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PREVALENCE OF ALLERGIC RHINITIS ON CHILDREN WITH STUNTING USING ISAAC QUESTIONNAIRE

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Abstract

Stunting is a chronic nutritional problem caused by many factors, including the condition of nutritional intake in infants. Malnutrition reduces body immunity so it is considered as a risk factor for inflammation in children. Allergic rhinitis is an inflammatory disease of the nasal mucosa caused by allergic reactions in patients. This study aims to determine the prevalence of allergic rhinitis in stunting patients in Kabupaten Bandung. This research is a descriptive study, data was taken by multistage cluster randomized sampling based on inclusion and exclusion criteria, in Kabupaten Bandung from the October 2019 to December 2019. The data obtained will be presented in the form of tables and diagrams. Result. From a total of 436 children age 2 – 5 years old with stunting, there were 188 children (43.11%) with allergic rhinitis and 245 children (58.6%) who did not suffer from allergic rhinitis. Most ages were in the range of 48-60 months as many as 77 children (40.95%), with the most sex being male as many as 100 children (53.19%), the most reported comorbidities were tonsillitis as many as 74 children (39.36%). Of the total 188 respondents, only 19 children (8.5%) had a history of atopy. In this study, the prevalence of allergic rhinitis in stunting children was 43.11%.

Keywords: Stunting, ISAAC Questionnaire, Allergic Rhinitis

Introduction

Stunting is one of the most significant health problems that should not be ignored in the realm of public health. Stunting is a condition of failure to grow in children under five years old due to chronic malnutrition which causes children to be shorter for their age. Malnutrition can occur since the infant is still in the womb and in the early stages of life after birth, but the symptoms only appears after the child is 2 years old. According to WHO, stunting is defined as a condition in which children have a height or length that is less than their age. This condition is measured by a length or height that is more than minus two standard deviations from the WHO median growth standard for children. Stunting includes chronic nutritional problems caused by many factors such as socioeconomic conditions, maternal nutrition during pregnancy, infant illness, and lack of nutritional intake in infants. Children with stunting will have difficulty achieving optimal physical and cognitive development in their future (Organization, 2018).

WHO shows as many as 87 million children with stunting are in Asia, 59 million in Africa and as many as 6 million in Latin America. There are five subregions that have a children with stunting rate that exceeds 30%, namely: West Africa (31.4%), Central Africa (32.5%), East Africa (36.7%), South Asia (34.1%), and Oceania (38.3% covering Australia and New Zealand) (Arshi et al., 2012).

According to data from the World Health Organization (WHO), the prevalence for children under five with stunting, Indonesia is included in the third country with the

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highest prevalence in the Southeast Asia / South-East Asia Region (SEAR). The average prevalence of stunting under five in Indonesia in 2005-2017 is 36.4%. This prevalence rate is still in the high category based on the threshold prevalence of malnutrition as a public health problem established by WHO. Based on data from the National Population and Family Planning Board (BKKBN), there are 29.9% or 2.7 million children under five who are stunted in West Java alone, especially in Kabupaten Bandung, where this study was conducted, the prevalence of stunting children in Kabupaten Bandung is 40.7% (Organization, 2018).

Lack of nutritional intake is one of the factors that influence the incidence of stunting. The intake of these nutrients includes macronutrients such as carbohydrates, proteins and fats as well as micronutrients such as antioxidants, various vitamins and minerals. Macronutrient and micronutrient deficiency can increase the risk of various diseases, especially allergic diseases, one of which is allergic rhinitis (Arshi et al., 2012; Sudiro et al., 2017). Children in early age, micronutrient such as Vitamin A, B1, B6, B12, C, D, Fe, and Zn to maintain their immunology status. These micronutrients contribute to all two types of imunnity. First they maintain the integrity of physical barrier. In innate immune system micronutrients help to regulate inflamatorry response, oxidative burst and self protection, and also help innate immune cell proliferation. While in adaptive immune response, micronutrien mainly help T Cell proliferation, differentiation and function (Gombart et al., 2020; Maggini et al., 2018).

Allergic rhinitis is an inflammatory disease of the nasal mucosa caused by an allergic reaction in patients who have previously been sensitized to the same allergen and released chemical mediators upon re-exposure to the allergen. Allergic rhinitis is a disorder of the nose with symptoms of sneezing, rhinorrhea, itching and congestion after being triggered by an allergen (Sudiro et al., 2017). Allergic rhinitis can lead to health and quality of life problems such as asthma, urticaria, tonsilitis, and otitis media. According to a study by Dewi et al in 2016, the prevalence of children experiencing recurrent acute respiratory infections was higher in children with malnutrition status. Undernutrition or malnutrition is considered to cause a decrease in body immunity so that it is a risk factor for infection in children (Dewi et al., 2016; Van Neerven & Savelkoul, 2017).

One of the methods to diagnose allergic rhinitis in children is scoring system from the International Study of Asthma and Allergies in Childhood (ISAAC). One of the strengths of the ISAAC questionnaire is that it can be used for research on children in populations with different cultures. This questionnaire is a widely used research instrument, because it is cheap, can be applied easily and has high sensitivity and specificity. This questionnaire has been translated into various languages (Kim et al., 2018).

Given that currently, there has not been any research on allergic rhinitis in stunting children, researchers are interested in conducting a study on the prevalence of allergic rhinitis in stunting patients in Kabupaten Bandung. This study aims to determine the prevalence of allergic rhinitis in stunting patients in Kabupaten Bandung.

Research Method

This study is part of a joint study on stunting children in Kabupaten Bandung, but is specifically done to assess the incidence of allergic rhinitis. This research is a crossectional descriptive study conducted in a sub-district in Kabupaten Bandung from

October to December 2019. Using a multi-stage cluster random sampling method, were then taken into 800 data.

The study population was pediatric patients age 2-5 years old diagnosed with stunting. Samples were taken with the inclusion criteria of children diagnosed based on clinical signs and symptoms and the child's parents were willing to provide written consent (informed consent). The exclusion criteria were patients with autoimmun diseases and patients with poor general conditions and 436 samples were obtained. The data was analyzed using the SPSS statistical application.

The data were collected using the ISAAC questionnaire which was translated into Indonesian and then statistically analyzed and presented in tabular form.

Results and Discussion

In this study, all of the respondents who met the inclusion criteria were interviewed using the ISAAC questionnaire. Data acquired from the completed questionnaires were then analyzed. From a total of 427 children with stunting, there were 184 children (43.1%) with allergic rhinitis and 243 children (56.9 %) without allergic rhinitis.

Table 1. Prevalence of Allergic Rhinitis in Children with Stunting

Allergic Rhinitis	N	%
Yes	184	43,1
No	243	56.9

Table 2. Characteristics of Allergic Rhinitis in Children with Stunting

No.	Variable	N(184)	%
1.	Age		
	24-35 months	49	26.6
	36-47 months	60	32.6
	48-60 months	75	40.8
2.	Sex		
	Male	99	53.8
	Female	85	46.2
3.	Comorbidity		
	Asthma	21	11.4
	Urticaria	2	1.1
	Tonsilitis	74	40.2
	Acute Otitis Media	13	7.1
	No comorbidity	74	40.2
4.	History of Atopy		
	Yes	17	9.2
	No	167	90.8

Age of the respondents were mostly in the range of 48-60 months (as many as 75 children (40.8%)), the sex was mostly male (as many as 100 children (53.8%)), and the comorbidity was mostly tonsillitis (as many as 74 children (40,2 %)). Of the total 188 respondents, only 17 children (9.2%) had a history of atopy. In this study, the prevalence of allergic rhinitis in children with stunting was 43.1% (n = 184).

The number of allergic rhinitis patients classified as mild persistent in this study were 28 children (15.21%), 150 children (81%) were classified as mild intermittent, 3

children (1.63%) were classified as moderate severe intermittent, and only 4 children (2.16%) were classified as moderate severe persistent.

Table 3. Classification of Allergic Rhinitis in Children with Stunting

2001 ARIA Classification					
	Mild Intermittent	Mild Persistent	Moderate Severe Intermittent	Moderate Severe Persistent	N
Allergic Rhinitis	150 (81%)	28 (15.21%)	3 (1.63%)	4 (2.16%)	184

Discussion

The ISAAC questionnaire used in this study is a widely accepted questionnaire to assess the prevalence of allergic rhinitis in children and adolescents. In a study conducted by Kim et al, the validity of the ISAAC questionnaire for rhinitis could be assessed with higher accuracy because it was carried out in the general population, with the subjects of the study acquired from a variety of individuals from different areas. The questions about symptoms had a moderate sensitivity and specificity (57.5% and 58.4%). The specificity of the questionnaire increased as the age of the subjects also increased, the specificity for children aged 5-7 years was 30%, and 50% for children aged 11-16 years (Annesi-Maesano et al., 2002; Kim et al., 2018).

In this study, the prevalence of allergic rhinitis in children with stunting was 43.1% (n = 184). These findings were thought to be related with the theory that stated micronutrient deficiency is one of the risk factors that influence the incidence of autoimmune diseases, infections and the immune system. Micronutrients have a significant role in the immune system and are closely related with allergic rhinitis, and in general they regulate the activity of variety of cells involved in the immune system, including monocytes, dendritic cells, T lymphocytes and B lymphocytes, and epithelium (Arshi et al., 2012; Sudiro et al., 2017).

Micronutrients regulate cell mediated and innate immunity, modulate cytokine expression, humoral antibody response and play a crucial role in the differentiation and development of Th1 and Th2 lymphocyte subsets. Studies have established that micronutrients such as iron, zinc, selenium, vitamin A, C, D, and E, and folic acid are essential for efficient immune system functioning. Apart from these, micronutrients like copper and chromium are significantly important in immunomodulation. Animal models have shown that copper deficiency results in reduced T cell proliferation thereby decreasing humoral, cell- mediated and nonspecific immune response suggesting its role in maintenance in immune competence. Chromium, on the other hand, alters immunostimulatory or immunosuppressive processes thereby affecting immune response that causes hypersensitivity reactions; it also has an influence on T and B lymphocytes; and cytokine and macrophage production (Pai et al., 2018).

In recent years, an increase in allergic diseases in the world has been linked to low levels of vitamin D in the blood. Schauber et al in 2008 stated that the relationship between low serum vitamin D levels in the blood and an increase in impaired immunity is not a coincidence. Population growth causes people to spend more time indoors leading to less sun exposure and less vitamin D production in the skin (Mostafa & Hegazy, 2013; Schauber & Gallo, 2008).

Research by Mulligan (2011) and several other researchers has proven that low vitamin D levels in the blood are associated with a high number of dendritic cells

compared with the control group (groups with normal or high vitamin D levels through vitamin D supplementation). Dendritic cells have an important role directly in the process of differentiation of Th cells into Th1 or Th2 cell subsets, where without vitamin D (or in conditions of low vitamin D levels in the blood) the inflammatory response will be chaotic wherein the Th1 subset will become more dominant which causes the occurrence of a chronic inflammatory process and a person will become more sensitive to allergens through the formation of immunoglobulin-E. Researchers also proved that low vitamin D levels will also increase levels of inflammatory mediators (chemokines) such as IL-2, IL-5, and leukotrienes. Increased Th1 activity, as well as inflammatory cytokines, will increase the risk for a person with a history of atopy to develop complaints such as allergic rhinitis (Mulligan et al., 2011).

The results about sex characteristics of allergic rhinitis in children with stunting showed that there were more male subjects than female subjects in this study. This is consistent with the statement of the literature that says boys tend to suffer higher numbers of allergic diseases (such as asthma and urticaria) than girls (Frohlich et al., 2017). Estrogen were thought to have an important role, in which it has a significant effect on several components of immunity. Estrogen has a potential effect at every stage of allergic sensitization, such as: antigen presentation, Th2 polarization, IgE production, mast cell degranulation via classic estrogen receptors, and it can also induce eosinophil cells in peripheral blood (Bonds & Midoro-Horiuti, 2013).

Several studies have tried to investigate the genetic predisposition to the incidence of allergic rhinitis in childhood. It was stated that the history of atopy in the parents was a factor associated with the incidence of allergic rhinitis (Ji et al., 2016).

One study in Korea by Byeon states that the degradation of the immune system in the children can contribute to the incidence of allergic diseases, and higher the risk of developing otitis media in children. This is caused by the dysfunction of the eustachian tube due to repeated inflammation of the lymphoid tissue, such as adenoids. Increased number of eosinophils in adenoids and tonsils was found in patients with a history of allergy (Byeon, 2019).

We found that most of the children in this study were classified as mild intermittent. This is consistent with previous study. Study in Latin America shows that those who have had symptoms of allergic rhinitis in the past year, suffered from intermittent allergic rhinitis (74.5%) (Miranda-Machado et al., 2018).

Although lack of miknoutrient could compromised the immunological status on stunting childern. We can not foresee the economical factor that might contribute. Family with low income could result to lack of fresh and nutritious food, this situation would lead to poor consumption of mikronutrient and later become risk factory of various allergy (Bawekes et al., 2018).

Conclusion

In this study, it was found that the prevalence of allergic rhinitis in children with stunting in Kabupaten Bandung was quite high. This can be influenced by the role of macronutrient and micronutrient deficiency in children with stunting. Lack of nutritional intake that occurs in stunted children can lead to susceptibility to allergic disease in childhood. In this study, we also found the comorbid factors associated with allergic rhinitis in children with stunting, such as asthma, urticaria, tonsillitis, and acute otitis media. However, the association of these comorbid factors with allergic rhinitis in children with stunting should be investigated further.

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