PERSONAL HYGIENE AND HEALTHY BEHAVIOR TOWARD SCABIES INCIDENCE IN JEMBER REGENCY: A CROSS-SECTIONAL STUDY

Khaidar Ali[1], Muhammad Addin Rizaldi[1], Khoiron[2], Isa Ma'rufi[2]

[1]Department of Public Health, Faculty of Health Sciences, Universitas Jenderal Soedirman, Indonesia
[2]Department of Environmental Health, Faculty of Public Health, The University of Jember, Indonesia

Email : 1. khaidar.ali@unsoed.ac.id
2. muhammad.rizaldi@unsoed.ac.id

ABSTRACT

Scabies is an endemic in both tropical and subtropical regions, in which this reemerging disease commonly found among vulnerable population such as the homeless, refugees, and immunocompromised individual. This study aims to analyze the association between personal hygiene and healthy behavior with scabies incidence among students (*santri*) in Khalafi and Salafiyah Islamic boarding schools in Jember Regency.

This quantitative research utilized a cross-sectional approach. The outcome variable was scabies incidence, while the exposure variables were personal hygiene and healthy behavior. The cluster random sampling was used, where the Islamic boarding schools were grouped into Khalafi (Modern) and Salafiyah (Conservative). The total respondents from the Khalafi dan Salafiyah was 89 and 62, respectively. The correlation between variables was assessed using the chi-square test, where the Prevalence Ratio (PR) was estimated. Path analysis was conducted in SmartPLS3.

The scabies prevalence in the Khalafi and Salafiyah is 41 cases (46.07%) and 16 cases (25%), respectively. In both types of Islamic boarding schools, personal hygiene and healthy behavior were significantly associated with scabies with p-value 0.000 ($p < 0.05$), with personal hygiene showing a strong association (Coefficient > 0.5). The PR estimation in Khalafi school is, personal hygiene (PR: 10.87) and healthy behavior (PR: 13.27) toward scabies incidence. Meanwhile, the PR estimation in Salafiyah is personal hygiene (PR: 42.64). The model found that the personal hygiene can influence the scabies incidence.

The scabies incidence was found high in Khalafi compared to Salafiyah, in which personal hygiene and healthy behavior were positively significant. Exposure variable is associated with a higher likelihood of scabies incidence. Therefore, Islamic boarding schools and the Jember Health Office organize educational and training programs on personal hygiene and healthy behaviors for students.

Keyword: Scabies, Personal hygiene, Healthy behavior, Islamic boarding school

Background

Scabies is a skin disease caused by the infestation and sensitization to *Sarcoptes scabiei var. hominis* (1). It is endemic in both tropical and subtropical regions (2), but this disease is often overlooked because it is not life-threatening, resulting in low prioritization for management (2). However, chronic and severe cases can lead to dangerous complications (3). Scabies is reemerging disease in developed countries, particularly vulnerable population such as the homeless, refugees, and immunocompromised individual (4).

Scabies causes discomfort due to highly pruritic lesions (3), leading to scratching that can result in secondary infections from *Streptococcus pyogenes* (GAS) and *Staphylococcus aureus* (5–8). Complications from secondary infestations of GAS and *S. aureus* are often observed in children in developing countries (5). Moreover, CDC in 2024 noted that anyone can be vulnerable to scabies, as it affects people of all genders, ages, ethnicities, and socioeconomic backgrounds (9). As a result, scabies requires attention to mitigate its harmful effects.

Scabies is recognized as a public health issue among population, with an estimated global prevalence of 300 million cases, often found in impoverished countries, where rates can exceed 50% (10,11). The World Health Organization (WHO) reports that scabies affects over 200 million people at any given time, with a 5-50% of children in resource-poor areas are affected (WHO, 2023). Urban et al (2020) reported that scabies affects approximately 455 million people worldwide, with high distribution in tropical and low-income region (12). High prevalence of scabies is typically found in environments with high population density and interpersonal contact, such as prisons, orphanages, and Islamic boarding schools (*pondok pesantren*) (13–16). Transmission occurs through direct skin-to-skin contact between individuals (17).

Islamic boarding schools (IBS), also known as pondok pesantren, are religious schools with a boarding system, where students are referred to as *santri*. The curriculum includes both general knowledge and religious

education, with an emphasis on Islamic teachings (18). The Indonesian Ministry of Health in Ratnasari et al. notes that Indonesia has the largest Muslim population globally, with 14,798 Islamic boarding schools was recorded exhibiting the potential of high prevalence rates of scabies (3). The incidence of scabies in IBS is notably prevalent, particularly in Indonesia. A study by Sugiarto & Song noted the prevalence of scabies among student in IBS is 22.5% (19). Scabies prevalence among student in IBS in many regency in Indonesia mainly Magelang, Lamongan, Demak, Medan, Padang is 43%, 64.2%, 45.5%, 36.8%, and 24.6%, respectively (20–24). The occurrence of scabies among student in Islamic boarding schools is considered elevated and requires attention.

Islamic boarding schools (ISB) are categorized into two main types: Khalafi and Salafiyah boarding schools, distinguished by their differing educational policy systems. Khalafi boarding schools implement a modern education model that integrates both religious and secular knowledge. They include modern subjects and employ innovative teaching methods, such as discussions and technology-based learning, to prepare students for contemporary societal challenges. This approach equips students with both religious knowledge and practical skills (25,26). On the other hand, Salafiyah boarding schools, also known as conservative Islamic Boarding Schools, emphasize the study of the Qur'an and Hadith, focusing on the practices of early Muslim generations. Their curriculum is heavily based on classical Islamic texts, which results in graduates having a deep mastery of religious scriptures but often lacking the ability to apply this knowledge to contemporary contexts (27,28).

According to data from the Ministry of Religious Affairs of Jember Regency, there were 557 Islamic boarding schools recorded in Jember in 2015 (29), with a total of approximately 208,280 students enrolled in these institutions (30). The highest incidence of scabies cases was reported in the Mayang District, with a total of 526 cases (30). The Ministry of Religious Affairs noted that there are 19 Islamic boarding

schools in Mayang District, which accommodate a total of 1,031 student (30). The significant number of Islamic boarding schools and their student population in Jember Regency suggests a potential for unrecorded high prevalence rates of scabies, highlighting the need for research to determine the actual prevalence of scabies among student in these institutions. This study aims to analyze the correlation between personal hygiene and healthy behavior concerning the incidence of scabies among student in Islamic boarding schools in Jember Regency, categorizing the schools into Khalafi and Salafiyah. In addition, the prevalence ratio is also measured. Thus, the research will provide insights into the incidence of scabies in both types of IBS and examine any differences in personal hygiene and healthy behavior between Khalafi and Salafiyah boarding schools.

Method

This analytical observational study was conducted using a cross-sectional approach, where data collection for the exposure and outcome variables was carried out at a single point in time (point time approach) (31). The study was conducted in Jember Regency, East Java. Data were collected from three Islamic boarding schools.

Population and Sample

The population in this study consists of all students who were present and actively participating in the Islamic boarding schools located in Mayang District, Jember Regency. The choice of this district for the study was based on the recorded number of scabies cases, which amounted to 526 cases (Dinkes, 2014). Based on preliminary studies, 17 boarding schools met the criteria of having student residing in dormitories provided by the caretakers or kyai. The number of Khalafi and Salafiyah boarding schools in Mayang District is 14 schools (with 1,226 students) and 3 schools (with 172 students), respectively.

The cluster random sampling was employed, categorizing the Islamic boarding schools into two groups: Khalafi and Salafiyah. The sample size was calculated using Slovin's formula. The total sample of respondents from the Khalafi and Salafiyah Islamic boarding schools is

89 respondents and 62 respondents, respectively.

Variables

Scabies cases served as the outcome variable in this study, where scabies was a skin disease caused by the infestation and sensitization to *Sarcoptes scabiei* var. hominis, affecting student. The exposure variables consisted of individual characteristics, personal hygiene, and healthy behaviors. The individual characteristics variable includes age, gender, and duration of stay in the boarding school.

The personal hygiene variable assessed the cleanliness of each student, measured through the following components:

1. Skin cleanliness (three questions: frequency of bathing, use of soap, and use of different soaps).
2. Bedding cleanliness (three questions: washing of bedding, cleaning of mattresses/carpets/floors/mats, and frequency of sunning pillows).
3. Clothing cleanliness (two questions: changing clothes and not wearing the same clothes as the previous day).
4. Cleanliness of teeth, nails, and hands (two questions: handwashing method and frequency of nail cutting).

The personal hygiene variable comprises 10 questions, with minimum and maximum scores of 0 and 10, respectively. This variable was then categorized into two groups: low (score: 0-5) and high (score: 6-10).

The other exposure variable was healthy behavior, which includes four questions addressing: a) not wearing or sharing clothes, b) not sharing towels, c) not sharing prayer mats, and d) not sleeping in close proximity. The healthy behavior variable has minimum and maximum scores of 0 and 4, respectively, and was categorized into two groups: low (score: 0-2) and high (score: 3-4). Both personal hygiene and healthy behavior variables were structured in a questionnaire, which underwent validity and reliability testing on 10 students using SPSS version 12.

Scabies Identification

Identification of scabies among student in Islamic boarding school was conducted by a trained health officer. The examination for scabies was performed in three stages:

1. Directly interviewing the student regarding the symptoms, they experienced.
2. Observing the presence of lesions on the skin or other visible characteristics of scabies symptoms.
3. Conducting the burrow ink test.

The Burrow ink test has been shown to have diagnostic validity to identify scabies (7,32). The burrow ink test was a method used to identify the burrows (papules) in the skin created by *Sarcoptes scabiei*, which were characteristic of the skin lesions associated with scabies. Rauwerdink & Balak noted that the burrow ink test was a straightforward and non-invasive diagnostic procedure that can be conducted rapidly (33). This technique entailed the application of a colored ink, such as a purple skin marker, onto lesions suspected of being caused by scabies.

Data collection

The data used in this study was primary data, obtained through the use of questionnaires and observation sheets. The outcome variable data, namely the identification of scabies cases, was recorded on observation sheets (skin lesions and burrow ink test results) and the scabies identification questionnaire (characteristic symptoms of scabies: itching at night and during sweating). Subsequently, the exposure variable data were collected using questionnaires on personal hygiene and healthy behavior, which had previously undergone validity and reliability testing. The collected data were inputted and stored in SPSS, where data analysis was then performed using this tool.

Analysis

The data analysis conducted in this study included univariate and bivariate analyses. Both univariate and bivariate analyses were conducted using SPSS version 12. The multivariate analyses using pathway analysis to discuss about the influence of scabies. The pathway analysis was conducted using a Smart PLS version 3. The T-Value > 1.96

can be interpreted that the variable X influencing variable Z, that the variable Z is a mediation variable to influence a variable Y.

The estimation of the Prevalence Ratio (PR) was obtained using the following formula:

$$PR = \frac{(prevalence\ in\ the\ exposed\ group)}{(prevalence\ in\ the\ unexposed\ group)}$$

RESULT

Scabies incidence in Islamic Boarding School

The cross-tabulation of individual characteristics, personal hygiene, and healthy behaviors with the incidence of scabies among student in Khalafi boarding schools is presented in Table 1. According to Table 1, the incidence of scabies among male student, those aged ≥13 years, with a duration of stay in the boarding school of less than 6 years, and exhibiting low levels of personal hygiene and healthy behavior, is recorded to have a higher incidence rate of scabies.

The Chi-Square test results indicate that personal hygiene and healthy behavior are significantly associated with the incidence of scabies (P < α (0.05); reject H0). Furthermore, personal hygiene demonstrates a strong association (Coefficient > 0.5). Based on Table 1, the incidence of scabies among student with a duration of stay of less than 6 years, and low levels of personal hygiene and healthy behavior, shows a higher incidence rate. The Chi-Square test results reveal that the variables of personal hygiene and healthy behavior are significantly associated with the incidence of scabies (p < α (0.05); reject H0), with personal hygiene exhibiting a strong association with the incidence of scabies (Coefficient > 0.5).

Table 1 The Association Between Personal Hygiene, and Healthy Behaviors with the Incidence of Scabies in Islamic Boarding Schools

Type	Variabel		Scabies				Total		Coefficient (p-value)
			Case	%	No Case	%	n	%	
Khalafi school	Sex	Male	33	76,7	10	23,3	43	100	-
		Female	8	17,4	38	82,6	46	100	
	Age	<13 YO	4	57,1	3	42,9	7	100	-
		≥13 YO	37	45,1	45	54,9	82	100	

	Student duration	< 6 years	41	46,1	48	53,9	89	100	Constant
		≥6 years	0	0	0	0	0	100	
	Personal Hygiene	Low	37	90,24	4	9,8	41	100	0.634
		High	4	8,3	44	91,7	48	100	(0.000)**
	Healthy Behavior	Low	40	59,7	27	40,3	67	100	0.431
		High	1	4,5	21	95,5	22	100	(0.000)**
Salafiyah school	Sex	Male	12	32,4	25	67,6	37	100	-
		Female	4	16	21	84	25	100	
	Age	<13 YO	4	80	1	20	5	100	-
		≥13 YO	12	21,1	45	78,9	57	100	
	Student duration	< 6 years	16	27,6	42	72,4	58	100	0.153 (0.223)
		≥6 years	0	0	4	100	4	100	
	Personal Hygiene	Low	15	93,8	1	6,3	16	100	0.675
		High	1	2,2	45	97,8	46	100	(0.000)**
	Healthy Behavior	Low	16	33,3	32	66,7	48	100	0.303
		High	0	0	14	100	14	100	(0.012)*

Coefficient: Coefficient Contingency
*p-value: <0.05
**p-value: <0.01
YO: Years Old

The estimation of prevalence ratio (PR) between outcome variable and exposure variable was recorded in Table 2. Based on Table 2, the estimation of PR in Khalafi school is as follow: personal hygiene: 10.87 and healthy behavior: 13.27 toward Scabies incidence. On the other hand, the estimation of PR in Salafiyah school is as follow personal hygiene: 42.64 toward Scabies incidence.

Table 2. The Estimation of Prevalence Ratio

Variables	**Type of Islamic Boarding School**	
	Khalafi	**Salafiyah**
Student duration	NA	NA
Personal hygiene	10.87	42.64
Healthy Behavior	13.27	NA

The analysis with pathway analysis can be seen in Figure 1. The analysis can be interrupted that characteristic can influence the personal hygiene and personal hygiene affect the event of scabies in Islamic boarding school. From the Figure 1 can see that T-value of characteristic with personal hygiene furthermore the T-Value of Personal Hygiene with scabies is > 1,96, it means the scabies can occurred if the personal hygiene of student in Islamic boarding school is inadequate.

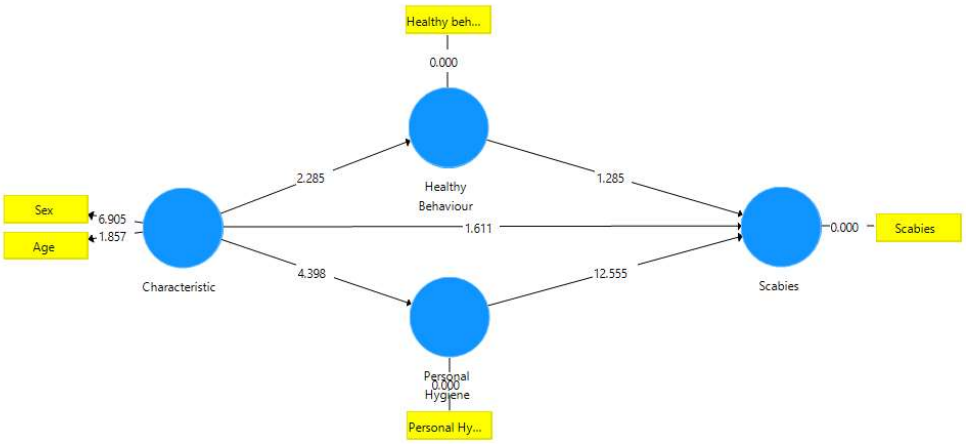

Figure 1. Model of Pathway analysis characteristic, healthy behaviour, and personal hygiene with scabies

The total effect of pathway analysis can be seen on Table 3. From Table 3 we can interpret that just the healthy behaviour does not influence the scabies on student in Islamic boarding school, furthermore characteristic and personal hygiene can influence of scabies in Islamic boarding school. Based on the analysis the P-value of characteristic with healthy behaviour and personal hygiene is <0.005, so it can be interpreted that the characteristic influences the healthy behaviour and personal hygiene.

Table 3. Path coefficient of pathway analysis

	Original sample (O)	T Statistics	P Values
Characteristic -> Healthy Behaviour	-0.190	2.316	**0.021**
Characteristic -> Personal Hygiene	-0.387	4.052	**0.000**
Characteristic -> Scabies	0.111	4.447	**0.000**
Healthy Behaviour -> Scabies	-0.064	1.325	**0.186**
Personal Hygiene -> Scabies	-0.790	12.478	**0.000**

DISCUSSION

Scabies is a skin disease caused by infestation and sensitization to *Sarcoptes scabiei* var. *hominis*. Scabies is caused by infection of the skin by the human itch mite (*Sarcoptes scabiei var. hominis*) (9,34). The most common symptoms reported for this disease are itching and skin rashes (9).

The incidence of scabies among student in Islamic boarding school in Jember Regency is 57, with the distribution of scabies cases in Khalafi and Salafiyah school being 41 students (46.07%) and 16 students

(25.81%), respectively. Afraniza et al. reported that 45.5% of students at Kyai Gading Demak suffered from scabies (21). A study conducted on student in East Jakarta found that the cases of scabies in that Islamic boarding school were distributed by gender, with male and female cases at 57.4% and 42.9%, respectively (3). Study in Ethiopia found that one out of ten school-age suffer scabies (35). Meanwhile, only 3.1% cases were observed among schoolchildren in Iran (36).

Based on this study, it is evident that the proportion of male student in both types of Islamic boarding schools had a higher incidence of scabies compared to female student. These findings are consistent with another research in Ratnasari et al. (3) and Akmal et al. (24). However, these results differ from those of Downs et al. from Ratnasari et al., (3) and Savin et al. (37), who found differing trends (3,37). Based on another research recorded the 60% of scabies occurrence was distributed among male student in Islamic boarding school (38). The findings align with the research from Ratnasari et al. (3), which explain that the prevalence of scabies is associated with the gender of the student (3).

Based on age of student can be seen that student under 13 years in both Khalafi school and Salafiyah school showed the highest percentages of scabies incidence, at 57.1% and 80%, respectively. Based on research from Akmal et al. (24) and Rohmawati et al. (39), which indicate that the highest prevalence of scabies occurs among student aged 13 years (24,39). Scabies incidence is also notably prevalent among younger student (10-14 years) due to developing immune systems and communal living condition (40).

The prevalence of scabies concerning the duration of stay reveals that student who have resided for less than 6 years have a high prevalence of scabies in both types of Islamic boarding school. This suggests that student who stay for less than 6 years have a higher risk of developing scabies. This finding is consistent with the study from Desmawati et al. (41), which reported that the majority of respondents living in Islamic boarding school for a short duration had the highest prevalence of scabies (41). The low incidence of scabies

among student who have resided for 6 years or more in both types of Islamic boarding school is linked to the higher personal hygiene levels among these students, particularly in Salafiyah school, where 100% maintain high personal hygiene. This indicates that student aged 6 years or older can maintain personal cleanliness, influencing the occurrence of scabies. However, statistical tests in both Khalafi and Salafiyah school reveal no relationship between the duration of stay and the incidence of scabies ($p > 0.05$).

Personal hygiene is defined as knowledge about individual health practices to maintain personal health, improve health status, and prevent disease. Another study noted that personal hygiene practices include skin cleanliness, foot and nail hygiene, hair hygiene, and overall body hygiene (1). Personal hygiene encompasses bathing frequency, soap and towel usage, dental hygiene practices, handwashing after activities, clothing cleanliness, and bedding hygiene (22). Study from Chinazzo et al. (42) found 6.4% scabies case is confirmed in nail involvement among children (42). Low socioeconomic status and personal hygiene were the vital risk factor for the occurrence of scabies (36). In Jambi - Indonesia, 66.5% students living with poor personal hygiene, in which it is significant to Scabies incidence in Islamic Boarding School (43).

Based on interview, some students reported bathing less than twice a day, sharing soap with other student, rarely washing bedding, and not drying their pillows or bolsters, which could increase scabies incidence. Additionally, not changing clothes regularly and improper handwashing practices contribute to the low levels of personal hygiene among student in both Islamic boarding schools, elevating their risk of contracting scabies. Chi-square tests revealed a significant relationship between personal hygiene levels and scabies incidence among student in both Khalafi and Salafiyah school ($p < 0.05$). These results are consistent with findings which indicate that personal hygiene is associated with scabies incidence (21,24,41,44). However, these findings differ from those of the research from Desmawati et al. (41) and Wijaya (45), who found

no relationship between personal hygiene and scabies incidence (41,45). The contingency coefficient for personal hygiene and scabies incidence indicates a strong relationship (Coefficient > 0.5). The determinant factors of scabies incidence among student are individual cleanliness and bedroom condition (ventilation and humidity) in Islamic Boarding School (19).

Healthy behavior is another factor influencing scabies incidence, as it pertains to the actions individuals take to prevent health issues. Healthy behavior is an outcome of the knowledge possessed by individuals. In this study, healthy behavior includes student' habits regarding the sharing of clothing, towels, prayer tools, and sleeping arrangements. Observations and interviews with student in both Islamic boarding schools revealed that most student bathe using shared towels, share prayer tools, and exchange clothing with peers. Additionally, some student reported bathing while wearing clothes and using water from a large basin, with many bathing together, who noted that student often bathe using previously used water (large basins) (46). Some even immerse themselves in shared bathing containers. These practices contribute to low healthy behavior scores among student in both Islamic boarding schools. Chi-square tests indicate a relationship between healthy behavior levels and scabies incidence among student in both Khalafi and Salafiyah school ($p < 0.05$). These results align with Ma'rufi et al. (22), who stated that healthy behavior is measured through three parameters: knowledge, attitudes, and actions regarding scabies (22). A study in Jember also noted that low sanitation in Islamic boarding school found high scabies prevalence (51). In Ethiopia, only 32% of scabies patient is seeking treatment, where the lack of formal education on scabies contributing to low-healthcare-seeking behavior (47).

All three parameters significantly influence the prevalence of scabies, indicating that healthy behaviors such as frequently sharing clothes or towels, sleeping together, and close sleeping arrangements increase scabies incidence. Other study found a relationship between knowledge, attitudes, and scabies incidence

among student in Islamic Boarding School (48). Study from Rohmawati (39) explained that sharing clothing or prayer tools, sharing towels, and sleeping closely are associated with scabies incidence at Ponpes Al-Muayyad Surakarta (39). Study in rural Ethiopia also found that sharing clothing is risk factor for the scabies transmission (49). Misganaw et al (35) noted that contact history, infrequent changing clothes, bedding sharing, and sleeping on the floor were risk factor for the occurrence of scabies.

Table 2 shows the estimated Prevalence Ratio (PR) for exposure variables affecting the outcome. The personal hygiene variable is also significantly related to scabies incidence, with student exhibiting poor personal hygiene having a 10.87 times greater risk of contracting scabies compared to those with good personal hygiene. Additionally, unhealthy behavior shows a significant relationship with scabies incidence, with student exhibiting unhealthy behaviors having a 13.27 times greater risk of contracting scabies compared to those with healthy behaviors. Poor personal hygiene increases the risk of contracting scabies by 42.64 times compared to those with good personal hygiene. Study by Sanei-Denkordi et al (36) recorded that use of shared articles were over 33,37 (CI: 10.82–102.90) times more likely to contract scabies compared to those with use of personal articles (36). Inadequate bathing habits and unclean bedding significantly contributed to scabies case (OR = 56.336) (50). Based on Path analysis, the model found that inadequate personal hygiene influences the incidence of scabies (T-Value >1.96), in which the total effect of pathway analysis noted that characteristics influence the healthy behavior and personal hygiene ($p<0.005$).

Limitation

Although the sample was measured using the sampling technique described in the methods, the authors assume that the sample size is still relatively small, indicating the need for further research with a larger sample size. Further research also needed to include demographic, environment, and population characteristics to provide robust result in the incidence of scabies.

RECOMMENDATION

The scabies incidence among student in Islamic boarding school of Jember found high, in which personal hygiene and healthy behavior significant statistically. Based on this finding, preventive measures should be address from stakeholder (Health Office of Jember and *Kyai*/Caregiver). The recommendations for Health Office of Jember are a) enhance promoting healthy behavior to student, such skin-, bedding-, clothing- cleanliness, and also the utilization of personal properties, b) activate Health Post Pesantren to conducting routine screening and first treatment, c) provide health education media (seminar and poster) and d) supply hygiene kits. On the other hand, the recommendations for *Kyai*/Caregiver are: a) ensure adequate hygiene facilities for student, b) conduct routine health inspection to student.

CONCLUSION

The incidence of scabies is notably high among student in Islamic boarding schools in Jember Regency, with case distributions in Khalafi and Salafiyah school is 46.07% and 25%, respectively. In both school types, the variables personal hygiene, and healthy behaviors were significantly associated with the incidence of scabies ($p < 0.05$). The PR estimation in Khalafi school is as follows personal hygiene (PR: 10.87) and healthy behavior (PR: 13.27) toward scabies incidence. Meanwhile, the PR estimation in Salafiyah schools is personal hygiene (PR: 42.64). $PR > 1$ indicating that poor personal hygiene and unhealthy behaviors are associated with a higher likelihood of scabies incidence among student in Islamic boarding schools. The model found that characteristics can influence personal hygiene which also influence the scabies among student. Therefore, Islamic boarding schools and the Jember Health Office should organize educational and training programs on personal hygiene and healthy behaviors for students.

CONFLICT OF INTEREST

There is no conflict of interest need to disclose

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