

ORIGINAL ARTICLE

THE CORRELATION OF ENVIRONMENTAL FACTORS WITH THE PREVALENCE OF ATOPIC DISEASE IN ELEMENTARY SCHOOL CHILDREN

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ABSTRACT

Atopic diseases (AD) are a group of diseases involving the underlying immune system. The etiology of AD is believed to be multifactorial, caused by the interaction between genetic factors, the immune system, and environmental factors. This study was aimed to assess the correlation of environmental factors with atopic diseases in elementary school children. A cross-sectional design and questionnaires, developed by the International Study of Asthma and Allergies in Childhood (ISAAC), were used to determine the atopic disease record and environmental conditions in sample of 88 rural and urban elementary school children. The sampling method was purposive sampling with each one representatives of primary schools in rural and urban areas. The data were analysed using the chi-square test. There was a significant correlation statistically (p -value < 0.05) between asthma incidence to the floor condition (i.e., cement vs. ceramic tile) ($p = 0.008$). Rhinitis allergic and dermatitis allergic did not give significant correlations statistically ($p > 0.05$) to environmental conditions like the smoke-exposure area, food allergen, floor condition of the residence, and residence location. There was no significant relation between the environment and the atopic incident record of the elementary children. Floor condition was an environmental factor that significantly influence to asthma occurrence in elementary children.

Keywords: asthma, dermatitis, environment, rhinitis.

INTRODUCTION

Atopic diseases (AD) are a group of diseases involving the underlying immune system. Common childhood atopic diseases include atopic dermatitis, allergic rhinitis, asthma, and food allergies, and they may continue until adulthood.¹ The etiology of AD is believed to be multifactorial, caused by the interaction between genetic factors, the immune system, and environmental factors. The risk factors concerning AD remain unclear despite considerable interest from researchers.²

The prevalence of allergic rhinitis (AR) varies across countries because of different economic conditions, biodiversity, climate, level of industrialization, allergen exposure, pollution, and lifestyle. But an increasing trend is consistently observed worldwide, especially in developing countries.³ Based on the research of Nurcahyo,⁴ in Indonesia rhinitis allergy prevalence in 2009 reach approximately a value of 1.5-12.4%, and this has tended to increase. The International Study of Asthma and Allergies in Childhood (ISAAC) research was conducted in Jakarta Barat on children from 13 to 14 years old, and found rhinitis allergy prevalence reached 26.7% in the age group.⁵ The World Health Organization (WHO) estimated there are 235 million people with asthma worldwide.⁶ In the Indonesian population, asthma prevalence is around 4.5%, occurring more frequently in women than males. Based on research using a questionnaire developed by ISAAC, the value

of atopic dermatitis prevalence stands at 8.2% in children aged 6 to 7 in Semarang.⁷

The symptoms of atopic diseases can be very disturbing, decreasing the patients' quality of life and cause limitations in activities and also affect children's performances.⁸ The correlation between atopic diseases like AR, allergic conjunctivitis, atopic dermatitis or risk of asthma is well known. Several studies report the possible environmental risk factors, including individual use of personal care products and exposure to climate, pollution, food, and other exogenous factors.⁹

This study evaluated the correlation of environmental factors with atopic diseases in elementary school children because the assessment of these complex risk factors is crucial to developing targeted interventions to prevent the disease and counsel patients on minimizing exposure to irritants, pruritogens, and other harmful exposures.

METHODS

This study used quantitative and analytical observational research with the cross-sectional design approach to observe the relationship between the effects of environmental conditions on atopic diseases in elementary school children. We evaluated the environment condition, including cigarette smoke exposure from family, floor conditions of children houses, and urban or rural home location. The research was conducted at

Yogyakarta that located in a rural area in August 2016. This research received a registered ethical clearance from Faculty of Medicine and Health Science of Universitas Muhammadiyah Yogyakarta, number 239/EP-FKIK-UMY/IV/2017.

According to sample size formulation Lameshow, we found the appropriate number sample size was 77, with method consecutive sampling.¹⁰ The inclusion criteria of this study were subjects in primary school within the age of 10 to 12, willing to fill out the ISAAC questionnaire translated into Bahasa Indonesia (i.e., Indonesian) and also sign the informed consent. The exclusions criteria were subjects who did not return the inform consent and questionnaires to researchers. Complaints of atopic symptoms were evaluated by using ISAAC questionnaires. The questionnaires were divided into several parts: atopic symptoms history,

cigarette smoke exposure, asthma, and environmental conditions including floor condition of respondent house.

The study results were analyzed using SPSS© software version 23.0. Data analysis was performed using Chi-square test with significance if $p < 0.05$. Descriptive data were reported in frequency and percent in tables.

RESULTS

The general characteristics of the 88 respondents who participated in this research are discussed below and shown in Table 1. The majority of sample was females (55%) with mostly aged eleven years (75%). Mostly subjects were lived in in rural areas (70%) lived.

Table 1. Characteristics of the samples

		Frequency	Percentage
Gender	male	40	45%
	female	48	55%
Age	10	8	9%
	11	66	75%
	12	14	16%
Living	urban	27	30%
	rural	61	70%

The prevalence of atopic diseases in the sample is given in Table 2. Out of the total of 88 subjects, 75 respondents had an atopic symptoms history, 23 respondents had asthma, 80 respondents a rhinitis allergy, and 29 respondents a dermatitis allergy. Our study showed that children in rural areas had a lower prevalence of asthma because rural residence associated with a reduced prevalence of allergic sensitization, the protective effect of rural living has been associated with farm and other exposures in early life with microbes and their products. There has been considerable interest in the protective role against allergy of parasitic infections during childhood, associated with reduced atopy.¹¹ Moreover, children who had been living in a house with a ceramic floor had a higher risk of having asthma than those living in houses with cement

floors ($p = 0.008$, 95%), but asthma was not correlated with cigarette smoke exposure, food, and location in an urban or rural environment ($p = 0.739$, 0.069 , 0.578 , respectively; see Table 3). As seen in Table 3, the p values for the correlation of rhinitis allergy with cigarette smoke exposure, food, floor conditions of habitations, and urban or rural home locations were 0.090 , 0.644 , 0.166 , 0.197 , respectively. Thus, this indicated no relation between rhinitis allergy and environmental conditions. The p values for the correlation of dermatitis allergy variable with cigarette smoke exposure, food, floor conditions of habitations, and urban or rural home location were 0.67 , 0.896 , 0.819 , 0.127 , respectively, showing no relation between dermatitis allergy and environmental conditions.

Table 2. Atopic disease frequencies in the subject population (n=88)

		Frequency	Percentage
Atopic Symptoms History	Negative	13	14.8%
	Positive	75	85.2%
Asthma	Negative	65	73.9%
	Positive	23	26.1%
Rhinitis Allergy	Negative	8	9.1%
	Positive	80	90.9%
Dermatitis Allergy	Negative	59	67%
	Positive	29	33%

Table 3. Statistical testing of correlation of environmental factors with atopic diseases

		Asthma	p	Rhinitis Allergy	p	Dermatitis Allergy	p
		n		n		n	
Cigarette Smoke Exposure	No	0	0.739	1	0.909	0	0.67
	Yes	23		79		29	
Food	No	14	0.069	60	0.644	22	0.896
	Yes	9		20		7	
Floor	Cement	9	0.008	17	0.166	6	0.819
	Ceramics	14		63		23	
Location of Habitation	Urban	6	0.578	23	0.197	12	0.127
	Rural	17		57		17	

DISCUSSION

Children growing up in houses with cement floors in rural areas had a lower prevalence of asthma. This was similar to the findings in previous study, which reported that children living on farms are protected against wheezing independently of atopy, but this farm effect was not attributable to improved airway size and lung mechanics. This might include alterations of immune response and susceptibility to triggers of wheezing, such as viral infections.¹² Moreover, the environmental factors in this study had no correlation with the atopic disease; this may be because the major allergen was house dust mites. Molecular together with exogenous agents contained in dust mite fecal particles can be the source of highly potent allergens to sensitize and induce allergic symptoms in sensitized and genetically predisposed individuals, resulting in allergic rhino-conjunctivitis, asthma, and atopic dermatitis.¹³

Mite allergens can be detected in many areas of the home, including beds, carpets, upholstered furniture, and clothing. Beds are the perfect habitat for mites since they provide the ideal temperature, food, and moisture for their proliferation, and the allergens they produce accumulate deep inside mattresses and pillows, especially when they are old. Controlling factors with a comprehensive program of personal hygiene, bed hygiene, properly fitted allergen-impermeable covers, cleaning, dehumidification or air conditioning, and appropriate food storage in very damp climates can reduce exposure to house dust mite allergens.¹⁴ Since last decades there has been a rise in the incidence and prevalence of atopic disorders, this evolution possible explanation by hygiene hypothesis. There were inverse relationship between smaller family size, lower incidence of infections in early childhood, cleaner homes and development of allergic disease. The association between bedroom conditions and the presence of allergic symptoms. Similar to this study that cement floors in rural areas had a lower prevalence of

asthma, the presence of stuffed toys in the bedroom was associated with a lower prevalence of conjunctivitis and allergic respiratory symptoms.¹⁵

The results of this study were also in accord with Illis, who found said that children growing up on farms in Germany, Austria, and Switzerland are protected against asthma, hay fever, and atopic sensitization. Atopy diseases happen more in cleaner environments than where there are a high-risk microorganism exposure and infectious disease environment, according to the immune deviation or hygiene hypothesis.¹⁵ The Hygiene hypothesis states that environmental changes in industrialized world lead to reduced microbial exposure in early life, which results in the increased prevalence of allergic sensitization and disease.³ Ceramic floors tend to be cleaner since they have a bright color, which makes it easier to see and clean the dust. In contrast, cement floor makes dust less visible.

The results do not show any significant correlation between smoke exposure, food, and urban or rural residence to allergic rhinitis and atopic dermatitis in children, similar to research conducted previously that found there was no significant correlation between residence location and rhinitis allergic occurrence. The pollen concentration in the atmosphere depends on the vegetation and climate of a given geographic zone, and there are important regional differences.^{16,17}

Children also not aware of AR. It is recommended that health promotion initiatives through patient education and public information be done among AR patients with the family, being the most common source of health information for this population.¹⁶ However, depending on the sensitivity and lifestyle of the allergic person, prudent efforts over an extended period of time are likely to result in a gradual improvement in health.¹²

CONCLUSION

In this research, no significant relation was found statistically between the environment and the atopic incident record for elementary-aged children. However, there was a significant relation statistically between the floor condition (cement vs. ceramic) of their housing and asthma occurrence in elementary children.

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CONFLICT OF INTEREST

The author declares that in this study, there is conflict of interest.

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