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The Association of Household Waste Management with the Risk of Scabies Incidence in Endemic Areas

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ABSTRACT

Introduction: Scabies is a contagious skin disease that remains a public health problem in endemic areas, especially in environments with poor sanitation and waste management. Ecosystem-based household waste management is believed to contribute to the prevention of environment-based diseases through improvements in sanitation and community behavior. This study aims to analyze the relationship between ecosystem-based household waste management and the risk of scabies in endemic areas, as well as to identify factors that play a significant role in its transmission.
Methods: The study used a cross-sectional design with 248 respondents from households in an area endemic for scabies, namely Rumak Village, West Lombok, Indonesia. Data were collected through structured interviews and field observations using a standardized questionnaire. Data analysis used the Chi-square test and logistic regression to determine the dominant factors associated with the incidence of scabies.
Results: A total of 39.1% of respondents reported having experienced scabies. Logistic regression analysis showed that the most influential factors affecting the incidence of scabies were poor local final waste management (p=0.001), followed by lack of waste sorting (p=0.004), presence of pets (p=0.004), and lack of organic composting (p=0.008). Other significant factors included poor personal hygiene (p=0.008) and low knowledge about scabies (p=0.023).
Conclusion: The results of the study confirm that ecosystem-based household waste management plays an important role in reducing the risk of scabies. Good environmental management practices, accompanied by hygienic behavior and increased public knowledge about scabies, are effective strategies for controlling this disease in endemic areas.

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INTRODUCTION

Household waste is one of the main factors contributing to environmental pollution and an increased risk of infectious diseases (1). Ineffective waste management can create an environment that supports the breeding of various disease vectors, including mites that cause scabies (2). Scabies is a contagious skin disease caused by infestation with the mite *Sarcoptes scabiei*, which can spread rapidly, especially in environments with poor sanitation and high population density (3).

In areas where scabies is endemic, the high incidence of this disease is often associated with poor environmental hygiene, including suboptimal waste management (4). Accumulated and poorly managed waste can become a breeding ground for pathogenic microorganisms and increase physical contact between individuals who are susceptible to infection (5). Therefore, an ecosystem-based approach to household waste management is important in reducing the risk of scabies transmission.

Scabies remains a public health problem influenced by the complexity of interactions between environmental factors, human behavior, and disease agents, as explained in the ecological health approach. Ecosystem-based waste management, including waste sorting, household composting, recycling, final disposal site management, and biological treatment, plays an important role in shaping microenvironmental conditions that can support or inhibit the survival and spread of infestation agents, either directly or through vectors and reservoirs (2). On the other hand, personal hygiene and the level of public knowledge about scabies determine individual prevention behaviors, particularly in reducing the intensity of contact that risks transmission (4). The presence of pets in the household environment also enriches the dynamics of the domestic ecosystem, which has the potential to become a source or intermediary of infestation (5). The interconnection of these factors indicates that the risk of scabies does not stand alone, but is the result of a systemic relationship between suboptimal environmental management and household hygiene behavior.

The ecosystemic approach to waste management emphasizes environmental balance by considering ecological, social, and health aspects (6). This model seeks to integrate waste reduction, sorting, and recycling strategies with efforts to improve environmental health. Thus, waste management focuses not only on final disposal, but also on preventing negative impacts on public health.

A study conducted by Widaty et al. (2022) shows that a clean environment and a good waste management system can reduce the risk of skin infections such as scabies and a properly sterilized environment can ensure the elimination of mites and prevent further transmission (7). However, there are still limitations in the implementation of ecosystem-based waste management models in areas endemic to scabies. Lack of public awareness and limited infrastructure are often major obstacles to the implementation of this model.

In Indonesia, many areas with high rates of scabies also face problems with household waste management (8). The results of a study conducted by Nurtafiana et al. (2024) show that areas with poor sanitation tend to have higher rates of scabies compared to areas with better environmental management systems (9). This indicates a close relationship between environmental hygiene and the prevalence of scabies.

In addition to environmental factors, community behavior in waste management also plays an important role in determining the success of an ecosystem-based management system. Communities that have a habit of littering tend to create an environment that supports the spread of scabies (10). Therefore, effective educational strategies are needed to raise public awareness about the health impacts of poor waste management.

The implementation of an ecosystem-based household waste management model can not only reduce the prevalence of scabies, but also has long-term benefits in improving environmental quality and community welfare (11). By adopting ecosystem principles, waste management can be carried out sustainably by considering environmental, social, and economic aspects.

In the context of this study, the ecosystem-based waste management model includes strategies for waste reduction, sorting, recycling, and raising public awareness about the importance of maintaining environmental cleanliness. This model aims to create a healthier environment and reduce the risk of spreading contagious skin diseases such as scabies. In addition, this model also promotes a participatory approach that directly involves the community. This collaboration is expected to increase the effectiveness of waste management programs and accelerate the decline in the incidence of scabies in endemic areas. The study aims to analyze the association between

the ecosystem-based household waste management model and the incidence of scabies and to evaluate the effectiveness of the ecosystem approach in controlling scabies.

METHODS

Study Design

The study used a cross-sectional design to analyze the relationship between ecosystem-based household waste management and the prevalence of scabies in endemic areas. This study was conducted at a specific time using an analytical observational approach. The study was conducted in an area endemic for scabies, in Rumak Village, West Lombok Regency, West Nusa Tenggara Province, Indonesia. The study period was from May to October 2025.

Participants and Sampling

The study population consisted of all 356 households in the scabies endemic area that had family members with or without a history of scabies in the past year. Inclusion criteria were households willing to be respondents and sign informed consent, and households that had lived in the area for at least 1 year. Exclusion criteria were households that could not be contacted during data collection and households with other risk factors that could interfere with the study results (e.g., other skin diseases unrelated to scabies). The research sample was taken using sample size proportion through the OpenEpi Version 3 calculator, at: https://www.openepi.com/SampleSize/SSPropor.htm, totalling 186 heads of households who met the inclusion and exclusion criteria. The sample size estimate was calculated with a 95% confidence level, 5% for Confidence limits as % of 100, and the percentage of frequency of the hypothesized outcome factor in the population (p) is 50%.

Variables

The examination of scabies cases refers to the clinical guidelines of the International Alliance for the Control of Scabies (IACS), to ensure consistency and validity in case determination. The examination was conducted by health workers who had received special training in the identification of scabies, thereby minimizing interobserver variability. A case of scabies (nominal scale) is defined as a person who shows typical clinical symptoms of scabies, such as intense itching, especially at night, the appearance of papules, pustules, or small tunnels (burrows) on the skin between the fingers, wrists, elbows, waist, or other areas of the body, and is confirmed through a physical examination by a health worker or trained medical personnel. A case of scabies is categorized as “Never” if the respondent or family member has never experienced symptoms or been diagnosed with scabies in the past 12 months, and no clinical signs are found during examination, and “Ever” if the respondent or family member has experienced symptoms or been diagnosed with scabies by a health worker in the past 12 months, or clinical signs of active scabies are found during examination.

The age (ratio scale) of respondents was measured based on their last age in full years, calculated from their date of birth to the time of the study. Age was expressed in mean values and standard deviations to describe the characteristics of respondents in the study population. The gender (nominal scale) of respondents was identified based on their biological characteristics and categorized as male and female.

Waste sorting (nominal scale) is defined as the action taken by households to separate waste types based on organic, inorganic, and hazardous categories before disposal or further processing. It is categorized as “Yes” if waste is sorted regularly and “No” if waste is not sorted or all types of waste are mixed together. Home composting (nominal scale) is defined as the effort of households to process organic waste (food scraps, leaves, vegetables) into compost for plant fertilizer or other purposes. It is categorized as “Yes” if composting is done independently and “No” if composting is not done

Reuse (nominal scale) is defined as households reusing used items or packaging for other purposes without going through a recycling process, such as plastic bottles, buckets, or used containers. It is categorized as “Yes” if reuse is done regularly and “No” if reuse is not done. Local final disposal management (nominal scale) is defined as households disposing of waste in a safe and closed local final disposal site that does not pollute the environment around the home. It is categorized as “Yes” if waste is disposed of in an appropriate and safe location and “No” if waste is disposed of indiscriminately or in open areas.

Biological processing (nominal scale) is defined as household activities in processing organic waste using biological processes such as biogas, fermentation, or other environmentally friendly techniques. It is categorized as "Yes" if biological processing is carried out and "No" if biological processing is not carried out.

Personal hygiene (nominal scale) is defined as an individual's habits in maintaining personal cleanliness to prevent the transmission of scabies, including the habit of bathing every day, washing clothes and bed sheets regularly, and not sharing clothes with others. It is categorized as "Yes" if the respondent has good personal hygiene habits and "No" if they have poor personal hygiene habits. Knowledge about scabies is defined as the extent to which respondents know basic information related to scabies, which is measured by the score of correct answers to a series of questionnaire questions about scabies

Knowledge about scabies (ordinal scale) is defined as the respondent's level of understanding of the causes, transmission, symptoms, and prevention of scabies. It is measured by the score of correct answers to a series of questionnaire questions about scabies and categorized as "Good" if the respondent answers correctly ≥ 75% of the total questions and "Poor" if the respondent answers correctly < 75% of the total questions. The presence of pets (nominal scale) is defined as the presence of animals that live or are often around the house (such as dogs, cats, goats, chickens) that have the potential to be vectors for the spread of scabies mites. It was categorized as "None" if there were no pets around the house and "Yes" if there were pets that often interacted with the occupants of the house.

Data Collection

Data collection was conducted through self-reports and observations to assess the condition of household waste management using a validated checklist. Structured interviews were conducted using questionnaires to determine hygiene habits and waste management patterns. The research instrument was a questionnaire to determine environmental conditions, waste management, hygiene behavior, and history of scabies. According to Pallant (2020), instruments with a Cronbach's Alpha value above 70% are considered reliable and suitable for measuring research variables (12). The results of the questionnaire reliability test revealed that Cronbach's Alpha value was 0.807 or 81%.

Data Analysis

Data analysis was performed using Statistical Package for the Social Sciences (SPSS) version 26. Descriptive analysis was performed to display the frequency distribution of respondent characteristics and research variables. Bivariate analysis was performed using the chi-square test to examine the relationship between waste management models and the prevalence of scabies. Multivariate analysis was performed using logistic regression to examine the depth of the relationship between variables and control for confounding factors with a significance level of p-value <0.05 and Adjusted Odds Ratio (AOR) with 95% Confidence Interval.

Ethical Approval

The study has been approved by the Health Research Ethics Committee and Academic Integrity Committee of Universitas Bima International MFH with Number: 202/KEPK-IA/VI/2025. Before data collection was conducted, respondents were provided with written information regarding the purpose and objectives of the research, and the researchers requested consent by having them sign an informed consent form. The researchers guaranteed that the respondents' data would be kept confidential and used solely for research purposes.

RESULTS

Based on the results of descriptive analysis of 248 respondents, it was found that most respondents had never experienced scabies, namely 60.9%, while 39.1% reported having experienced scabies during the study period (Table 1). The study findings show that scabies is still quite prevalent in the study area, with nearly four out of ten respondents having been infected. Although the majority of respondents did not experience scabies, the incidence rate of 39.1% reflects that scabies transmission remains a significant public health problem, especially in areas with crowded environmental conditions, suboptimal personal hygiene, and household waste management that is not yet fully ecosystem-based.

Table 1. Frequency distribution of scabies cases among family members (n=248)

Incidence of Scabies	Frequency	Percent
Never	151	60.9
Ever	97	39.1

Based on the results of the analysis in Table 2, it shows that the average age of respondents in the group who had never experienced scabies was 30.42±2.264 years, and the statistical test results showed p=0.957, which means that there was no significant difference between age and the incidence of scabies. Thus, age is not a factor that influences the incidence of scabies in this study. This may be because scabies can affect individuals from various age groups without any noticeable difference in risk.

Most respondents who had never experienced scabies were male (66.2%), while respondents who had experienced scabies were predominantly female (67%). The results of the bivariate analysis explain that there is a significant association between gender and the incidence of scabies (p<0.001). The study findings indicate that women have a higher incidence of scabies than men, possibly due to differences in social activities and the intensity of physical contact within the household, which occur more frequently among women (Table 2).

The results showed that respondents who sorted waste had a lower incidence of scabies (35.1%) compared to those who did not sort waste (64.9%). There was a significant association between waste sorting and the incidence of scabies (p<0.001). This indicates that waste sorting is an important part of good environmental management, as it can reduce the accumulation of waste and mites that cause scabies around the home (Table 2).

A total of 26.8% of respondents who practiced organic composting had scabies, which was much lower than the 71 respondents (73.2%) who did not practice composting. The p-value was <0.001, indicating a significant association between organic composting and the incidence of scabies. Composting practices help reduce organic waste in the home environment and improve the micro-ecosystem conditions around the residence, thereby lowering the risk of mite and pathogen spread (Table 2).

Table 2. Results of bivariate analysis of the association between ecosystem-based waste management and reduced risk of scabies (n=248)

Variables	Incidence of Scabies		Total	χ^2	p-value
	Never n (%)	Ever n (%)			
Age (Mean±SD)	30.42±2.264				0.957*
Gender					
Male	100 (66.2)	32 (33)	132 (53.2)	26.204	<0.001**
Female	51 (33.8)	65 (67)	116 (46.8)		
Waste sorting					
Yes	122 (80.8)	34 (35.1)	156 (62.9)	52.959	<0.001**
No	29 (19.2)	63 (64.9)	92 (37.1)		
Home composting					
Yes	95 (62.9)	26 (26.8)	121 (48.8)	30.822	<0.001**
No	56 (37.1)	71 (73.2)	127 (51.2)		
Reuse					
Yes	108 (71.5)	33 (34)	141 (56.9)	33.863	<0.001**
No	43 (28.5)	64 (66)	107 (43.1)		
Waste disposal site management					
Yes	122 (80.8)	33 (34)	155 (62.5)	55.131	<0.001**
No	29 (19.2)	64 (66)	93 (37.5)		
Biological treatment					
Yes	118 (78.1)	30 (30.9)	148 (59.7)	54.721	<0.001**
No	33 (21.9)	67 (69.1)	100 (40.3)		

Personal hygiene					
Yes	113 (74.8)	35 (36.1)	148 (59.7)	36.858	<0.001**
No	38 (25.2)	62 (63.9)	100 (40.3)		
Knowledge about scabies					
Good	114 (75.5)	39 (40.2)	153 (61.7)	31.124	<0.001**
Poor	37 (24.5)	58 (59.8)	95 (38.3)		
Presence of pets					
None	111 (73.5)	29 (29.9)	140 (56.5)	45.696	<0.001**
Yes	40 (26.5)	68 (70.1)	108 (43.5)		

*Spearman's rho
**Pearson Chi-Square

Respondents who reuse used items have a lower proportion of scabies (34%) compared to those who do not (66%). These results indicate a significant association between reuse behavior and the incidence of scabies ($p<0.001$). This indicates that households that are aware of the principle of reuse tend to have better waste management and hygiene practices, resulting in a cleaner and healthier home environment (Table 2).

Respondents who disposed of waste in proper waste disposal sites had a lower incidence of scabies (34%) compared to those who disposed of waste indiscriminately (66%), with $p<0.001$. These results indicate that proper waste disposal site management is an important factor in reducing the risk of scabies transmission because it can prevent environmental contamination and the breeding of mites or other disease vectors (Table 2).

A total of 30.9% of respondents who practiced biological waste treatment experienced scabies, while in the group that did not practice biological treatment, the proportion increased to 69.1%. There was a significant association between biological treatment and the incidence of scabies ($p<0.001$). This shows that the application of biological treatment such as biogas, fermentation, or vermicomposting contributes to the cleanliness and stability of the household ecosystem, which has an impact on reducing cases of scabies (Table 2).

The results of the study show that respondents with good personal hygiene had a lower incidence of scabies (36.1%) compared to respondents with poor personal hygiene (63.9%). There was a significant association between personal hygiene and the incidence of scabies ($p<0.001$). The study findings confirm that personal hygiene is a major protective factor against scabies infection, as the mites that cause scabies are easily transmitted through skin-to-skin contact or the shared use of personal items (Table 2).

Respondents with good knowledge about scabies had a lower incidence rate (40.2%) compared to those with poor knowledge (59.8%). This indicates a significant association between knowledge level and scabies incidence ($p<0.001$). The better a person's knowledge of the causes and modes of transmission of scabies, the more likely they are to take appropriate preventive measures such as maintaining personal and environmental hygiene (Table 2).

Respondents who did not have pets showed a lower incidence of scabies (29.9%) compared to those who had pets (70.1%). This indicates that the presence of pets is significantly associated with the incidence of scabies, as animals such as cats and dogs can be reservoirs or vectors for Sarcoptes scabiei mites ($p<0.001$), especially if the hygiene of the animals and their environment is not maintained (Table 2).

Overall, the results of the study show that almost all variables related to ecosystem-based household waste management, personal hygiene behavior, knowledge about scabies, and the presence of pets have a significant association with the incidence of scabies. The study findings reinforce the hypothesis that the implementation of good, ecosystem-based waste management, accompanied by improved hygiene behaviors and community knowledge, can reduce the risk of scabies transmission in endemic areas (Table 2).

Table 3. Results of logistic regression analysis of the association between ecosystem-based waste management and reduced risk of scabies (n=248)

Variables	AOR	95% CI	p-value
Gender	1.336	0.614–2.907	0.465
Waste sorting (ref: No) Yes	3.100	1.439–6.679	0.004
Home composting (ref: No)	2.820	1.310–6.070	0.008

Yes			
Reuse (ref: No) Yes	2.444	1.119–5.339	0.025
Waste disposal site management (ref: No) Yes	3.788	1.751–8.197	0.001
Biological treatment (ref: No) Yes	2.955	1.314–6.644	0.009
Personal hygiene (ref: No) Yes	2.744	1.295–5.813	0.008
Knowledge about scabies (ref: Poor) Good	2.493	1.133–5.488	0.023
Presence of pets (ref: Yes) None	3.034	1.419–6.487	0.004
AOR: Adjusted Odds Ratio; 95% CI: 95% Confidence Interval			

Based on the results of the analysis in Table 3, the AOR value of 1.336 (95% CI: 0.614–2.907; p=0.465) shows that gender is not significantly associated with the incidence of scabies. This means that, after controlling for other variables, men and women have a relatively equal risk of developing scabies. This indicates that gender is not a major determinant in the transmission of scabies in the community studied.

The results of logistic regression analysis show that respondents who do not separate waste have a 3.1 times higher risk of contracting scabies compared to those who separate waste (AOR=3.100; 95% CI: 1.439–6.679; p=0.004). The study results show a statistically significant association, confirming that waste sorting is an important component of household environmental management that can reduce the risk of scabies. Unsorted waste can become a breeding ground for mites and disease vectors that increase the risk of transmission (Table 3).

Respondents who did not practice organic composting had a 2.82 times greater risk of developing scabies compared to those who practiced organic composting (AOR=2.820; 95% CI: 1.310–6.070; p=0.008). The results of the study are statistically significant, showing that organic composting acts as a protective factor because it helps reduce the volume of organic waste that can be a source of moisture and a habitat for scabies mites (Table 3).

Respondents who did not reuse waste had a 2.44 times greater risk of developing scabies compared to respondents who did reuse waste (AOR=2.444; 95% CI: 1.119–5.339; p=0.025). The study shows a significant association between reuse behavior and the incidence of scabies. Households that have a habit of reusing used items generally have better waste management and environmental hygiene practices, thereby contributing to a reduction in the risk of contagious skin diseases such as scabies (Table 3).

Respondents who did not manage their waste disposal properly had a 3.79 times higher risk of developing scabies compared to respondents who managed their waste disposal well (AOR=3.788; 95% CI: 1.751–8.197; p=0.001). The results of the study were one of the most influential factors in the model. These findings confirm that household waste disposal systems that do not meet ecosystemic standards can significantly increase the risk of scabies, possibly due to increased humidity, environmental contamination, and the proliferation of vectors or mites around the home (Table 3).

Respondents who did not practice biological waste treatment had a 2.96 times greater risk of developing scabies compared to those who practiced biological waste treatment (AOR=2.955; 95% CI: 1.314–6.644; p=0.009). The results of the study are significant and reinforce that the implementation of biological waste treatment, such as biogas or natural compost, has a protective effect on skin health and household environmental hygiene (Table 3).

Respondents with poor personal hygiene had a 2.74 times greater risk of developing scabies compared to respondents with good personal hygiene (AOR=2.744; 95% CI: 1.295–5.813; p=0.008). The study findings are significant and consistent with the literature that personal hygiene is a dominant factor in the prevention of scabies, given that transmission of this disease generally occurs through direct skin-to-skin contact and the sharing of personal items (Table 3).

Respondents with poor knowledge about scabies had a 2.49 times higher risk of developing scabies compared to those with good knowledge (AOR=2.493; 95% CI: 1.133–5.488; p=0.023). The study results show that adequate

knowledge about the causes, modes of transmission, and prevention of scabies plays an important role in reducing the risk of the disease. Public health education is a key strategy in controlling scabies in endemic areas (Table 3).

Respondents who owned pets showed a 3.03 times greater risk of developing scabies compared to those who did not own pets (AOR=3.034; 95% CI: 1.419–6.487; p=0.004). The study results are significant and indicate that pets can be a potential reservoir for Sarcoptes scabiei mites, especially if they are not properly cared for. Cage hygiene and close interaction between humans and animals play a role in the transmission of this disease (Table 3).

In general, these results indicate that ecosystem-based household waste management has a strong influence on reducing the risk of scabies. Poor environmental management factors increase the risk of scabies by 2–4 times. In addition, hygienic behavior and good knowledge about scabies also play an important role as protective factors. The study's findings emphasize the importance of an integrated approach between environmental management and public health education in efforts to control contagious skin diseases such as scabies in endemic areas.

DISCUSSION

The results of the study show that factors significantly associated with the incidence of scabies include waste sorting, home composting, reuse, waste disposal site management, biological treatment, personal hygiene, knowledge about scabies, and the presence of pets. Meanwhile, the gender variable did not show a statistically significant association with the incidence of scabies. These results reflect the close association between ecosystem-based environmental management and household hygiene behaviors with the risk of scabies transmission in the community.

The incidence of scabies can be explained through a health ecology approach that emphasizes the dynamic interaction between environmental factors, human behavior, and disease agents. Ecosystem-based waste management, which includes sorting, household composting, recycling, landfill management, and biological treatment, plays a role in controlling microenvironmental conditions that can affect the survival and spread of infestation agents, both directly and through vectors and reservoirs. At the same time, personal hygiene and the level of knowledge about scabies shape individual prevention behaviors that determine the intensity of contact and opportunities for transmission. The presence of pets is also a contributing factor in the household ecosystem, potentially acting as a source or intermediary of infestation. Thus, the risk of scabies is the result of a systemic link between suboptimal environmental management and household hygiene behavior, so that scabies control requires an integrated approach that combines environmental interventions and behavioral change.

In this study, gender had no significant association with the incidence of scabies. This indicates that both men and women have an equal chance of being exposed to scabies, depending on hygiene practices and living conditions. The findings of this study are consistent with the research by Wu et al. (2019), which states that gender does not affect the incidence of scabies, as transmission of this disease is determined more by skin contact and personal hygiene than by biological differences between male and female individuals (13). Thus, behavioral and environmental factors play a more important role in determining the risk of scabies than demographic factors such as gender.

The results show that households that do not separate waste have a significantly higher incidence of scabies compared to households that do separate waste. Waste sorting is the first step in ecosystem-based waste management, which serves to prevent waste accumulation and maintain environmental cleanliness. The study results are supported by research conducted by Roswendi and Zakiyah (2022), which found that communities with good waste sorting practices have lower rates of infectious skin diseases (14). Waste sorting can reduce the potential for mites, flies, and pathogenic microorganisms to develop around the home, which indirectly lowers the risk of scabies (15). Thus, waste sorting not only functions in environmental management, but also serves as a preventive measure against environment-based diseases such as scabies.

The results of the study show that organic composting at home has a significant association with the incidence of scabies. Respondents who compost have a lower risk of developing scabies than those who do not compost. The findings of the study are in line with the research by Jetly et al. (2022), which reported that household composting contributes to a reduction in the amount of organic waste and improved environmental sanitation (16). A clean and dry environment will inhibit the reproduction of mites that cause scabies (*S. scabiei*). Ecologically, composting plays a role in creating a healthier and more sustainable balance in the microecosystem of the household.

The study found that reuse of used goods was significantly associated with a reduced risk of scabies. Households that applied the principle of reuse tended to have more environmentally conscious waste management

behaviors and better maintained household hygiene. A study by Rahman et al. (2024) supports these findings by showing that the implementation of the 3R concept (Reduce, Reuse, Recycle) at the household level significantly reduces the incidence of environmentally-based diseases, including contagious skin diseases (17). The principle of reuse encourages people to reduce the accumulation of solid waste that can become a breeding ground for mites or insects, thereby indirectly helping to control scabies in the community (18).

The results of the study indicate that poor local waste management is significantly associated with an increased risk of scabies. Respondents who dispose of waste improperly or do not have adequate waste disposal facilities have an almost four times higher risk of contracting scabies. This study is in line with the findings of Setiajaya et al. (2025), which state that poorly managed waste disposal can create damp and dirty environmental conditions that are ideal for the development of scabies mites (19). Proper waste management not only impacts environmental cleanliness, but also plays a role in maintaining the balance of micro-ecosystems around residential areas.

The results of the study show that biological waste treatment, such as biogas or organic fermentation, is significantly associated with the incidence of scabies. Households that practice biological treatment have a lower risk of this disease. This is in line with the study by Gustina and Yorita (2023), which explains that biological treatment is a form of environmentally friendly innovation that reduces waste volume and prevents the decomposition of organic waste, which becomes a breeding ground for pathogenic microorganisms (20). Thus, the application of biological treatment not only has ecological benefits, but also provides protective effects on public health through improved environmental sanitation.

Personal hygiene has a significant association with the incidence of scabies, with respondents with poor personal hygiene having an almost three times greater risk of infection. The study findings are consistent with many previous studies, including Melese et al. (2023), which reported that poor personal hygiene is a dominant factor in the transmission of scabies in densely populated environments (21). *S. scabiei* is generally transmitted through direct contact between individuals or the shared use of personal items (22). Therefore, personal hygiene practices such as regular bathing, washing clothes, changing bed sheets, and not sharing personal items are key preventive measures in the prevention of scabies (23).

This study shows that respondents with good knowledge about scabies have a lower risk of infection than those with poor knowledge. These findings are in line with the research by Ejigu et al. (2019), which found that increasing public knowledge through health education can reduce the prevalence of scabies by up to 40% (24). Good knowledge encourages hygienic behavior and environmental awareness, thereby reducing the chances of disease transmission. Therefore, community-based educational interventions and health promotion are important strategies in controlling scabies in endemic areas.

The presence of pets is closely associated with the incidence of scabies. Respondents who own pets such as cats or dogs have a higher risk of contracting scabies than those who do not own pets. The results of this study are consistent with the findings of Halid et al. (2024), who stated that pets can be a potential reservoir for Sarcoptes scabiei var. canis mites, which can be transmitted to humans through direct contact (25). Poor cage hygiene and animal care are major factors in the transmission of this zoonosis (26). Therefore, monitoring and hygiene of domestic animals are important aspects of household-based scabies control strategies.

Study Limitations and Recommendations for Future Research

The study has several limitations that need to be considered in interpreting the results. First, the cross-sectional study design does not allow researchers to determine a direct causal relationship between ecosystem-based waste management and the incidence of scabies. The data obtained describe conditions at a single point in time, so the possibility of temporal bias and changes in community behavior after data collection cannot be controlled. In addition, data on scabies incidence were obtained through self-reporting, which has the potential to cause information bias such as recall bias and social desirability bias. The measurement of environmental and hygiene variables also relied heavily on momentary observations and respondents' perceptions, which may not fully reflect actual daily conditions.

Further research should use longitudinal designs or community-based interventions to confirm causal relationships and assess the effectiveness of ecosystem-based waste management models in sustainably reducing the

incidence of scabies. In addition, research using direct clinical verification or microscopic examination is needed to confirm the diagnosis of scabies, thereby minimizing reporting errors. The development of a One Health-based approach is also recommended, incorporating components of pet condition analysis, microenvironmental factors, and community interaction patterns. Qualitative-quantitative combination studies can also provide an in-depth understanding of the dynamics of community behavior in waste management practices and personal hygiene as factors in the prevention of scabies in endemic areas.

CONCLUSION

The study results confirm that ecosystem-based household waste management and individual hygienic behavior play a major role in preventing scabies. These findings are consistent with the One Health approach, which emphasizes the interconnection between the environment, humans, and animals in maintaining public health. Improvements in ecosystemic behaviors such as waste sorting, composting, and biological waste processing need to be combined with education on personal hygiene and pet care to create a clean and scabies-free environment. Thus, this study not only strengthens the empirical evidence on the relationship between environmental factors and scabies cases, but also provides a scientific basis for the development of ecosystemic-based public health interventions in endemic areas.

AUTHOR CONTRIBUTION STATEMENT

IH, MN, and MH: Conception and designing of work, data acquisition and analysis, along with manuscript writing, and revision. IH and MH: Conception of work, data analysis, and data acquisition. All authors critically reviewed the manuscript and gave final approval of the manuscript.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

Using Grammarly for Punctuation and Grammar Correction in manuscript.

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