidism during childhood and adolescence can also cause delayed skeletal maturation and growth arrest [4]. Pesticides can also affect the IGF-1 hormone, this is supported by research in Spain proving that there are disturbances in IGF-1 levels in women who are exposed to pesticides, especially the organochlorine group. Pesticides can affect the IGF-1 hormone by considering that androgens can positively modulate the IGF system. Thyroid hormone deficiency will also indirectly affect growth hormone where growth hormone will be disrupted in hydrolyzing IGF-1. Reduced IGF hormone can affect prenatal and postnatal growth. In the growth plate, IGF-1 stimulates chondrocyte proliferation and hypertrophy as well as ossification by affecting osteoblasts. Children who have low serum IGF-1 concentrations may show short stature [4-15].

Exposure to toxic pesticides in the environment is thought to be the cause of impaired nutrient absorption in children, which is known as EED. The occurrence of EED can reduce macronutrient intake, especially energy and protein, which can result in growth disorders in children. Foods containing amino acids, carbohydrates, and fats support the growth process directly or indirectly, such as providing fuel for neutrophils, macrophages, lymphocytes, and other cells that function in cell or tissue regeneration. Therefore, nutritional deficiencies can affect growth.

CONCLUSION

The frequency distribution of respondents according to pesticide exposure in Gedong Tataan District, Pesawaran Regency, found that there were fewer pre-schoolers exposed to pesticides with high levels of pesticide exposure, namely 78 pre-schoolers (26.5%) compared to pre-schoolers exposed to pesticides with low levels of pesticide exposure, namely 216 respondents (73.5%). There is an influence between exposure to pesticides on the

incidence of stunting in pre-schoolers in Gedong Tataan District, Pesawaran Regency. For stakeholders, it is necessary to provide outreach to the community in Gedong Tataan District, Pesawaran Regency about the dangers of pesticides to health along with steps to reduce exposure to pesticides that enter the body. There is also a need to provide outreach regarding the composition of food needed to meet the nutritional needs of pre-schoolers in order to prevent stunting. For people in Gedong Tataan District, Pesawaran Regency, it is best not to bring pre-schoolers during the process of spraying pesticides and regularly clean themselves after returning from the garden to avoid exposure to high levels of pesticides, make more optimal use of yard land, especially in the protein sector, and it is necessary to implement agricultural technology innovations or looking for non-farm sources of income to increase sources of income to overcome food insecurity.

REFERENCES

1. Stewart CP, Iannotti L, Dewey KG, Michaelsen KF, Onyango AW. Contextualising complementary feeding in a broader framework for stunting prevention. Journal of Maternal and Child Nutrition. 2013;9(2):27-45.
2. Deonis M, Branca F. Childhood stunting: A global perspective in maternal and child nutrition. Matern Child Nutr. 2016;12(1):12-26.
3. Alim KY, Rosidi A, Suhartono. Riwayat paparan pestisida sebagai faktor risiko stunting pada anak di daerah pertanian. Journal of the Indonesian Nutrition Association. 2018;41(2):77-84.
4. Benyi E, Savendahl L. The physiology of childhood growth: hormonal regulation. Journal of Maternal and Child Nutrition. 2017;88(1):1-9.
5. Asparian, Setiana E, Wisudariani E. Faktor-faktor yang berhubungan dengan kejadian stunting pada balita usia 24-59 bulan dari keluarga petani di wilayah kerja Puskesmas Gunung Labu Kabupaten Kerinci. Jurnal Akademika Baiturrahim Jambi. 2020;9(2):293-305.
6. Budge S, Parker AH, Hutchings PT, Garbutt C. Environmental enteric dysfunction and child stunting. Nutr Rev. 2019;77(4):240-253.
7. Dewi IA, Adhi KT. Pengaruh konsumsi protein dan seng terhadap kejadian pendek pada anak balita umur 24-59 bulan di wilayah kerja Puskesmas Nusa Penida. Journal of the Indonesian Nutrition Association. 2014;3(1):36-46.
8. Harper KM, Mutasa M. Prendergast AJ, Humphrey J, Manges AR. Environmental enteric dysfunction pathways and stunting: A systematic review. Plos Negl Trop Dis. 2018;12(1):1-23.
9. Hudayya A, Jayanti H. Pengelompokan pestisida berdasarkan cara kerja (Mode of Action). Bandung: Balai Penelitian Tanaman Sayuran. 2013.
10. Owino V, Ahmed T, Freemark M, Kelly P, Loy A, Manary M, et al. Environmental enteric dysfunction and growth failure/stunting in global child health. Pediatrics. 2016;138(6):1-12.
11. Pamungkas OS. Bahaya paparan pestisida terhadap kesehatan manusia. Jurnal Bioedukasi. 2016;14(1):27-31.
12. Petros L, Daba AK, Fekadu T. Comparison of nutritional status of pre-school children from households with home garden and without home garden in wondogenet woreda, south ethiopia. Journal of Clinics in Mother and Child Health. 2018;15(2):1-6.

13. Sari MR dan Prishardoyo B. Faktor-faktor yang mempengaruhi kerawanan pangan rumah tangga miskin di Desa Wiru Kecamatan Bringin Kabupaten Semarang. Jurnal Jejak. 2009;2(2):135-143.
14. Sutarto, Mayasari D, Indriyani R. Stunting, faktor resiko dan pencegahannya. Jurnal Agromedicine. 2018;5(1):540-545.
15. Yuwanti Y, Mulyaningrum FM, Susanti MM. Faktor-faktor yang mempengaruhi stunting pada balita di kabupaten grobogan. Jurnal Keperawatan Dan Kesehatan Masyarakat Cendekia Utama. 2021;10(1):74-84.