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THE RELATIONSHIP BETWEEN THE PRESENCE OF HOUSE DUST MITES AND ALLERGY INCIDENTS AT THE MAULANA HASANUDDIN FOUNDATION ORPHANAGE IN CILEGON, BANTEN

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ABSTRACT

Allergy is a clinical manifestation in the form of an excessive symptomatic response from the immune system's reaction to substances or antigens in the environment that are usually harmless. House dust mites (HDM) are a major source of indoor aeroallergens. Some allergic diseases associated with HDM are allergic rhinitis, asthma, and eczema or atopic dermatitis. The aim of this research is to determine the presence and density of house dust mites, as well as to determine the relationship between the presence of house dust mites and the incidence of allergies in the Maulana Hasanuddin Foundation Orphanage in Cilegon. This research was conducted in March-April 2024 using observational analytical methods with a cross-sectional research design. The research subjects were 37 respondents. The sampling technique used was total sampling. Data collection was carried out using the International Study of Asthma and Allergy in Childhood (ISAAC) questionnaire and dust sampling in the bedrooms of the Maulana Hasanuddin Foundation orphanage. Data analysis was carried out using the Fisher exact test. Of the 37 children from the Maulana Hasanuddin Foundation orphanage, 27 respondents (73%) showed positive allergies and 10 respondents (37%) showed negative allergies. Of the 27 subjects who tested positive for allergies, they could experience more than 1 type of allergy, so the number of allergic incidents could grow to 75 cases and the majority of orphanage children had experienced allergic rhinitis (32%). There is no statistically significant relationship between the presence of HDM and allergy sufferers (allergic rhinitis, asthma, or eczema) with OR 1.25 (0.29 – 5.34) and p-value > α (1.00 > 0.05).

Keywords : presence of HDM, density of HDM, allergy

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INTRODUCTION

Allergy is a clinical manifestation of an exaggerated symptomatic response of the immune system to normally harmless environmental substances or antigens. [mejf] As much as 8-10% of the global population suffers from one or more allergic diseases, ranging from mild rhinitis to severe anaphylaxis or asthma.[3] In Indonesia, the highest prevalence of allergies in big cities are allergic rhinitis, asthma and atopic dermatitis.[4] *Allergic rhinitis* (AR) is an inflammation that can be characterised by nasal and non nasal symptoms.[5] AR is estimated to affect 10% to 30% of adults and 40% of children and its prevalence is still increasing globally.[6] In Indonesia, the prevalence of AR is estimated to be around 1.5-12% of the population in all age groups.[7] According to basic health research data (Riskesdas) in 2007, the prevalence of AR in Banten Province reached 20%.[8] Asthma is a common, chronic disease of the respiratory tract characterised by inflammation and narrowing of the respiratory tract. Asthma affects approximately 15% to 20% of people in developed countries and around 2% to 4% in less developed countries.[10] Riskesdas (2018) recorded the prevalence of asthma in Indonesia at 2.4% in the population of all ages. Meanwhile, the prevalence of asthma in Banten Province reached 2.5%.[11] *Atopic dermatitis* (AD) or eczema is the most common chronic inflammatory skin disease that can result in redness, swelling, scaling, exudative, and dryness.[12,13] AD affects approximately 10% to 30% of children and 2% to 10% of adults in developed countries.[12] The prevalence of atopic dermatitis in Indonesia has been studied by the Children's Dermatology Study Group (KSDAI) from 10 hospitals spread throughout Indonesia, specifically in 5 major cities in Indonesia, atopic dermatitis is ranked first of the top 10 skin diseases in children, which is 23.7%.[14]

House dust mites are a major source of indoor aeroallergens that are associated with several allergic diseases.[15] House dust mite allergens are the main cause of AR in children in Indonesia.[4] A study on TDR density as a trigger of allergic rhinitis in Pekanbaru orphanage children by Yolazenia et al. revealed that symptoms of allergic rhinitis were experienced by 81.2% of orphanage children and found TDR with a mean density of 9.11/g dust. TDR was found in all four orphanages studied and had a high incidence of allergic rhinitis.[16] Meanwhile, another study by Nova DF et al. found that there was no difference between the density of TDR and the incidence of AR in two orphanages in Koto Tangah District.[17]

Indoor allergens produced by house dust mites, mould, and cats are triggers of asthma in childhood and adults, especially in people who are sensitive to these allergens.[18] Pangadongan SENY et al. concluded that there is a relationship between TDR and the incidence of bronchial asthma in children in the working area of Puskesmas Lempake Samarinda City.[19] Meanwhile, Armunanto SIS et al. revealed no relationship between TDR density and asthma incidence in paediatric patients in Semarang.[20] A retrospective study by Nugroho WT et al. found that 63.3% of 60 AD patients had

sensitisation to TDR.[21] Another study in Brunei conducted by Emran H et al. showed an association ofTDR with the incidence of atopic dermatitis.[22]

Children in orphanages are susceptible to allergic events. In addition, orphanage buildings such as the use of shared mattresses, the number of occupants, temperature, and humidity have the potential to affect the survival of house dust mites. The results of research on the relationship between TDR and allergic events are still varied, so there are inconsistencies in the relationship. Currently, research data on the relationship between TDR and allergy incidence in orphanages in Banten province is still limited. Therefore, research on the relationship between the presence of house dust mites and the incidence of allergies in orphanages is important to do.

METHODS

This study used an observational analytic method with a cross-sectional research design. The research subjects consisted of 37 subjects. The sampling technique used in this study was total sampling according to the inclusion and exclusion criteria. Data collection was carried out using the International Study of Asthma and Allergy in Childhood (ISAAC) questionnaire and dust sampling in the rooms of residents of the Maulana Hasanuddin Foundation orphanage.

The temperature and humidity of the rooms in the orphanage were measured using a thermo hygrometer. Dust sampling was conducted in the sleeping room of the orphanage children using a 300 W handheld vacuum cleaner. The dust samples studied were obtained from the mattress, both on the upper, lower and edge sides. Then, researchers used zip lock plastic bags as storage containers for dust samples. The zip lock plastic was labelled with the room number where the dust came from. Dust samples were examined at the Parasitology Laboratory of the Faculty of Medicine, Sultan Ageng Tirtayasa University to determine the presence of house dust mites (Dermatophagoides sp.) and calculate the density of TDR per 0.1 gram of dust in each dust sample and dust samples were viewed under a light microscope using 10x or 40x magnification. This study involves individuals as respondents, so this study requires submission of ethical permits. This research has been approved by the Ethics Committee of the Faculty of Medicine and Health Sciences, Sultan Ageng Tirtayasa University with letter number 1/UN43.20/KEPK/2024.

RESULTS

A. Description of Research Location and Respondent Characteristics

The research was conducted at the Maulana Hasanuddin Foundation Orphanage. The orphanage is located in Cilegon City in Banten Province. The orphanage building has an area of approximately 1800 m2 and there are 4 rooms for boys and 4 rooms for girls. One girls' room is occupied by 6 to

7 children, while one boys' room is occupied by 5 children at most. The study was conducted on 37 respondents aged 12-18 years.

The table below describes the characteristics of 37 respondents, with a median age of 14 (8-19) years. The majority of respondents were female (67.6%). Most of the subjects are junior high school students (78.4%). The complete data can be seen in table 1 below.

Table 1 Characteristics of Respondents at the Maulana Hasanuddin Foundation Orphanage

Respondent Characteristics	Median (Min-Max)	Frequency (N)	Percentage (%)
Gender			
• Male		12	32.4
• Female		25	67.6
Pendidikan			
• Elementary School		1	2.7
• Junior High School		29	78.4
• Senior High School		7	18.9
Age (years)	14 (8-19)		

B. Temperature and Relative Humidity

Researchers used a thermo hygrometer to measure room temperature and humidity. The results of these measurements are described in the temperature and relative humidity table (Table 2) in each room of the Maulana Hasanuddin Foundation orphanage in Cilegon. Based on this table, it is found that the room with the highest temperature is room 8 and the highest relative humidity is room 6.

Table 2 Temperature and Relative Humidity in Maulana Hasanuddin Foundation Orphanage Rooms

	Room							
	1	2	3	4	5	6	7	8
Temperature (ºC)	34	31.5	31.9	31.9	31.5	31.3	32	32.3
Relative Humidity (%)	60	69	70	70	71	72	68	65

C. Presence, TDR Density , and Dust Weight

The table below describes the presence and density of TDR in each room of the Maulana Hasanuddin Cilegon foundation orphanage. Based on table 3, it was found that there were 4 rooms where TDR was found in dust samples and 4 rooms where TDR was not found in dust samples taken from mattresses in each room. TDR density is calculated using the calculation and weight of dust after flotation of dust samples. The highest TDR density was found in room 3.

Table 3. TDR Density in Maulana Hasanuddin Foundation Orphanage Rooms

	Room							
	1	2	3	4	5	6	7	8
Existence of HDM	+	+	+	-	+	-	-	-
HDM density (mites/g dust)	1.7	3.9	9.0	0	8.1	0	0	0

The table below describes the weight of dust samples both before and after flotation in each dust sample obtained from each room of the Maulana Hasanuddin Cilegon foundation orphanage. Based on table 4, it is found that the weight of dust samples with positive TDR after flotation is the highest obtained from room 5.

Table 4. Weight of dust samples in the Maulana Hasanuddin Foundation Orphanage Room

	Room							
	1	2	3	4	5	6	7	8
Weight of dust before flotation	0.39	0.4	0.5	0.45	0.86	0.33	0.79	0.5
Weight of dust after flotation	0.17	0.39	0.45	-	0.81	-	-	-

D. Allergy Distribution

The table below explains that allergy sufferers in the residents of the Maulana Hasanuddin

Foundation Orphanage are 27 subjects with a percentage of 73%. Meanwhile, 10 subjects showed negative allergies. Of the 27 subjects who showed positive allergies could experience more than 1 type of allergy, so the number of allergic events could develop into 75 cases. The complete data can be seen in table 5 and table 6 below.

Table 5. Allergy Sufferers in Residents of Maulana Hasanuddin Foundation Orphanage

Allergy sufferers	Frequency (N)	Percentage (%)
Positive	27	73
Negative	10	27
Total	37	100

Table 6. Distribution of Allergy Events in Residents of Maulana Hasanuddin Foundation Orphanage

Allergic Events	Frequency (N)	Percentage (%) of Events
Ever experienced allergic rhinitis	24	32
Currently experiencing allergic rhinitis	18	24
Ever experienced asthma	9	12
Currently experiencing asthma	6	8
Ever experienced atopic dermatitis (eczema)	9	12
Currently experiencing atopic dermatitis (eczema)	9	12
Total	75	100

The table above explains the distribution of allergic events experienced by children living in the Maulana Hasanuddin Foundation orphanage in Cilegon. There were 37 children living in the orphanage who responded to the questionnaire questions about

allergic events experienced. Of all the events, most of the allergic events experienced by the orphanage children were ever experienced allergic rhinitis (32%) and currently experiencing allergic rhinitis (24%). Less than a quarter of the allergic events were ever experienced asthma (12%), currently experiencing asthma (8%), ever experienced atopic dermatitis (12%), and currently experiencing atopic dermatitis (12%).

E. Severity of Allergic Rhinitis Symptoms

The researcher categorised the degree of AR based on the WHO-ARIA classification. Respondents who suffered from allergic rhinitis were considered to have a mild degree if they answered that the symptoms of allergic rhinitis did not or only slightly interfere with daily activities. Meanwhile, respondents who answered that the symptoms of allergic rhinitis disorder had a considerable influence or greatly interfered with daily activities were considered to have a moderate-severe degree. Table 7 explains that there were more respondents with mild allergic rhinitis (55.6%) than respondents with moderate-severe allergic rhinitis (44.4%).

Table 7. Distribution of Severity of Allergic Rhinitis Symptoms in Residents of Maulana Hasanuddin Foundation Orphanage

Severity of allergic rhinitis	Frequency (N)	Percentage (%)
Mild	10	55.6
Moderate-severe	8	44.4
Total	18	100

F. The relationship between the presence of TDR and allergy sufferers at the Maulana Hasanuddin Foundation orphanage

Table 8 below shows that there were 15 children who were positive for allergies and found mites in their rooms, while 12 children who were negative for allergies and did not find mites in their rooms. The results obtained after the Fisher's exact test statistical test was conducted, namely the finding of mites in the room had no significant effect on the incidence of allergies in children in orphanages because p-value > α (1.00 > 0.05) .

Table 8. Relationship between House Dust Mites and Allergy Patients at Maulana Hasanuddin Foundation Orphanage

Variables	Allergy sufferers						p-value	OR
	Positive		Negative		Total			
	n	%	n	%	n	%		
Mite findings in the room (+)	15	55.6	5	50	20	54.1	1.00	1.25 (0.29 – 5.34)
Mite findings in the room (-)	12	44.4	5	50	17	45.9		
Total	27	100	10	100	37	100		

DISCUSSION

A. Respondent Characteristics

Based on the age characteristics of the respondents, this study found that the median age of the subjects was 14 years old with the highest level of education being junior high school. This is in line with research in Indonesia on the incidence of allergies in children. One of them is a study in Semarang by Nugraha (2011) which recorded 30.2% of school students aged 16-19 years suffering from allergic rhinitis. Meanwhile, Kholid Y (2013) in East Ciputat found that children aged 13-14 years suffered from allergic rhinitis 25.2%. Zulfikar et al. (2008) in West Jakarta reported 16.4% of children aged 13-14 years suffered from allergic rhinitis. In addition, a study by Mawarni F et al. found that asthma patients at Puskesmas Ciputat South Tangerang were dominated by children aged 5-14 years (20.2%).[29,64,65] Children's age susceptibility to allergies is associated with an immune system that is still developing and during this process there can be highly reactive hypersensitivity to some allergens of certain substances that trigger an allergic response. In addition, an article mentioned that environmental factors from indoor air pollution, such as house dust mites and cigarette smoke are involved in the development and exacerbation of allergic rhinitis (AR) in childhood. Children may be exposed to greater allergens and environmental pollutants due to their higher oxygen consumption rate per unit of body weight and immature respiratory and immunological systems.[66]

The majority of respondents in this study were female, namely 25 people with a percentage of 67.6%. While men totalled 12 people with a percentage of 32.4%. This finding is not in line with an article by De Martinis M et al. which states that at a young age, allergies are experienced by manymen

compared to women.[67] However, in general, allergies can affect both men and women. Furthermore, after puberty, the incidence of allergies increases to be higher or equivalent to that of post-pubertal males. This is related to the role of sex hormones on IgE levels and different physiological and anatomical conditions between the sexes.[67]

B. Presence and Density of House Dust Mites

The presence of house dust mites is supported by various factors, such as temperature and relative humidity. In this study, all rooms had relative humidity that supported the presence of house dust mites with a range of 60% to 71% and temperatures with a range of 31.3° C to 34° C. This finding is slightly different from the study of Bergmann K, who concluded that the relative humidity level favoured by mites to thrive is 75-80%.[51] In addition, Subahar R et al. revealed in their study that relative humidity of 60-70% has a significant influence on the presence of TDR compared to humidity <60% in Pamulang and Jakarta. The study also found that TDR can develop optimally ata temperature of 25°C-35°C.[20,23,51,68] In addition to temperature and humidity, the presence of TDRis influenced by food in the form of human skin flakes (squama) on the surface of mattresses neededfor mite growth, as well as room ventilation. The presence of TDR can be reduced by cleaning the house properly and regularly by changing mattress sheets and pillowcases, drying mattresses, pillows and bolsters, and cleaning items or surfaces of furniture at home using a wet cloth or *vacuumcleaner*.[52,53] Based on the results of examination using a microscope, TDR was found in the dust samplesof rooms 1, 2, 3, and 5. The highest TDR density was found in room 3 and the lowest was found inroom 1, and several other rooms showed negative TDR. The TDR density was calculated based on the weight of dust after flotation as listed in table 4.4. TDR density is categorised as low if the valueis 1 - 3, while TDR density is categorised as high if the value is more than 6.[20] Based on this categorisation, table 4.3 shows that rooms 1 and 2 have low TDR densities of 1.7 and 3.9respectively. Meanwhile, rooms 3 and 5 have a high TDR density, which is 9.0 and 8.1 respectively.Previous research by Armunanto SIS et al. in Semarang took samples from 25 houses and found 9 houses with high TDR density, 8 houses with medium TDR density, and 8 houses with low TDR density. In contrast to this study which measured the temperature and temperature per room in the orphanage, Armunanto SIS et al. described the temperature and humidity of the air in Semarang which supports the growth and development of TDR, namely an average temperature of 27.5° C anda relative humidity of 75%.[20] Another study by Anindita R et al. in Jatimulya Village Bekasi reportedthe highest TDR density found was 7.24/g dust and the lowest was 4.37/g dust .[69] In contrast to thisstudy, sampling in Anindita R et al.'s study was conducted at the location of mattresses, carpets, and floors in 9 houses. Meanwhile, Yolazenia et al. found that the average TDR density in orphanages in Pekanbaru was 9.11 /g dust .[16] This study has differences with the research of Yolazenia et al. whocompared 4 orphanages and

separated the samples per orphanage, while this study was only conducted in 1 orphanage. However, there are similarities in the form of sampling that is not separated per individual because in 1 room the mattress is used simultaneously.

C. Allergic Events

Based on table 5, the number of positive subjects with allergies in the residents of the Maulana Hasanuddin Foundation Orphanage was 27 subjects with a percentage of 73% of the total37 subjects. One subject who tested positive could experience more than 1 allergic event. Based ontable 6, this study found a total of 75 cases of allergic events with the most incidence was having experienced allergic rhinitis which had a percentage of 32%. This is in line with what was stated byPawankar R who stated that allergic rhinitis is a common allergic disease that affects 400 million people worldwide and is something of global concern given its high prevalence.[5]

At the time of data collection, the prevalence of allergic rhinitis obtained from orphanage children was 24%. This finding has similarities with previous research by Nugraha et al. in Semarang who reported a prevalence of allergic rhinitis of 30.2% in school students aged 16-19 years. Meanwhile, Kholid Y recorded the prevalence of allergic rhinitis in children aged 13-14 years in East Ciputat at 25.2%. In addition, Zulfikar et al. in West Jakarta reported a prevalence of 16.4% in children aged 13-14 years.[29,65] This close comparison of prevalence is thought to be due to the geographical location that is not too far away, as well as the climate and environment that is not too different, namely a wet tropical climate characterised by relatively high temperatures and evenly distributed rainfall throughout the year. In addition, the environmental dust sources are relatively similar because these areas are urban areas with relatively high population density and similar dust sources such as building dust and industrial dust. TDRs can grow and develop well in a favourable climate and environment as it relates to temperature, relative humidity, and habitat. Thus, the presence of TDR eventually becomes a risk factor for causing allergic rhinitis for people living in the area.

Based on table 6, the results of this study show an asthma prevalence of 8%. This is in line with research by Yunus F et al. who observed the age group of 13-14 years in West Jakarta in 2011 and showed an asthma prevalence of 13.1%. In addition, from research by Mawarni F et al. found that asthma patients at Ciputat health centre in South Tangerang were dominated by children aged 5-14 years (20.2%).[64]The correspondence with this study shows that asthma is an allergic event thatis likely to be frequently experienced by orphanage children in Banten because of the similarity of age groups and geographical location. Similar to the location of this study, West Jakarta and South Tangerang are urban areas that tend to have high levels of air pollution and allergens that can trigger asthma. Thus, these exposures could be aeroallergens associated with sensitisation and worsening of

allergic asthma in an individual.[37]

The prevalence of atopic dermatitis found at the time of data collection in this study was 12%. This is in line with this study because it can show that atopic dermatitis is an allergic event that is likely to be frequently experienced by children in orphanages in Cilegon, which is also locatedin Banten Province. Globally, WHO states that 5-20% of children suffer from atopic dermatitis. In Banten Province in 2021, atopic dermatitis is a common disease with a proportion of atopic dermatitis of 7.5%. Data from the Banten Provincial Health Office in 2022 noted that Serang Regency had the highest prevalence, reaching 65.14%.[70]

Based on table 7, this study found that mild cases of allergic rhinitis were more common than moderate-severe, with a percentage of 55.6%. This is in line with Kholid Y's research in 2013 to junior high school students in East Ciputat who found that allergic rhinitis sufferers mostly had mild degrees (89.29%). Similarly, research by Pasaribu PS et al. to school children aged 13-14 yearsin Pontianak found the majority of allergic rhinitis sufferers belonged to the mild degree group (52.6%).[29,65] However, the findings in this study are not in line with the results of research obtained by Wibowo E et al. on allergic rhinitis patients at Dr Hasan Sadikin Bandung Central General Hospital in 2017-2021. In their study, Wibowo E et al. reported persistent moderate-heavy allergic rhinitis as the most common classification of allergic rhinitis. The difference with the results of this study may occur because patients with allergic rhinitis who access health services may experience more severe AR symptoms and have reduced their quality of life.[71] Therefore, different findings may be influenced by the sampling location. The results of this study are in line with the research of Kholid Y and Pasaribu PS, presumably due to the similarity of demographic factors and sample characteristics, namely a group of children in their teens with mild AR symptoms that tend not to interfere with daily life and do not need to receive treatment at the hospital.

D. Relationship Between House Dust Mites and Allergy Sufferers

This study found that the presence of TDR did not have a statistically significant relationship with allergy sufferers (allergic rhinitis, asthma, or eczema) with OR 1.25 (0.29 - 5.34) and *p-value* > α (1.00 > 0.05). Research with similar results was found in a study by Nova et al in the Koto Tangah orphanage which revealed the absence of a significant relationship between TDR density and the incidence of allergic rhinitis.[17] Similar to these results, Nurhutami DN et al. also revealed intheir research that there was no significant relationship between TDR exposure and the incidence of AR, but the researchers did not explain how the researchers measured TDR in the study.[72]

As one of the indoor aeroallergens, TDR is believed to play a role in the pathogenesis of allergic diseases, such as allergic rhinitis, asthma, and atopic dermatitis. Group 1 (Der p 1, Der f1), group 2 (Der p 2, Der f 2), and group 23 (Der p 23) are considered to be the dominant allergens

involved in allergic responses. These factors combined with the intrinsic biological activity of the allergens stimulate the innate immune pathway resulting in allergy.[73,74] A study by d'Alessandro et al. revealed the role of Der p1 in a population of patients with allergic rhinitis and asthma that and Der p1 was associated with bronchial asthma and cosensitisation.[74] In addition, a study by Anasis AM et al. found IgE positive *anti-HDM* patients in the persistent asthma group were higher (69%) than the normal clinical group (25%) and a positive correlation was found between bedroom dust mite density and serum IgE *anti-HDM* levels in persistent asthma patients.[75] These data also support the findings in a literature review conducted by Huang H et al. on a study in Singapore involving 253 children with an average age of 7.3 years (with an age range between 0.4 to 18.4 years) who suffered from mite allergy. The findings showed that 79% of them met the diagnostic criteria for allergic rhinitis, 47% for asthma, 72% for atopic dermatitis, and 31% for all three conditions.[73]

Similar to this study, Armunanto SIS et al. found that there was no significant association between TDR density and asthma incidence in paediatric patients in Semarang ($p>0.05$).[20] Research on TDR density with atopic dermatitis is still very limited. However, there is a study by Akhyar G who examined the relationship between TDR density and the recurrence rate of atopic dermatitis using anamnesis and *skin prick test.* In his study, it was found that about 80% of patients with AD showed sensitivity to TDR, indicating that TDR allergens can cause disease exacerbation in AD, but there was no difference in the incidence of atopic dermatitis with TDR density.[76]

The absence of a statistically significant association between the presence of TDR and allergy sufferers could be influenced by several factors, including the fact that allergy sufferers did not live in rooms that had dust samples with negative TDR results. In addition, this result could alsobe influenced by several other factors, including individual health conditions and genetic factors. Some respondents in the study may have health conditions that affect their response to house dust mite exposure. For example, individuals with compromised immune systems may be more susceptible to TDR allergy, or the opposite condition that allows for the effects of immunity may account for the lack of a significant association. One article mentioned the innate and adaptive immune systems are critical in regulating adaptation to the external microenvironment and allergy is caused by the interaction of multiple genes and the external environment in cells. For example, IgE-mediated sensitisation is responsible for the pathogenesis of dust mite allergy and allergen sensitivity profiles may differ between individuals.[15,77]

Genetic factors may also play a role as there is a possibility that individuals have a genetic predisposition to develop allergy to TDR, while others do not. A study by Dey D et al. in India examined the association of IL 6 and IL 8 polymorphisms with TDR sensitisation and showed the results that IL 6 -572G/C and IL 8 -251A/T may pose a risk of TDR sensitisation.[78] In addition,

several studies described genes identified to be involved in the severity, development and progression of allergic diseases that mainly play a role in regulating inflammatory responses (IFN- α, TLR-1, IL-13, IL-4, IL-5, HLA-G, iNOS), maintaining vascular endothelium and mucosal lining(FLG, PLAUR, CTNNA3) mediating immune cell function (IL1RL1, PHF11, H1R), and influencing susceptibility to allergic sensitisation (ORMDLR3, CHI3L1).[79]

In this study, the number of respondents involved was quite limited, which affected the statistical power of the analysis. This limitation may lead to the inability to produce a significant relationship between the presence of TDR and allergy sufferers, although there is still a possibility that the relationship exists in a wider population. In addition to the limited number of respondents, the detection of TDR using light microscopy in this study may be an obstacle that is thought to limit the accurate identification of TDR species when compared to stereo microscopy. This may be related because stereo microscopy can help identify TDRs that are more effective for use in research. By using stereo microscopy, TDR objects on dust samples which are 3-dimensional samples can be seen more clearly and sharper in various focal planes with high resolution.[52,80]

The researcher considered other factors and some of these limitations in the study, so therewas no significant relationship between the two variables observed in this study. In this study, the researcher faced obstacles in controlling other factors such as occupant behaviour related to room hygiene, health conditions, and genetics may also illustrate the complexity of the interaction between these factors in influencing the relationship between TDR exposure and allergies. The small sample size may also increase the risk of sample reliability and reduce the validity of the study results. Thus, it is important to conduct further research that considers the importance of these factors and higher research *power*, as well as more sensitive tools to gain a more thorough understanding of the relationship between TDR and allergy.

CONCLUSION

The results of the examination by researchers using a microscope on dust samples obtained from the Maulana Hasanuddin Foundation orphanage Cilegon showed 4 rooms with positive TDR and 4 rooms with negative TDR. The research conducted at the Maulana Hasanuddin Foundation orphanage Cilegon obtained the highest TDR density calculation result of 9.0 / g dust and the lowest TDR density calculation result of 1.7 / g dust. According to the results of research and analyses conducted, researchers did not find a significant relationship between the presence of house dust mites and the incidence of allergies in the Maulana Hasanuddin Foundation Cilegon orphanage.

REFERENCES

1. Dougherty JM, Alsayouri K, Sadowski A. Allergy [Internet]. StatPearls. 2023 [updated 2023 Jul 31; cited 2023 Nov 24]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK545237
2. Murphy KP, Weaver C, Berg L. Janeway's immunobiology. New York: W. W. Norton & Company; 2022. p. 135, 1522.
3. Aldakheel FM. Allergic Diseases: A Comprehensive review on risk factors, immunological mechanisms, link with COVID-19, potential treatments, and role of allergen bioinformatics. Int J Environ Res Public Health. 2021;18(22):12105.
4. Endaryanto A, Nugraha RA. Indonesia-based study of the clinical and cost-saving benefits of subcutaneous allergen immunotherapy for children with allergic rhinitis in private practice. Cells. 2021;10(7):1841.
5. Nur Husna SM, Tan HTT, Md Shukri N, Mohd Ashari NS, Wong KK. Allergic rhinitis: a clinical and pathophysiological overview. Front Med (Lausanne). 2022;9:1-10
6. Zhang X, Zhang M, Sui H, Li C, Huang Z, Liu B, et al. Prevalence and risk factors of allergic rhinitis among Chinese adults: a nationwide representative cross-sectional study. WAOjournal. 2023;16(3):100744.
7. Irfandy D, Ramadhan MF, Ermayanti S. Gambaran riwayat asma pada pasien rinitis alergi di RSUP Dr. M. Djamil Padang. JIKESI. 2022;3(1):81–7.
8. Badan Penelitian dan Pengembangan Kesehatan Departemen Kesehatan Republik Indonesia. Laporan riskesdas 2007. Jakarta: Lembaga Penerbit Badan Penelitian dan Pengembangan Kesehatan; 2008. p. 118.
9. Teti Madiadipoera. Strategi Penatalaksaan Rinitis alergi untuk mengoptimalkan kualitas hidup pasien. MEDICINUS. 2021;34(2):3–10.
10. Hashmi MF, Tariq M, Cataletto ME. Asthma [Internet]. StatPearls. 2023 [cited 2023 Nov 24]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK430901/
11. Badan Penelitian dan Pengembangan Kesehatan Departemen Kesehatan Republik Indonesia. Laporan riskesdas 2018. Jakarta: Lembaga Penerbit Badan Penelitian dan Pengembangan Kesehatan; 2019. p. 114.
12. Kolb L, Ferrer-Bruker SJ. Atopic dermatitis. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. [updated 2023 Aug 8; cited 2023 Nov 24]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK448071/
13. Chovatiya R. Atopic dermatitis (eczema). JAMA. 2023;329(3):268.
14. Tubalawony SL, Tuasela D, Siahaya G. Factors associated with the incidence of atopic dermatitis in school-age children in the working area of the Waai health center in 2022. JIIKI. 2022;12(02):59–67.
15. Aggarwal P, Senthilkumaran S. Dust mite allergy. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. [updated 2023 Aug 8; cited 2023 Nov 24]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK560718/
16. Yolazenia Y, Harianto H, Riady IT. Gambaran kepadatan tungau debu rumah sebagai pencetus rinitis alergi pada anak panti asuhan Pekanbaru. JIK. 2019;13(1):23.
17. Nova DF, Rusjdi SR, Fitri F. Perbedaan paparan tungau debu rumah dengan status rhinitis alergi berdasarkan kriteria ISAAC pada anak di dua panti asuhan Kecamatan Koto Tangah. JKA. 2018;7(2):253.
18. Dharmage SC, Perret JL, Custovic A. Epidemiology of asthma in children and adults. Front Pediatr. 2019;7.
19. Pangadongan SENY, Rahyu A, Pasulu S. Hubungan tungau debu rumah, paparan asap rokok dan riwayat penyakit keluarga terhadap kejadian asma bronkial pada anak usia 5 – 10 tahun di wilayah kerja puskesmas Lempake Kota Samarinda. KUJKM. 2017;3(1):1–4.
20. Armunanto SIS, Dewi DP, Pramono D, Anam MS. Correlation between house dust mite density with healthy house criteria and asthma status in pediatric patients : study among asthma pediatric patient in Semarang. JKD 2021;10(5):357–62.
21. Nugroho WT, Ervianti E, Zulkarnain I, Hidayati AN, Damayanti, Utomo B, et al. Characteristics of atopic dermatitis patients who underwent skin prick test. BIKKK. 2022;34(1):10–4.
22. Emran H, Chieng CSE, Taib S, Cunningham AC. House dust mite sensitisation and association with atopic dermatitis in Brunei. Clin Transl Allergy. 2019;9(1):65.
23. Subahar R, Widiastuti, Aulung A. Prevalensi dan faktor risiko tungau debu rumah di Pamulang (Tangerang) dan Pasar Rebo (Jakarta). J. Prof. Medika. 2016;10(1):4–13.
24. Ikbal I, Sorisi A, Pijoh V. Gambaran faktor lingkungan yang berperan pada rumah yang ditemukan tungau debu di Kota Manado. eBiomedik. 2015;3(2):558–61.
25. Sun Y, Cui L, Hou J, Luo S, Norbäck D, Sundell J. Role of ventilation and cleaning for controlling house dust mite allergen infestation: A study on associations of house dust mite allergen concentrations with home environment and life styles in Tianjin area, China. Indoor Air. 2022 Aug 21;32(8).

26. Gutowska-Ślesik J, Samoliński B, Krzych-Fałta E. The increase in allergic conditions based on a review of literature. Postepy Dermatol Alergol. 2023;40(1):1–7.
27. Bousquet J, Anto JM, Bachert C, Baiardini I, Bosnic-Anticevich S, Walter Canonica G, et al. Allergic rhinitis. Nat Rev Dis Primers. 2020 Dec 3;6(1):95.
28. Lourenço O, Bosnic-Anticevich S, Costa E, Fonseca JA, Menditto E, Cvetkovski B, et al. Managing allergic rhinitis in the pharmacy: an ARIA guide for implementation in practice. Pharmacy. 2020 May 16;8(2):85.
29. Kholid Y. Prevalensi dan faktor risiko kejadian rinitis alergi pada usia 13-14 tahun di ciputat timur dengan menggunakan kuesioner international study of asthma and allergy in childhood (ISAAC) tahun 2013. [Skripsi]. Universitas Islam Negeri Syarif Hidayatullah; 2013.
30. Akhouri S, House SA. Allergic rhinitis. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. [updated 2023 Jul 16; cited 2023 Nov 27] Available from: https://www.ncbi.nlm.nih.gov/books/NBK538186/
31. Waruwu IKP, Pangestu II, Meutia S, Sangging PRA, Himayani R. rhinitis alergi: etiologi, patofisiologi, diagnosis dan tatalaksana. Medula. 2023;13(4.1):21–6.
32. Sharma K, Akre S, Chakole S, Wanjari MB. Allergic rhinitis and treatment modalities: a review of literature. Cureus. 2022;14(8):e28501.
33. Cheah SC, Hamizan AKW, Zahedi FD, Baki MM, Husain S. The modification, translation, and validation of the Malaysian version of Score for Allergic Rhinitis (SFAR) questionnaire. EJO. 2023;39(1):52.
34. Widuri A, Fakhriani R. Validity and reliability of the indonesian modification of score for allergic rhinitis. Berkala Kedokteran. 2021;17(1):1–6.
35. Firmansyah A, Nurwahidah S, Hamdani D, Fitriani A, Gunawan A. The effectiveness of coughing effectively for removing secretions in clients of bronchial asthma : case study. HNJ. 2023;5(1):546–50.
36. Asthma [Internet]. World Health Organization (WHO). 2023 [cited 2023 Nov 27]. Available from: https://www.who.int/news-room/fact-sheets/detail/asthma
37. Kuruvilla ME, Vanijcharoenkarn K, Shih JA, Lee FEH. Epidemiology and risk factors for asthma. Respir Med. 2019;149:16–22.
38. Sinyor B, Perez LC. Asthma [Internet]. StatPearls. 2023 [cited 2023 Nov 27]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK551579/
39. Abu Khweek A, Kim E, Joldrichsen MR, Amer AO, Boyaka PN. insights into mucosal innate immune responses in house dust mite-mediated allergic asthma. Front Immunol. 2020;11:1–14.
40. Saglani S, Menzie-Gow AN. Approaches to asthma diagnosis in children and adults. front pediatr. 2019;7.
41. Johnson J, Abraham T, Sandhu M, Jhaveri D, Hostoffer R, Sher T. Differential diagnosis of asthma. Allergy and Asthma. 2019:383–400.
42. Lukito JI. Tata laksana farmakologis asma. CDK-312. 2023;50(1):22–9.
43. van Dijk BCP, Svedsater H, Heddini A, Nelsen L, Balradj JS, Alleman C. Relationship between the Asthma Control Test (ACT) and other outcomes: a targeted literature review. BMC Pulm Med. 2020;20(1):79.
44. The Lancet. GBD cause and risk summaries [Internet]. 2020 [cited 2023 Nov 27]. Available from: https://www.thelancet.com/gbd/summaries
45. Lobefaro F, Gualdi G, Di Nuzzo S, Amerio P. Atopic dermatitis: clinical aspects and unmet needs. Biomedicines. 2022;10(11):2927.
46. Nutten S. Atopic dermatitis: global epidemiology and risk factors. Ann Nutr Metab. 2015;66(Suppl. 1):8–16.
47. Bumbacea R, Corcea S, Ali S, Dinica L, Fanfaret I, Boda D. Mite allergy and atopic dermatitis: Is there a clear link? (Review). Exp Ther Med. 2020;20(4): 3554–3560
48. Fleming P, Yang YB, Lynde C, O'Neill B, Lee KO. Diagnosis and management of atopic dermatitis for primary care providers. J Am Board Fam Med. 2020;33(4):626–35.
49. Frazier W, Bhardwaj N. Atopic dermatitis: diagnosis and treatment. Am Fam Physician. 2020;101(10):590–8.
50. Oliveira EF de, Penedo C, Valle SOR, Kuschnir FC. Validation and reproducibility of the international study of asthma and allergies in childhood (isaac) written atopic eczema questionnaire for telephone survey in children aged 6–7 years. An Bras Dermatol. 2022;97(2):173–8.
51. Bergmann KC. Biology of house dust mites and storage mites. Allergo Journal International. Springer Medizin; 2022; 31:272–8.
52. Sarwar M. House dust mites: ecology, biology, prevalence, epidemiology and elimination. In: Bastidas G, Kamboh. Asghar Ali, editors. Parasitology and microbiology research. 1st ed. IntechOpen; 2020. p. 1–26.

53. Vatandoost H. Biology of house dust mites as an allergens and methods for their control. J Clin Resp Med. 2022;6(105):105.
54. Asher MI, García-Marcos L, Pearce NE, Strachan DP. Trends in worldwide asthma prevalence. Eur Respir J. 2020 Dec;56(6):2002094.
55. Vichyanond P, Sunthornchart S, Singhirannusorn V, Ruangrat S, Kaewsomboon S, Visitsunthorn N. Prevalence of asthma, allergic rhinitis and eczema among university students in Bangkok. Respir Med. 2002;96(1):34–8.
56. Gustina RE, Anni P. Pemeriksaan Tungau Debu Rumah (TDR) pada debu kasur di Pondok Pesantren Attamadun Kota Batam. JURPIKAT. 2021;2(3):372–84.
57. Negara IC, Prabowo A. Penggunaan uji chi–square untuk mengetahui pengaruh tingkat pendidikan dan umur terhadap pengetahuan penasun mengenai HIV–AIDS di provinsi DKI Jakarta. In: Prosiding Seminar Nasional Matematika dan Terapannya 2018. 2018. p. 1–8.
58. Bormashenko E. What is temperature? modern outlook on the concept of temperature. Entropy. 2020 Dec 3;22(12):1366.
59. National Institute of Standards and Technology. SI Units – Temperature [Internet]. 2010 [updated 2024 Jan 16; cited 2024 Jan 21]. Available from: https://www.nist.gov/pml/owm/si-units-temperature
60. Guarnieri G, Olivieri B, Senna G, Vianello A. Relative humidity and its impact on the immune system and infections. Int J Mol Sci. 2023 May 29;24(11):9456.
61. Hakim LN. Urgensi revisi undang-undang tentang kesejahteraan lanjut usia. Aspirasi: Jurnal masalah-masalah Sosial. 2020;11(1):43–5.
62. Sa'adah L, Martadani L, Taqiyuddin A. Analisa perbedaan kinerja karyawan pada PT Surya Indah Food Multirasa Jombang. JIP. 2021;2(2):515–22.
63. Junita D, Mukmin A. Pengaruh tingkat pendidikan dan penempatan kerja terhadap kinerja pegawai pada DP3AP Kabupaten Bima. Jurnal Manajemen. 2022;12(1):131–43.
64. Mawarni NA. Profil pasien asma di puskesmas ciputat tangerang selatan periode juli 2014 – juni 2015. [Skripsi]. Universitas Islam Negeri Syarif Hidayatullah; 2015.
65. Pasaribu PS, Nurfarihah E, Handini M. Hasil penelitian prevalensi dan karakteristik rinitis alergi anak 13-14 tahun di pontianak pada maret 2016 berdasarkan kuesioner isaac dan aria-who 2008. CDK. 2017;44(5):333-6.
66. Wu AC, Dahlin A, Wang AL. The Role of Environmental Risk Factors on the Development of Childhood Allergic Rhinitis. Children. 2021 Aug 17;8(8):708.
67. De Martinis M, Sirufo MM, Suppa M, Di Silvestre D, Ginaldi L. Sex and Gender Aspects for Patient Stratification in Allergy Prevention and Treatment. Int J Mol Sci. 2020 Feb 24;21(4):1535.
68. Amini H, Amini M, Wright RO. Climate Change, Exposome Change, and Allergy. Immunol Allergy Clin North Am. 2024 Feb;44(1):1–13.
69. Reza Anindita, Salma Lailatul Amwia, Maulin Inggraini, Dede Dwi Nathalia. Density of House Dust Mites (HDM) Dermathopagoides sp. In Jatimulya Village South Tambun District Bekasi City. International Islamic Medical Journal. 2022 Jun 30;3(2):73–9.
70. Nurleni N, Novita N. Perbedaan Efektifitas Antara Minyak Kelapa dan Lidah Buaya Terhadap Penyakit Dermatitis Atopik pada Balita di Kecamatan Cikeusal. Malahayati Nursing Journal. 2023 Oct 1;5(10):3403–15.
71. Wibowo EB, Dermawan A, Sudiro M. Clinical Signs in Allergic Rhinitis Patients at Dr. Hasan Sadikin General Hospital Bandung 2017-2021. Althea Medical Journal. 2022 Sep 30;9(3):168–73.
72. Huang HJ, Sarzsinszky E, Vrtala S. House dust mite allergy: The importance of house dust mite allergens for diagnosis and immunotherapy. Mol Immunol. 2023 Jun;158:54–67.
73. d'Alessandro M, Bergantini L, Perrone A, Cameli P, Beltrami V, Alderighi L, et al. House Dust Mite Allergy and the Der p1 Conundrum: A Literature Review and Case Series. Allergies. 2021 Apr 15;1(2):108–14.
74. Anasis AM, Rozaliyani A, Wibowo H. Density of Dermatophagoides spp. and Its Relationship with House-dust Mite Specific Serum IgE in Persistent Asthma. Molecular and Cellular Biomedical Sciences. 2020 Jul 1;4(2):61.
75. Nurhutami AD, Suprihati, Marliyawati D, Dewi AMK. Faktor risiko rinitis alergi pada anak usia 13-14 tahun di semarang. Diponegoro Medical Journal. 2020;9(2):154-60
76. Akhyar G. Correlation between density of house dust mites and relapse rate of atopic dermatitis: a cross sectional study. Proceedings of the 23rd Regional Conference of Dermatology; 2018 Aug 8-11 . Surabaya, Indonesia: SCITEPRESS - Science and Technology Publications; 2021.

77. Wang J, Zhou Y, Zhang H, Hu L, Liu J, Wang L, et al. Pathogenesis of allergic diseases and implications for therapeutic interventions. Signal Transduct Target Ther. 2023 Mar 24;8(1):138.
78. Dey D, Mondal P, Moitra S, Saha GK, Podder S. Association of Interleukin 6 and Interleukin 8 genes polymorphisms with house dust mite-induced nasal-bronchial allergy in a sample of Indian patients. Egyptian Journal of Medical Human Genetics. 2022 Sep 3;23(1):136.
79. Falcon RMG, Caoili SEC. Immunologic, genetic, and ecological interplay of factors involved in allergic diseases. Frontiers in Allergy. 2023 Aug 3;4.
80. Muthanandam S, A IF, Santhadevy A, Suganya R, N V, G U. A review on stereomicroscope. International Dental Journal of Student's Research. 2024 Mar 28;12(1):13–7.