

# Community based Scabies Detection by Trained Non-medical Personnel

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**Abstract:** Scabies infection is one of the common infectious disease occurred in developing countries, including Indonesia. Late diagnosis of scabies leads to prolonged infection, decrease the quality of life, and learning disability in children. Scabies diagnosis is challenging since people awareness to the disease is low, and trained medical personnel and the supporting equipment for diagnosing scabies are not distributed equally. To encounter this problem, community empowerment in scabies active case detection was done at a boarding school located in Bogor, West Java where scabies prevalence is high. This is a pilot study to evaluate the performance of the active case detection by community empowerment in a small-scale population. Six supervisors (non-medical personnel) from the boarding school were trained by dermatovenereologist to identify scabies and asked to examine 128 participated students. Later, the students also clinically examined by dermatovenereologist as comparison and confirmation test. Hypothesis comparison was tested using chi square test. The result for diagnostic study showed a wide range of sensitivity and specificity, respectively from 56 % to 97 % and 0 % to 74 %. Positive predictive and negative predictive values from 67 % to 95 % and 0 % to 56 %. Five out of six non-medical personnel have sensitivity above 60 %, more than the basis estimation of a screening study. We conclude that trained non-medical personal has ability to perform community based scabies detection among high prevalence scabies population.

## 1 INTRODUCTION

Based from the latest World Health Organization (WHO) data, incidence rate of scabies reach 130 million population worldwide, with varying prevalence from 0,3 % to 46 % in low-to-middle income countries. In 2010, it is estimated that the direct effect of scabies infection on the skin cause 1.5 million people living with disabilities (WHO, 2018).<sup>1</sup> Scabies, which also called “the itch”, “pamaan itch”, and “seven years itch”, causing enormous itchy symptom that can last for years without proper medication. *Sarcoptes scabiei*, the parasite that causes scabies infection, can infected anyone at any time. Moreover, scabies is much more easily transmitted and endemic in densely populated community setting where low hygiene, close skin contact, and sharing personal equipment are commonly found, such as boarding school, daycare, orphanage, geriatric housing care, prisons, and refugee camp (Sungkar, 2015).

Clinical diagnosis of scabies could be made by finding two of four scabies cardinal signs. The first cardinal sign is nocturnal pruritus, or itching that occur especially at night caused by increasing activity of the parasite at high humidity and hot temperatures. The second cardinal sign is that scabies infection occurring on a group of people. The third cardinal sign is by finding tunnels-like lesions that is a pathognomonic sign of scabies parasite on predilection sites. And the last one is the present of parasite, either by direct examination with dermoscopy or microscopic examination, which is a major support of the diagnosis of scabies (Boediardjo and Handoko, 2015). But the problem with the last cardinal sign is much more difficult to prove and perform, since the parasite is not always present in the symptomatic patients. It is also become a problems when diagnosing scabies especially in rural area since medical professional personnel and diagnostic tools resources are limited.

An early detection of scabies become important since untreated scabies infection could lead to several

complications and decreasing of patient’s life quality. A new method to increase scabies detection rate in community is urgently needed to increase scabies early detection in community setting, thus could promote to scabies early treatment, terminate scabies transmission, and reduce morbidity caused by scabies infection. Previous study showed that community empowerment is able to make a sustainable and equitable change for surrounding environment associated with health improvement (Laverack, 2006). We conducted a study on community based empowerment of scabies detection by trained non-medical personnel (NMP) in small-scale society with a high prevalence of scabies infection. The main purpose of this study is to evaluate the performance of the scabies active case detection by trained NMP in community compared to detection made by dermatovenereologist in a small-scale population.

## 2 METHODS

This is a diagnostic study to evaluate the hypothesis of trained NMP’s ability in scabies active case detection and early detection of scabies infection by recognizing the clinical sign and symptoms of scabies. The study was performed in a boarding school located in Tajur, Citeureup, Bogor, West Java, where high-risk population of scabies infection resides in December 2017. Ethical approval was granted by Ethical Clearance Committee of Medical Faculty Universitas Indonesia. Counseling and training on scabies detection based on clinical sign and symptoms were provided by dermatovenereologist to the 16 supervisors in the boarding school using the guidance of scabies detection form called “DeSkab” (*deteksi skabies*) that has been established before by medical experts in dermatovenereology. After that we performed theoretically and practically test to define trained NMP included further in this study. Later, 3 female and 3 male supervisors who obtained the highest

score then called NMP A, B, C for female, and NMP D, E, F, for male supervisors, asked to examine 69 female students and 59 male students according to the same gender.

The students are selected by consecutive sampling by their attendance list. Each of the NMP have different examination place and student’s scabies detection form to each other, so they don’t have the possibilities to look on another examination result. One student must have going through all the NMP’s short history taking and few physical examinations that listed on the scabies detection form. The diagnosis of scabies infection by NMP based on “DeSkab” occur when 3 criteria were full filled, which are history of itchy present especially at night, history of the same itchy problem from the closest friend in dormitory or their family back then at home, and by finding lesion on predilection areas. Confirmation of the scabies infection made by a dermatovenereologist as the comparison. Diagnosis made by dermatovenereologist were blinded.

The results both from trained NMPs and dermatovenereologist collected and processed for further statistical calculation. Calculation of sensitivity, specificity, positive predictive (PPV), negative predictive values (NPV) were tested with bivariate analysis for diagnostic testing by chi square 2 x 2 table using STATA 15<sup>th</sup> version.

## 3 RESULTS

There were 6 trained NMP included in this study and 128 students were examined blindly both by trained NMP and dermatovenereologist. Trained NMP sociodemography characteristic described on Table 1.

Trained NMP consisted from the same ratio of 50 % female-male gender. The trained NMP came in variety of age group and educational background. The trained NMP mostly come from the 21-30 years old (66,7 %) and the most common educational background is bachelor degree (50 %).

Table 1: Sociodemography characteristic of trained non-medical personnel (n=6).

Variables	Categories	n	%
Sex	Female	3	50
	Male	3	50
Age	21-30 years old	4	66.7
	31-40 years old	2	33.3
Education	Senior high	2	33.3
	Diploma	1	16.7
	Bachelor	3	50

As we explained on the previous method section, 3 female trained NMP A to C were asked to examine 69 female students and 3 male trained NMP D to F were asked to examine 59 male students that include

in this study. NMP A to C performed complete examination to 55, 57, and 52 students, and NMP D to F examined 51, 44, and 42 students respectively.

Table 2. Comparison between the result from 6 trained NMP and dermatovenereologist.

	n	Result	Dermatovenereologist		%				P
			+	-	Sn	Sp	PPV	NPV	
NMP A	55	+	32	16	86	11	67	29	0.802
		-	5	2					
NMP B	57	+	22	6	56	67	79	41	0.105
		-	17	12					
NMP C	52	+	22	5	67	74	81	56	0.005
		-	11	14					
NMP D	51	+	40	2	83	33	95	11	0.000
		-	8	1					
NMP E	44	+	39	3	95	0	93	0	0.695
		-	2	0					
NMP F	42	+	38	2	97	33	95	50	0.016
		-	1	1					

The result showed that the highest sensitivity is 97 % and specificity is 74 %. Most of NMP have sensitivity rates higher than specificity rate which is more desirable in screening purpose, except on NMP B (56 % vs 67 %) and C (67 % vs 74 %). P value from NMP C statistically significant but not significantly meaningful in clinical judgment for screening purpose (67 % vs 74%, p value 0.005) because the sensitivity is lower than specificity but has p value < 0.05. In the other hand, NMP D and F showed meaningful clinical judgement for screening purpose and statistically significant (83 % vs 33 %, p value 0.000; 97 % vs 33 %, p value 0.016). All PPV have higher value then NPV (67 % to 95 % vs 0 % to 56 %) because this study performed in a high prevalence of scabies infection.

#### 4 DISCUSSIONS

This is a pilot study to test the ability of non-medical personnel to identify scabies infection, in the setting of screening test in limited resource area. There were no study about empowering NMP as an active scabies detection before. In 2005 there was a study by primary health care workers to identify several common skin diseases in Africa including scabies. They used the different methods to establish scabies diagnosis by finding 3 predilection sites involvement which showed sensitivity, specificity, PPV, and NPV of 79.7 %, 99.5 %, 96.4 %, and 97 % respectively (Mahe *et al.*, 2005). Those rates were achieved by

primary health care workers with medical educational background.

The result from female trained NMP showed sufficient sensitivity rates while on male trained NMP showed much better rates. For specificity, the results varied with a wide range within female-male trained NMP. It looks like the trained male NMP had better ability in scabies detection rather than female NMP. If we took closer on their educational background, all trained NMP actually came from equal educational background. Moreover, they already passed the test and obtained the highest score before they choose to examine the students. Here we conclude that educational background might have no correlation to their different result. So we tried to look on some risk factors that came from the students that were gender and hygiene personality. Both female and male have the same possibilities to scabies infection, but Hilmy and Ratnasari in different studies reported that the incidence of scabies infection in male students were higher (51.6% and 57.4%, respectively) at two different boarding school in East Jakarta (Hilmy, 2011; Ratnasari and Sungkar, 2014). This might be due to hygiene personality that female students tends to be much better than male students. Severity of scabies infection is closely related to personal hygiene. The risk for scabies infection in people with lack of personal hygiene is 6 times higher than people with good personal hygiene (Sungkar, 2015). During the examination, female trained NMP could be more difficult to identify scabies because the

lesion in female students were not as severe as in male students.

Diagnostic study commonly evaluated by their sensitivity and specificity. Estimation of the basic value of a screening study is that its sensitivity must be at least 50 % if there is no hypothesis before to show that the probability or chance for an instrument to detect a true-positive is in balance with at least 50 %.<sup>8</sup> On the other hand, minimum value of sensitivity if there is any hypothesis before will be expected to be higher at least 70 % (Choplin and Lundy, 2001; Arroll, Khin, and Kerse, 2003; Bujang and Adnan, 2016). In this study, five out of six trained NMP have sensitivity above 60 %, more than the basis estimation of a screening study.

PPV is the probability that a subject with abnormal or positive test actually has the disease, meanwhile NPV is the probability that the subject has no disease given a negative test result. PPV or NPV are the key characteristics of a screening program. It is important to remember that the PPV or NPV are dependent on both the population under study and the technical characteristics of the screening test (Goetzinger and Odibo, 2016). A screening test with relatively high sensitivity and specificity may still have a low PPV if the population prevalence is sufficiently low. Thus, to assess a proposed screening test it is necessary to evaluate both the technical and population characteristics (Maxim, Niebo, and Utell, 2014). All the result of this study showed higher PPV than NPV. With this high PPV, we could apply this screening method to other communities with a high probability of scabies prevalence, so it might be able to identify the possibility of true-positive scabies well.

There is difficulty in establish scabies diagnosis due to the lack of gold standard examination. Using the current reference standard (scraping or biopsy), there are problems associated with excluding case with negative skin scrapping results because this technique is far from being 100 % accurate. It also happened with dermoscopy, showed the limitation that is excluding false negative because there is no reference standard for ruling out or verifying the absence of scabies infection. A systematic review on scabies diagnostic methods showed that the diagnosis of scabies infection is often imprecise or speculative. None of the reviewed studies met the criteria for high quality evidence based on established methodology filters (Leung and Miller, 2011).

Comparison for the examination result from NMP using dermatovenereologist clinical and knowledge judgement as gold standard in line with a statement from Leung that clinical experience and judgement

come into priority in diagnosis of scabies and may even include a treatment trial in some cases (Leung and Miller, 2011). We conclude that sensitivity rate achieved by trained NMP in this study were higher than the basic estimation for diagnostic screening tools.

## 5 CONCLUSIONS

Active case scabies detection by trained NMP in this study showed a good sensitivity rate. It might be applied to high scabies prevalence population. The cases could be referred to the primary health care earlier for proper treatment, stop the transmission, and reduce the morbidity rates. We also recommend that NMP training on scabies detection must be implemented periodically to achieve a higher result.

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