

House Dust Mites in One of Indonesian Detention Center in 2020

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ABSTRACT

House dust mite was one of the most common allergens in homes around the world and associated with manifestations of allergies of skin and respiratory tract such as bronchial asthma, allergic rhinitis, and atopic dermatitis. This arthropod was commonly found on carpets, mattresses, children's toys, and other home furnishings. This study was aimed to identify and quantify the number of *Dermatophagoides* spp in Detention Center. This descriptive study was conducted using flotation method on 52 samples of mattress dust collected in February 2020. The results showed that 49 out of 52 mattress dust samples were positive of *Dermatophagoides*spp. Of all *Dermatophagoides* spp, there were *Dermatophagoides pteronyssinus* (71.2%) and *Dermatophagoides farinae* (28.8%). In conclusion, this study found two species of *Dermatophagoides* spp. in Detention Center and suggested that the facility maintain the cleanliness of the mattress by drying the mattress and changing the sheets at least once a week.

Keywords:
Dermatophagoides spp.;
detention center; house
dust mites; mattress dust

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INTRODUCTION

Detention centers as correctional facilities for prisoners and child inmates in Indonesia were considered inadequate in terms of its infrastructure, environment and sanitation (Wati, 2017). One common problem was the density of prisoner in one cell, worsened by inadequate cell conditions, such as poor lighting, high humidity and cold air. These conditions strongly support the development of viruses such as Hepatitis B and C virus (Naully, 2020) or germs (Suchicha, 2017). House dust mites were very small and can only be viewed using microscope (Soedarto, 2016). House dust mites were arthropods and usually found living all over the house including carpets, mattresses, children's toys and other home furnishings (Natadisastra, 2009). One of the house dust mites genus producing allergens was *Dermatophagoides* (Thomas, 2010; Calderon *et al.*, 2015). Until recently, there were two most commonly found species of house dust mites throughout the world, *Dermatophagoides pteronyssinus* and *Dermatophagoides farinae* (Natadisastra, 2009; Arrahmi *et al.*, 2019).

House dust mites were found as trigger for asthma attacks and allergic symptoms throughout the world because of the enzymes (especially proteases) produced in its digestive tracks and were excreted along with their feces. Dust containing allergens could trigger the emergence of allergic diseases such as atopic dermatitis, bronchial asthma, and allergic rhinitis (Wahyuni *et al.*, 2017). According to WHO, there were as much as 50-80% of asthma and allergic rhinitis worldwide related to house dust mites especially *Dermatophagoides pteronyssinus* and *Dermatophagoides farinae*.

House dust mites population were affected by environmental factors, such as the relative elevation of the house above sea levels, the longer length of summer compared to rainy season, the presence of various animals in the house, and the amount of dust inside the house. The conditions supporting house dust mites survival were the large amount of dust, optimum temperature 25°C–30°C, 70–80% relative humidity, and 60–

65% critical humidity. Indonesia as a tropical region with an average temperature of 25–30°C and humidity of 70–80% was very suitable for the growth and development of house dust mites (Subahar, 2017).

The main food sources for house dust mites were skin debris of human and animals, as well as food residues left uncleaned, therefore house dust mites were often found on beds (mattresses, pillows, and sheets), carpets, and floors, as well outside the house for example in bird nests, mammalian skin surfaces, and other animal skins (Krysztof, 2011). Of all these places, beds were the main habitat of house dust mites because humans spent at least 1/3 of their lives in on a bed. Walangare *et al.* studied house dust in Manado City and found that 90% (0.9) of the samples were positive containing mites. A study in Jakarta during the year of 2000 found that 81.73% of people with asthma and allergic rhinitis were related to house dust mites. A prevalence study conducted by Majawati showed that Tanjung Duren Utara Village in West Jakarta of Jakarta Province was 32.69% infested by house dust mites. In 2017, a study on house dust mites in Class II B Detention Center showed that 62 out of 70 inmates (88,6%) had dermatitis with repeated itchy skin complaints, the presence of red patches on the skin due to itching and burning feeling as well as bumps, scaling, and dry areas of the skin.

MATERIALS AND METHODS

This descriptive cross sectional study was conducted at the Parasitology Laboratory of the Medical Technology Laboratory Department of Poltekkes Kemenkes Banten from February through May 2020. A total of total 115 mattresses in Detention Center, 52 were randomly sampled and the inmates using those mattresses were asked to fill out questionnaires to acquire information needed for this study.

The dust was collected using a 350 watts vacuum cleaner into transparent plastic bag with

labels of identification on each bag. Microscopic examination was performed immediately and the samples were stored in 4 °C refrigerator for future examination if needed. Mites were separated from the rest of the dust using flotation technique. In short, 0,1 gram sample was first washed using 3 mL of ethyl alcohol in a reaction tube. After incubation for 30 minutes, the supernatant and sediment formed were separated by pouring and pipetting. The sediment was then resuspended with 3 ml of hypertonic sodium chloride (33% NaCl) and reincubated for 45 minutes. A drop of the surface liquid was then examined under light microscope using regular object glass and cover, with 100–400× magnification assuming all present *Dermatophagoides* in the 0,1 gram of dust was included.

RESULT AND DISCUSSION

After microscopic examination on 52 dust samples obtained from randomly selected mattresses, 49 samples were found positive infested by *Dermatophagoides* spp as shown in Table 1. There were two species of *Dermatophagoides* identified based on their morphological features, *D. pteronyssinus* and *D. farinae* (figure 1 A and B)

with relative density of mites 158 and 65/gram dust respectively (Table 2). We tried to associate the itchy complaints from inmates with their past and present states (Table 3). Most of them (62%) did not have history of itchy skin condition and the itch could be found in every parts of the body but mostly on the hands. All respondents always change their clothes after taking shower which occurred once to three times a day (Table 4). The respondents admit that they change the sheet and sun dry the mattress on monthly basis, some of them do it more than twice a month (Table 5).

Microscopic examination on 52 dust samples taken from mattresses in this study showed that 49 (94%) of samples were positively infested by *Dermatophagoides* spp. As a tropical region, Indonesia had a relatively warm temperature 25–30°C and high humidity (70–80%) which were beneficial for the growth and development of house dust mites (Subahar, 2016). Mattress was one of the most occupied and the least often replaced object in detention center, therefore it was rich in skin debris that was the main source of food for house dust mites. The older a mattress, the higher population of house dust mites can be found (Tawurisi, 2014).

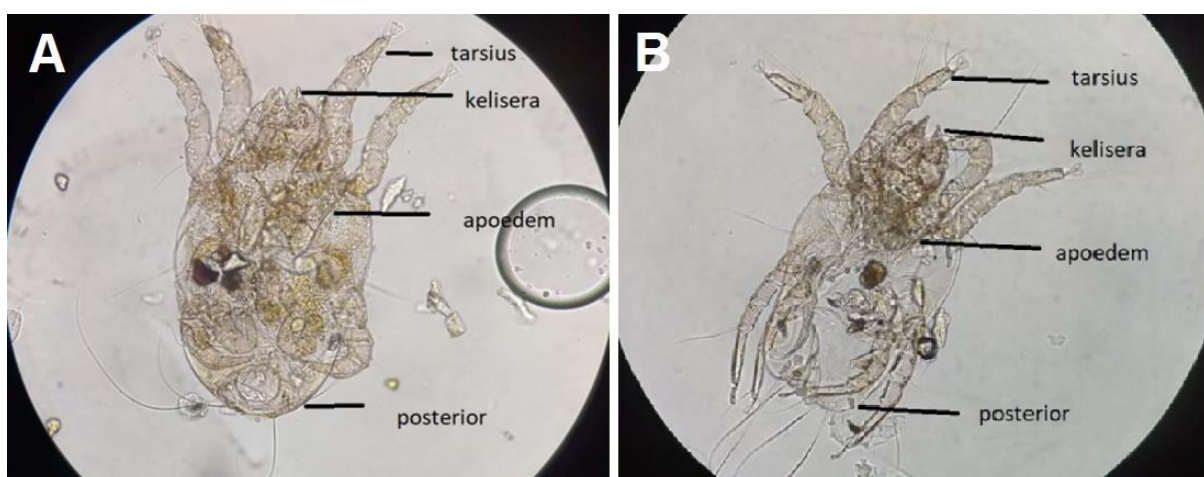


Figure 1. (A) *Dermatophagoides pteronyssinus* (B) *Dermatophagoides farinae*

Table 1. The number of samples examined for *Dermatophagoides* spp.

Result	Number	Percentage (%)
Positive (+)	49	94
Negative (-)	3	6
Total samples	52	100

Table 2 . The species and density of *Dermatophagoides* spp. from mattress dust

	<i>Dermatophagoides</i> spp.	<i>D. pteronyssinus</i>	<i>D. farinae</i>
Number	111	79	32
Density	223.0	158	65
Average	4,3	3	1,3

Table 3. Association of past and present condition with itchy complaints

Question	Answer			
Do you have the history of itchy skin condition?	Yes		No	
	20 (38%)		32 (62%)	
Do you sneeze frequently?	8 (40%)		12 (60%)	
Where do you usually feel the itch?	Thigh	Hand	All over	Nose
	6 (30%)	8 (40%)	2 (20%)	4 (10%)
When do you usually feel the itch?	Morning	Noon	Evening	Night
	0 (0%)	0 (0%)	0 (0%)	20 (100%)

Table 4. Inmates personal hygiene

Question	Answer			
How many times do you take shower everyday?	1×	2×	3×	4×
	0 (0%)	21 (40%)	24 (46%)	7 (14%)
Do you change with a fresh cloth after shower?	Yes		No	
	52 (100%)		0 (0%)	

Tabel 5. Mattress sheet cleanliness

Questions	Answer			
How many times do you replace the mattress sheet in a month?	1×	2×	3×	4×
	7 (14%)	24 (46%)	10 (19%)	11 (21%)
How many times do you dry the mattress under the sun in a month?	1×	2×	3×	4×
	2 (4%)	8 (15%)	12 (23%)	30 (58%)

Identification and quantification of *Dermatophagoides* was performed based on the morphological properties of the mites. Of the 49 positive samples, *Dermatophagoides pteronyssinus* was the most commonly found species (71,2%) followed by *Dermatophagoides farinae* (28,8%). Previous study by Hohakay (2017) that collected house dust mites from mattresses of homes in Manado city also found *Dermatophagoides pteronyssinus* (66,8%) as dominant species followed

by *Blomia tropicalis* (18,5%), and *Dermatophagoides farinae* (5,4%). We only found two species compared to three species of house dust mites found by Hohakay possibly due to the slightly different climates between Tangerang and Manado because the growth of house dust mites was highly influenced by environmental factors including physical factors such as climate (Subahar, 2017).

House dust mites were known to have caused the inflammation of the skin or dermatitis (Natalia, 2015). A total of the 52 respondents with respective sampled mattress dust, 38% admitted that they had itchy skin condition that could be found in every parts of the body but mostly on the hands and usually felt during the night (100%). When the body movements were limited during the night while sleeping on the mattress, that was the suitable chance for dust mites to invade human body and chew the dead cell on the skin surface, giving the itchy sensation. Forty percent of respondents with skin condition also reported the frequent sneezing which was a sign of problems in upper respiratory tract that could be caused by allergens produced by house dust mites. Inhalation of dust mites allergens could trigger allergic diseases such as dermatitis, bronchial asthma, and allergic rhinitis as the signature allergy caused by *Dermatophagoides pteronyssinus* and *Dermatophagoides farinae* (Widiastawan et al, 2015). The antigens of *Dermatophagoides pteronyssinus* were mainly found in the mite's digestive tract and cuticles. Food that entered the dust mite intestine was excreted as a strong antigen. Within 3 months of its life, dust mites were estimated to produce 2000 fecal particles, 50 eggs, and 4 cuticles, thus indirectly showing that 95% of mite allergens came from fecal particles as well as the dead body of the dust mites itself. Eighty percent of house dust mites related allergy patients had IgE antibodies specific to the allergens of *Dermatophagoides pteronyssinus* and *Dermatophagoides farinae*, most of them had asthma, dermatitis, and rhinitis (Natalia, 2015).

More than half of the respondents with respective mattresses (62%) did not have history of itchy skin condition. All respondents also admitted that they always change their clothes after taking shower which occurred once to three times a day (table 4). The relatively good personal hygiene contributed to the absence of the itchy skin condition because it was harder for the mites to stay on the skin that was regularly cleansed using soap, clothes that was washed with laundry soap, and clean bedding (Wati et al, 2017). The

respondents admitted that they change the sheet and sun dry the mattress on monthly basis, some of them do it more than twice a month. Table 5 showed that 22 (46%) of respondents changed their sheets twice a month and as many as 10 (14%) respondents changed their sheets 4 times per month, meanwhile 26 (58%) of respondents dried out their beds 4 times a month. The highest density of house dust mites was found on the mattress of which sheet was changed and sun dried less than 4x a month, causing dust and mites to accumulate between the sheet and mattress. This study shows that changing the mattress sheet and drying the mattress under the sun should be done at least once a week to avoid accumulation of dust as well as the mites on the old mattress and therefore the frequency of cleaning the bedroom affects the house dust mites population.

In this study, another mite, *Sarcoptes scabiei*, was found in one of the mattress dust sample taken from a respondent with scabies. This was one of the concerns because *Sarcoptes scabiei* can spread through clothing or bedding. Scabies usually occurred in high humidity environment with poor personal hygiene and can spread through shared towels, clothes, prayer equipment, and bedding (Sungkar, 2016). The incidence of scabies in Detention Center was relatively high throughout Indonesia. The report from Detention Center and Detention Center Branch (LPKA) by June 2016 ranked 3 out of 10 most prominent illnesses suffered by inmates were upper respiratory infections, skin diseases, and digestive disorders caused by poor environmental health conditions in the centers.

One of the constraints in this study was the unidentified mites due to the destructed structures although the remains of dead mites could be destroyed by bacteria and continue to be the source of allergens in house dust (Rofieq et al., 2016). Tool limitation was also another obstacle factor because dead or destroyed mites should be able to be identified using polymerase chain reaction (PCR) method.

CONCLUSION

The study of identification and quantification of house dust mites in Detention Center showed that 94% of the randomly sampled mattress dusts were positive containing *Dermatophagoides* spp. The most abundant dust mites species found were *D. pteronyssinus* and *D. farinae*, 71,2% and 28,8% respectively.

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