ORIGINAL ARTICLE

Exposure Pattern of House Dust Mites in Childhood Asthma Along the Year: A Series of 10 Cases

Zakiudin Munasir, Lenny S Budi, Titi Sularyo, Sri Rezeki H Hadinegoro

(Department of Child Health, Medical School, University of Indonesia, Cipto Mangunkusumo Hospital, Jakarta)

ABSTRACT House dust mite (HDM) is one of the inhalant allergens causing inflammation of respiratory tract. More than 100 dust mites/gram house dust may cause sensitization in childhood asthma, while more than >500 house dust mite/gram house dust may cause asthma attack. This report aimed to determine the exposure pattern of house dust mites on 10 asthmatic children during one year. Home visit to all patients was done every month to obtain house dust sample, measurement of relative humidity, bed room temperature, and to evaluate the clinical scores and peak expiratory flow rate (PEFR). The range value of house dust mite/gram house dust was 0-340. This study shows that house dust mite may cause of acute asthma attack when accompanied by nonspesific stimuli. In September the relative humidity is high, the temperature is low, and the amount of house dust mite/gram of house dust is highest, in contrast to in August and December. This study shows no seasonal variation. The amount of house dust mite/gram of house dust was found higher at the mattress than in the floor of bed room. The species of house dust mite that predominantly found is Dermato- phagoides pteronyssinus. We conclude that house dust mite may cause acute asthma attack whenever accompanied by nonspesific stimulus.
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Introduction

Asthma is a chronic disease commonly encountered in daily practice and is a leading cause of school absence.[1] The prevalence of childhood asthma in the world varies from less than 1% to more than 20%.[2] A study in Central Jakarta found 6.9% among 243 children under 14 years old suffered from asthmatic.[3] The majority of children with

Author's address: Zakiudin Munasir, MD, Department of Child Health, Medical School, University of University of Indonesia, Jakarta 10430, Indonesia. Tel 62-21-3907742; Fax. 390-7743.

asthma has allergy, a family history of atopy, and positive skin test. The three most commonly found allergens based on positive skin test are house dust, animal skin flakes, and house dust mites.[4] A large proportion of asthmatic children show positive skin test for house dust mite, as seen from studies in Australia (90%),[5] United States (70-80%),[6] Argentina (82.1%),[7] Thailand (84.%),[8] and Indonesia (54-76%).[9-11] Inflammation seems to be accepted as the main cause of bronchial hyperreactivity which is responsible for the occurrence of asthma.[12] House dust mite is one of the inhaled allergens causing inflammation in the respiratory tract, but asthma attack still needed by nonspecific stimuli.[13-15]

Studies done in the Netherlands[16] and England[17] revealed an association between the clinical features of asthmatic children with exposure to house dust mites; however, studies done in Australia[18] and Israel[19] failed to prove such an association. Hoppuse dust mite count of more than 100/gram of house dust but less than 500/gram of house dust is assumed to only cause sensitization to house dust mite allergens in asthmatic patients.[20] The species encountered most in a environment is *Dermatophagoides pteronyssinus*.[7,8,16,19,21,22] Other studies conducted in the Netherlands[16] and the United States showed that exposure to house dust mites was related to seasonal variation whereas a study in Australia did not.[24] The aims of this study were to determine the prevalence of positive skin test for house dust mite in asthmatic children, the clinical features of asthmatic children exposed to house dust mites during one whole year, and the pattern house dust mite count per gram house dust in each month.

Methods

This was a prospective serial cases design, to know the exposure pattern of house dust mites in 10 asthmatic children patients during on year. This study included all asthmatic patients treated for the first time in the Pediatric Allergy and Immunology Clinic during 1997, which were 58 patients. Study subjects were part of the 58 patients who had (+++) skin test to house dust mites; with this criterion, 22 persons were eligible for further study. Of them, those who aged between 6-18 years old, lived in Jakarta, and had FEV1 <80% than the predicted value outside an attack were selected. Patients who were on continuous corticosteroid treatment were excluded. Finally, this study obtained 10 patients.

The diagnosis of asthma was based on history, physical examination and laboratory finding (leukocyte count, total IgE, total eosinophil and FEV_1). At the beginning of every month during 1998 a house visit was done to collect dust sample, to obtain data of clinical score and PEFR and to determine the relative humidity and the temperature of the bedroom. The dust sample from the bed was collected by using a vacuum cleaner (National no. MC 1035) for 2 minutes for every 1 m^2, while the dust sample from the bedroom floor was collected from under the bed, and 1 m from the bed.

House dust mites were counted by using a floating technique with light microscope Olympus SZ 296787 under the magnification of 2-4x10. The relative humidity and temperature were measured using an instrument called Relative Humidity Fire Confort Barigo German. PEFR is conducted at 6 o'clock in the morning and 7 o'clock in the evening with the patient standing before using an oral disc bronchodilator and inhaler. Peak expiratory flow was done 3 times at the same tome to obtain the highest value. Clinical score is recorded at night before going to bed by using an evaluation form. The hygiene and sanitation of the environment especially in the bedroom, needs to be cared for during the study.

Results

During the period of January 1st, 1997 until December 31st, 1997 the number of patients treated for the first time in the Pediatric Allergy-Immunology Polyclinic of FKUI/RSCM were 241 children, 58 of which were asthmatic patients; 47 children (81%) had positive skin test to house dust mite *(Dermatophagoides pteronyssinus)*. From those 47 children, 22 had (+++) or (++++) the skin test result. Ten patients were available for further study. From the 10 asthmatic patients, the were 6 boys and 4 girls, 8 were in the early school age and 2 in the late school age, all had +++ or ++++ skin test to house dust mites and were in the category of a moderate degree of asthma.2. Clinical features of wheezing and PEFR

In this study, the range of the amount of house dust mites/gram of house dust varies from 0 to 340. In this study the clinical features of asthma can be mild or severe in the situation where no house dust mites are found as well as in the case where the amount of house dust mites/gram of house dust.

The highest amount of house dust mites/gram of house dust (127/gram of house dust) on the mattress is found in September, which is in conformity with the highest relative humidity (70%) and the lowest temperature (28°C) in the bedroom. The lowest amount of house dust mites/gram of house dust on the mattress is found in August and December (46 and 26/gram of house dust respectively) which is in accordance with the lowest relative humidity (54% each) and the highest temperature (33oC each). In this study no seasonal variation is found.

During this study, the average amount of house dust mites/gram of house dust on the mattress every month is always found higher than that on the bedroom floor. The species mostly found on the mattress as well as on the bedroom floor is *Dermatophagoides pteronyssinus* (72% and 55.4% respectively), followed by Glycyphagus destructor (12.7% and 26.5% respectively), Cheyletus erudetus is found both on the mattress and the bedroom floor (5.4% and 10.2% respectively). Cheyletus erudetus is a predator to the other species of house dust mites.

Table 1. Patient characteristics

No.	Initial	Sex	Age (year)	FEV1 (L/second) (% predictive)	Skin test
1.	H	girl	17	2.21 (78.9)	(+++)
2.	I	boy	10	1.33 (79.6)	(++++)
3.	N	girl	8	1.41 (66.0)	(++++)
4.	N	girl	10	1.52 (76.7)	(+++)
5.	O	boy	6	1.0 (67.1)	(+++)
6.	P	boy	9	1.06 (71.1)	(++++)
7.	R	boy	6	0.94 (75.8)	(+++)
8.	R	boy	8	1.08 (73.9)	(+++)
9.	S	girl	15	2.13 (76.0)	(+++)
10.	Y	boy	12	1.55 (78.2)	(++++)

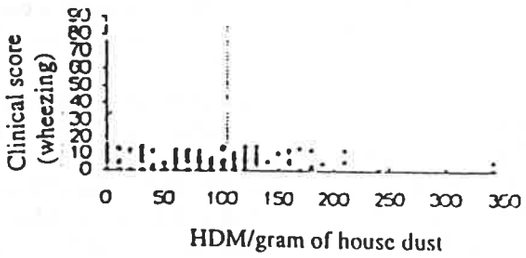

Figure 1.The number of house dust mites/gram of house dust and clinical score of wheezing.

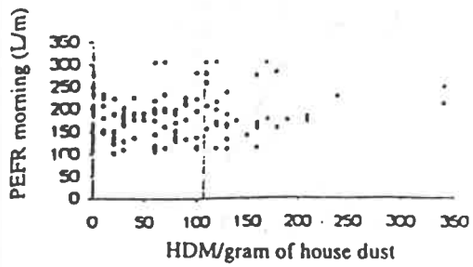

figure 2

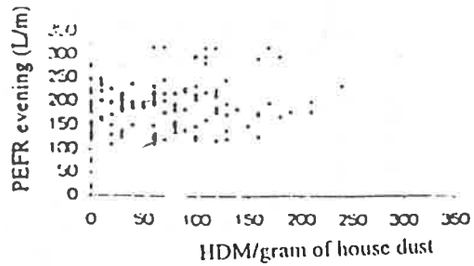

figure 3

Figures 2 and 3. Correlation between number of house dust mites/gram of house dust and PEFR (in the morning and evening).

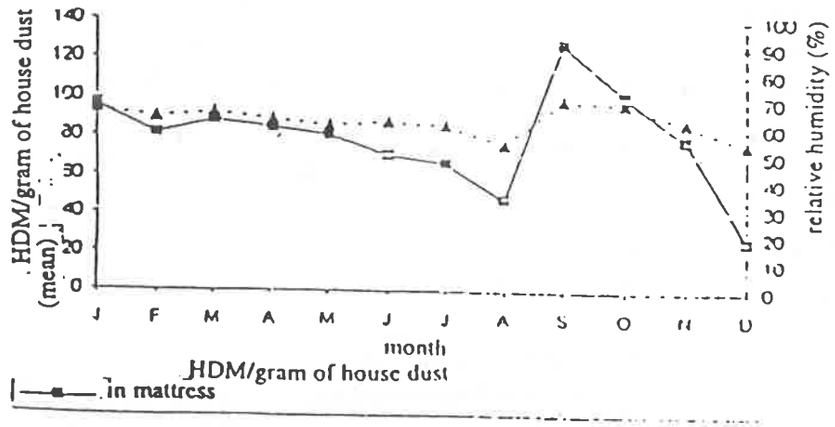

Figure 4. The number of house dust mites/gram of house dust on the mattress and the relative humidity in the bedroom every month.

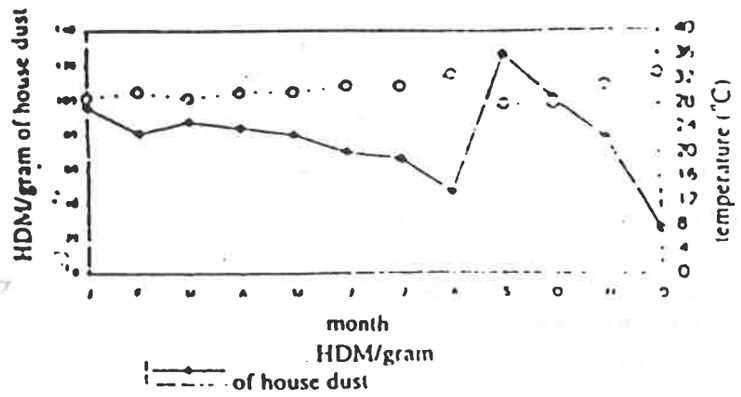

Figure 5. The number of house dust mites/gram of house dust on the mattress and the temperature in the bedroom every month.

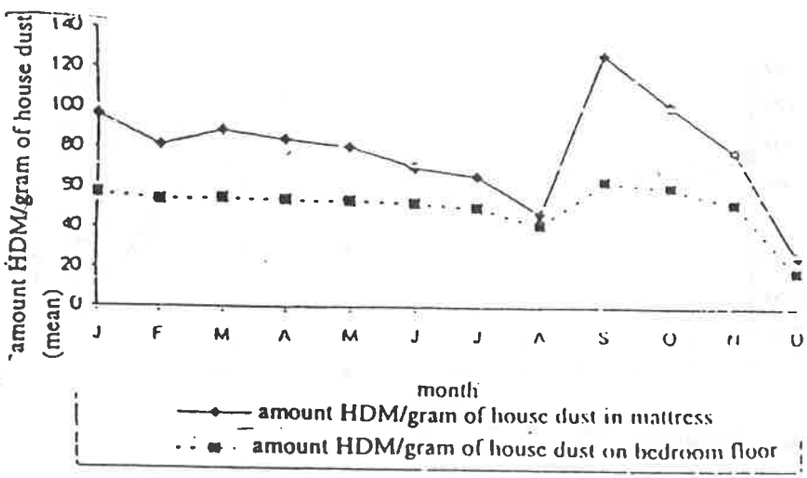

Figure 6. Ratio of the number of house dust mites/gram of house dust every month on the mattress and on the bedroom floor.

Table 2. Type of species of house dust mites found on the mattress along the year

Species	Total	
	N	%
Dermatophagoides pteronyssinus	6,797	72.00
Glycyphagus destructor	1,199	12.70
Dermatophagoides farinae	702	7.44
Cheyletus erudetus	508	5.38
Dermatophagoides microsera	170	1.80
Acarus siro	64	0.68
Total	9,440	100.00

Table 3. Type of species of house dust mites found on the bedroom floor along the year

Species	Total	
	N	%
Dermatophagoides pteronyssinus	3,374	55.41
Glycyphagus destructor	1,614	26.51
Cheyletus erudetus	622	10.21
Dermatophagoides farinae	256	4.20
Dermatophagoides microsera	156	2.54
Acarus siro	69	1.13
Total	6,090	100.00

Discussion

In this study, the reason for using asthmatic patients with a skin test of >(+++) is that it is in accordance with the study done by Kuno Sakai[25] where there was a correlation of 77% between skin test and test of specific IgE against house dust mites. In this study the prevalence of positive skin test with house dust mites is 81%, which agrees with the studies done in the USA,[6] Argentina[7] and Thailand[8] but is lower than that in Australia5 and higher than that in Indonesia.[13-15]

In this study the clinical feature of childhood asthma can be mild or severe on case where no house dust mites are found, and also in cases where the amount of dust mites/gram of house dust is highest for the whole year. Hence, it can be assumed that in order to induce an acute asthmatic attack a non specific stimulus is needed. This seems to agree with the studies conducted in Australia[18] and Israel[19] and support the theory proposed by Platts-Mills,[13] Dian-Sanches[14] and Fraenkle,[15] but it disagrees with the done in the Netherland[16] and England.[17]

The range of relative humidity and temperature needed for the multiplication of house dust mites in this study agrees with the result obtained by Voorshorst26 and Spieksma.[27] During this study, the average amount of house dust mites/gram of house dust found on the mattress every month is always higher than that on the bedroom floor. This result agrees with that obtained by Aulung,[22] Voorshorst[26] and Godfrey.[28] The species encountered most on the mattress as well as on the bedroom floor are *Dermatophagoides pteronyssinus* (72.0% and 55.4% respectively). This agrees with the studies done previously.[7,8,16,19,21,22] *Dermatophagoides pteronyssinus* propagates optimally at a temperature of 25°C and a continuously high relative humidity, which is in accordance with the condition in Indonesia. If an environment of a population, especially asthmatic patients, contain a large amount of *Dermatophagoides pteronyssinus*, then a Der p 1 allergen extract should be used for the skin test.[29]

In this study, *Cheyletus erudetus* species is also found which is a predator to other house dust mites. It seems that the amount of house dust mites <500/gram of house dust is due to the presence of this species.

Therefore in this study, the role of house dust mites in inducing an acute asthmatic attack still need to be accompanied by a nonspecific stimulus. Seasonal variation is not found in this study, hence the sanitation of asthmatic patient's environment has to cared for every time.

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