

The Presence of House Dust Mites in Residences and Classrooms of Students with Allergic Rhinitis

Keberadaan Tungau Debu Rumah di Tempat Tinggal dan Ruang Belajar Mahasiswa dengan Rhinitis Alergi

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Abstract: Allergy is still a health problem in Indonesia. One of the manifestations of allergies is allergic rhinitis. Many factors can trigger the recurrence of rhinitis, including exposure to house dust mites. This study aims to identify the population of house dust mites in the classrooms and student residences. This study was participated by 74 FK UNRI students with allergic rhinitis. The samples included dust collected from residences and classrooms consisting of four large classrooms, three small classrooms, four laboratories, two examination rooms, 12 skills lab rooms, and 15 tutorial rooms. Detection of dust was performed using the direct method. The results showed that no classroom (0%) was found with house dust mites. However, there were 37.8% of residences were positive. Based on the result, it can be concluded that the high population of house dust mites in the students' residences becomes an essential factor as a chronic stressor for allergic rhinitis.

Keywords: allergic rhinitis; house dust mites; residence

Abstrak: Alergi merupakan salah satu masalah kesehatan di Indonesia. Salah satu manifestasi alergi adalah rhinitis alergi. Banyak faktor pencetus kambuhnya rhinitis alergi, salah satu faktor penting adalah paparan tungau debu rumah. Penelitian ini bertujuan untuk mendeteksi keberadaan populasi tungau debu rumah pada ruang belajar dan tempat tinggal mahasiswa. Penelitian ini diikuti oleh 74 mahasiswa FK UNRI dengan rhinitis alergi. Sampel yang diambil adalah debu dari tempat tinggal dan ruang kelas yang terdiri dari empat kelas besar, tiga kelas kecil, empat laboratorium, dua ruang ujian, 12 ruang skill lab dan 15 ruang tutorial. Deteksi debu menggunakan metode langsung. Hasil identifikasi didapatkan bahwa di ruang belajar menunjukkan negatif (0%) tungau debu rumah, akan tetapi 37,8% tempat tinggal positif dengan tungau debu rumah. Sebagai kesimpulan, tingginya populasi tungau debu rumah di tempat tinggal merupakan faktor penting pencetus kekambuhan rhinitis alergi.

Kata Kunci: rhinitis alergi; tungau debu rumah; tempat tinggal

INTRODUCTION

Allergy is still a health problem in Indonesia. An allergic condition is a hypersensitivity disorder in which the immune system reacts to substances in the environment that are typically considered harmless. These chronic diseases are common worldwide, with a high prevalence reported in all age groups.¹ In general, the prevalence of allergic disease in the tropics is high, as it is observed in temperate countries and is even higher in some regions. The most common manifestation is an allergy, including allergic rhinitis.^{2,3} One of the most striking epidemiologic differences is the exposure to house dust mites.⁴ According to the World Health Organization (WHO), the prevalence of allergic rhinitis varied between 0.8 to 14.9% in 6-7 years old and 1.4 to 39.7% in 13-14 years old worldwide.⁵ The prevalence of allergic rhinitis in Indonesia is also relatively high at 5-%.⁶ In terms of age, patients with allergic rhinitis grow since an infant, increasing at the age of 5-10 years old. It will reach the age of 20 years and decrease at the age of 30 years.⁵ Based on Rafi's research, the prevalence of allergic rhinitis in FK UNRI students was 25.25%.⁷

In relation to that, one of the triggers of allergic diseases is house dust mites.⁸ *Dermatophagoides pteronyssinus* is the most species of house dust mites.⁹ It is the major allergenic component and has allergens from the cuticles, sex organs, digestive tract, and feces.¹⁰ Antigen from *Dermatophagoides pteronyssinus* enters the human body through skin penetration, while those from feces enter humans through inhalation. *Dermatophagoides pteronyssinus* live in many places that are rarely cleaned and contain dust, such as mattresses, carpets, air conditioners, fans, and others.¹¹

Other studies found that 85% of patients with atopic dermatitis have a high prevalence of allergic rhinitis associated with house dust mites.¹² Based on research in Tangerang and Jakarta, Subahar et al., examined house dust and found 66.9% house dust mites positive and identified as *Dermatophagoides pteronyssinus*, *Dermatophagoides farinae*, and *Glyciphagus destructor*.¹³ Based on research in Pekanbaru found all of the atopic dermatitis patients' residences were house dust mites positive.¹⁴

House dust mites are found all over the world. Various house dust mites are found in house dust, but the dominant mite is the family Pyroglyphidae. Another important mite is *Blomia tropicalis* which lives in tropical and subtropical climates. Other species of mites found in food products, dry grass, and need high humidity to live are the genus *Glyciphagus*, *Tyrophagus*, *Acarus*, *Lepidoglyphus*, and *Tarsonemus*.¹⁵

In Sundaru's study¹⁶ in Jakarta, it revealed that from 32.6 grams of house dust originating from 20 houses of people with asthma, 1,480 mites comprised 10 genera. The most commonly found genus is *Glyciphagus* for 582 mites. Manan et al.¹⁷ reported that in 10 houses of people with asthma, 9 genera were found, and the most mites were *Glyciphagus*. The most common house dust mites were in the bedroom furniture (582 individual), and the least was in the house decoration (186 individual mites). On house furniture, namely chairs, bookshelves, and cabinets, 349 mites were found, while on the house floor, it found 363 mites.

The presence of mites in bedroom furniture is closely related to food mites. Squama is a staple food of *Dermatophagoides pteronyssinus*. In bed, there are lots of squamae available because humans produce squads of 0.5 g - 1 g per day so that *Dermatophagoides pteronyssinus* can flourish. Besides bedroom furniture consisting of mattresses, blankets, and curtains, the bedspreads also contain many fibers that can easily accommodate dust than other home furniture. Therefore, it is understandable if *Dermatophagoides pteronyssinus* is most commonly found in the bedroom.¹⁵

Physical factors such as temperature and humidity affect the growth and development of organisms in house dust. Mites are susceptible to relative humidity. At a humidity of 60% or less, the house dust mites population will be found to be very little or even dead.¹⁵

In general, the range optimal temperature for house dust mite populations is 25°C-30°C and 70-80% of relative humidity. *Dermatophagoides pteronyssinus* required an optimal temperature of 25°C and humidity of 80% with critical humidity of 60-65%. Likewise, for warehouse products (store product mites) such as *Glyciphagus destructor*, the optimum temperature is 23°C-25°C, and humidity is 80-90%. In contrast, for *Tyrophagus putrescentiae* and *Acarus Siro*, the optimum temperature is 23°C, and humidity is 87%. The temperature suitable for the life of *Dermatophagoides farinae* is 25°C-30°C with 50-60% of relative humidity, and the critical humidity is 47-50%. The development of *Dermatophagoides pteronyssinus* will be disrupted at temperatures above 32°C, and it will die after being heated for 6 hours at 51°C with 60% air humidity.¹⁸

Riau Province, especially Pekanbaru City, with a relatively high population density, varying socioeconomic levels, and relatively low levels of knowledge and self-awareness and the environment, will significantly affect the existence of this parasite. The FK UNRI is on the edge of a highway that is exposed to road dust. Classrooms that are used as a learning process are constantly cleaned by cleaning staff. However, dust remains in places that are difficult to reach. The condition of the maintenance of the air conditioner is

not regularly carried out. In addition to classrooms at FK UNRI, house dust mite exposure can also come from student residences, especially in places with potential dust.

However, there was a lack of information on the diversity of house dust mites in allergic people's residences. Based on this reason, the authors conducted research on the detection of house dust mites in the study room and residence of FK UNRI students with allergic rhinitis.

MATERIALS AND METHOD

This study used a descriptive study design with a cross-sectional approach. The study location was in FK UNRI Study room and student residences with allergic rhinitis. The examination was conducted at the FK UNRI Parasitology Laboratory. The population in this study were 74 FK UNRI students from first until third grade who suffered from allergic rhinitis based on Rafi's research physical examination and skin prick test. The samples were taken using the total sampling technique.

Dust Collection and Detection

Dust from each room was taken using tweezers or a spoon. The dust was put into a petri dish disk labeled by each room. Some amount of dust was put on the water's surface and examined with a magnification of 20 times. Dead and living mites were seen floating on the surface of the water. The house dust mites were identified using a mite needle to remove mites; then, the mites were placed on a glass object to be made preparations using lactic acid staining. Data processing of the research results was carried out manually and computerized, displayed based on the frequency distribution of tables and percentages. The data were later displayed univariately to describe the frequency distribution of each variable.

RESULTS

The study was conducted at 40 study rooms at the FK UNRI, consisting of four large classrooms, three small classrooms, four laboratories, two examination rooms, 12 skills lab rooms, and 15 tutorial rooms. *The dust mite population can be seen in Table 1.*

Table 1. Distribution of House Dust Mite Population in the FK UNRI Study Room

Classroom	Number	The Dust Mite Population
Large Classroom	4	0
Small Classroom	3	0
laboratorium	4	0
Examination room	2	0
Skills Lab room	12	0
Tutorial room	15	0

Table 1 showed that there were no house dust mites in the FK UNRI study room. House dust mites can be found at the 74 student residences. *The house dust mites can be seen in figure 1, and the distribution of house dust mites is shown in Table 2.*

Table 2. Distribution of House Dust Mite from Student's Residences (N = 74)

Student's Grade	Number SR	Positive	%	Negative	%
I	31	6	8.1	25	33.8
II	43	22	29.7	21	28.4
Total	74	28	37.8	46	62.2

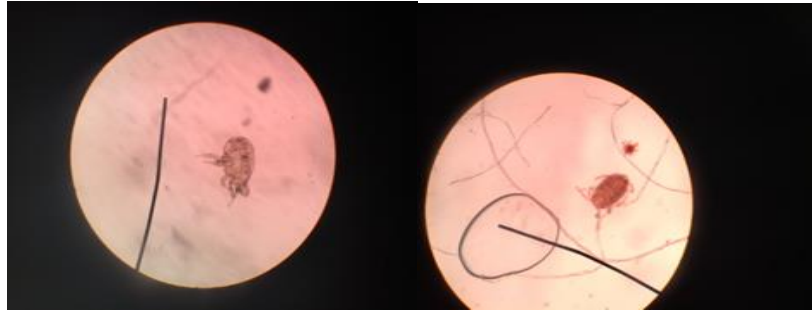


Figure 1. House Dust Mites from the FK UNRI Students' Residences with Allergic Rhinitis (40x 10 magnification)

DISCUSSION

The amount and presence of mites in a place depend on the temperature, humidity, and food available. *House dust mites* can live as omnivores. Home dust mite food is 0.5-1 g squama, which is enough to meet their food needs. One mg of squama can meet the needs of one mite for 20 months.¹⁸

A warm, moist, and dark place is a suitable medium for house dust mite growth. Mites require a room temperature of 25-30°C and 70-80% humidity for their lives. In the house of life, mites are mixed with dust in mattresses, carpets, sofas, and other household appliances. The mattress is the most preferred place because there is a major food source in the form of the epithelium of human skin and fungus.¹⁵

The temperature and humidity in Pekanbaru with 24-27°C temperature and 70-80% humidity are very supportive for the life of house dust mites.¹⁹ However, the available food may not be sufficient for the mite's life in the FK UNRI students' classroom. It is because every morning and evening, all the rooms used for teaching and learning are always cleaned and mopped so that there is no scale left over for the food of the mites. Besides that, every air conditioner in each room in FK UNRI is regularly cleaned every two months to clean the air filter from dust.

Furthermore, the student classrooms at FK UNRI do not use carpets, sofas made of cloth, or equipment made of wool. In each study room, there is also no pile of items that become a den of dust. The classrooms are maintained at the 22-24°C Temperature and 40% humidity. This condition will inhibit the existence and development of house dust mites.¹⁹

In relation to mites, this study showed house dust mites but did not identify the species. The low population of house dust mites in FK UNRI's study room is beneficial for allergic rhinitis sufferers. House dust mites are complex organisms with many protein variations that can stimulate IgE antibodies in potential individuals. One of these allergens is Der p 1 and Der f 1, possibly proteolytic, and Der p 1 and Der f 1 cause tight junction damage in the transmembrane occludin and claudin groups attached to the CD23 and CD25 receptors.²⁰ It causes the epithelial defenses to leak and increase the likelihood of allergen contact with antigen-presenting cells.²¹ Research by Sudaru showed that house dust mite exposure caused asthma sensitization in 77% of the respondents studied.¹⁶ In certain countries such as Korea, house dust mites are the most important inhalant allergen and have a significant exposure level. More than 31 allergens are extracted from house dust mites. It indicates house dust mites is one of the crucial causes of allergies.²²

Furthermore, based on table 2, it can be seen that a positive population of House Dust Mites is 37.8%, and more are found in the residences of second-grade students. The population is classified as high proportion and is one of the critical factors in allergic triggers in allergic rhinitis sufferers. The bedroom is the central location of house dust mites. The presence of mites in bedroom furniture is closely related to food mites. Squama is a staple food of house dust mites, and it is commonly available in beds. Humans produce squams of 0.5-1 grams per day so that house dust mites can flourish. Further, physical factors such as temperature and humidity affect the growth and development of organisms in house dust. Mites are susceptible to relatively high humidity. At humidity of 60% or lower, the house dust mites population is found to be very little or dead.¹⁷

Many factors cause the high presence of house dust mites in the bedroom; among others, house residents pay less attention to the house's condition in terms of cleanliness, temperature, and humidity.¹⁸ FK UNRI students suffering from allergic rhinitis generally stay at a dormitory and do not have the time to clean the room regularly due to busyness in their lectures. Rooms that are rarely cleaned will accommodate dust, especially in locations that contain fiber, such as mattresses, blankets, sheets, carpets, and others. Cleaning dust is not like cleaning with a feather duster as it also does not reduce the density of house dust mite population in the room. Based on interviews, it was found that the student room is generally equipped with

air conditioning. However, the condition of air conditioners is still rarely cleaned where air conditioning services should be done at least once every three months. It is likely to increase the risk of gathering house dust into house dust mite food.

In relation to the mites, the best way to prevent allergic disease is to avoid allergens by reducing exposure to house dust mites, and further will reduce the risk of asthma and rhinitis. Avoidance of *Dermatophagoides pteronyssinus* can reduce asthma symptoms and drugs used by sufferers as long as the avoidance of *Dermatophagoides pteronyssinus* is done aggressively. In patients with rhinitis, atopic dermatitis, and atopic asthma, avoiding exposure to the allergen *Dermatophagoides pteronyssinus* can reduce the frequency of asthma attacks, bronchial hyperactivity, and allergen capacity to provoke asthma.²³

Platt-Mills *et al.*,²⁴ isolated asthma sufferers who were allergic to house dust mites in the *Dermatophagoides pteronyssinus*-free ward and had improved asthma symptoms and decreased bronchial reactivity. Avoidance efforts also worked well in patients with atopic dermatitis who were allergic to *Dermatophagoides pteronyssinus*. Allergic rhinitis is an inflammatory disease that begins with the stage of sensitization and is followed by the stage of elicitation or allergic reactions. In the sensitization phase, the human nasal mucosa is exposed to particles such as pollen, dust, animal skin flakes, and other proteins inhaled with inhalation of breath.²³ This is where the role of house dust mites particles plays to cause the next phase of the elicitation phase.¹⁰

CONCLUSION

Based on the result of this study, it can be concluded that there was a high population of house dust mites in the FK UNRI student's residences with allergic rhinitis. The research results suggest that patients with allergic rhinitis should be more aware and discipline to keep their living areas clean.

CONFLICT OF INTEREST

There is no conflict of interest in this paper.

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