INVOLVEMENT OF NON-MEDICAL PERSONNEL IN MANAGEMENT OF SCABIES AT A BOARDING SCHOOL IN INDONESIA

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Abstract. One of the most common neglected tropical skin diseases in Indonesia is scabies, commonly associated with overcrowding, poor hygiene and poor nutritional status. Boarding schools are at risk of harboring infected populations. As recurrence is common, non-medical personnel need to be involved in management of scabies. This study aimed to investigate how non-medical personnel, in this case, the boarding school teachers, could manage scabies in a boarding school in Indonesia. We trained the teachers using the education module for early scabies detection approach, namely DeSkab program, to be able to identify three major signs of scabies in the students. Impact of this approach was evaluated in 2017 and 2018 at a religious boarding school in Bogor, Indonesia involving 127 and 202 students, consecutively. An education module was given to 16 boarding school teachers expecting them to be able to examine students prior to school admission and before and after mid-semester break. Teachers' knowledge increased significantly after the training (p <0.001). This knowledge improvement is an important basis for teachers as non-medical personnel to implement independent scabies monitoring process during the educational year to find students with suspected scabies. Those suspected scabies students were directly referred to nearby public health clinic and treated with 5% permethrin and re-treated one week later. Prevalence of scabies decreased from 76% in 2017 to 49% in 2018 in 69 students who can be followed-up in two consecutive years (p-value = 0.014). In conclusion, involvement of non-medical personnel is an essential and effective strategy to improve management of scabies.

Keywords: boarding school, non-medical personnel, prevention, scabies, DeSkab

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INTRODUCTION

Scabies, a neglected tropical disease, is caused by Sarcoptes scabiei var hominis, a microscopic mite transmitted through direct prolonged skin-to-skin contact and infested fomite (Romani *et al*, 2015a). This infestation is often observed in a population with poor hygiene, overcrowded residence and low socioeconomic level (Golant and Levitt, 2012). The overall prevalence of scabies in Indonesia ranges from 32.1-64% (Romani *et al*, 2015a). Among Southeast Asian countries, high prevalence of scabies exists in certain populations, such as 87% of orphanage children in Thailand, 46% of children in guest houses in Malaysia and 51.6% of children in an Islamic boarding school in Indonesia (Sungkar *et al*, 2014). Similarity of these countries is that they are developing countries in a tropical region, with overcrowded communities (Hay *et al*, 2012).

Clinical manifestations of scabies are mites' burrows in skin, nocturnal pruritus, presence of mites under microscopic examination, and crowded community (Hay *et al*, 2012). In general, there are three variants of scabies' manifestations, namely classic (skin rash ranging from papules, nodules, vesicles, pustules, and excoriation on axillae, extensor of elbow, interdigital space, flexor area of wrist, periumbilical, periareolar, and genital area), crusted (hyperkeratotic skin with crusts (psoriasiform dermatitis), usually in a generalized manner or localized on face, scalp, sole, and nail; commonly present in immunocompromised subjects) and nodular (erythematous-brownish nodules on axillae, groin, buttocks, and genital area) (Golant and Levitt, 2012; Thompson *et al*, 2017). Pruritus induces itch-scratch cycle leading to devastating itchiness, reduced concentration ability, sleep discomfort, social stigmatization, and secondary bacterial infection (impetigo), latter leading to life-threatening conditions, such as rheumatic heart disease, glomerulonephritis and sepsis (Romani *et al*, 2015a).

In managing scabies in high-risk populations, various methods have been developed, such as mass drug treatment, education and dissemination of information on the disease (Romani *et al*, 2015b). Previous study in Bangladesh reported 5% permethrin cream treatment reduces incidence of scabies from 61 to 5% (Talukder *et al*, 2013). Similarly, a study in Fiji noted a 12-month permethrin, ivermectin or standard treatment significantly reduces prevalence of scabies 94, 62 and 49%, respectively (p-value <0.001) (Romani *et al*, 2015).

As this infestation is prone to recurrences and outbreaks, reliance on management of the infection should not fall upon only the physician but a multidisciplinary approach should be taken. For example, in a hospital setting, nurses, case manager and allied health representative or

in a community, when a mass drug campaign is launched, not only consent of patients but cooperation of close contacts and commitment of health personnel and community leaders to identify, report and treat adverse effects of the drugs, possible appearance drug resistance, and assistance in cost sharing of program and solving of logistical problems (Scheinfeld, 2004). In addition, prevention of scabies transmission and recurrence particularly in crowded communities, involvement of managers, supporting health personnel and community leaders is needed to carry out such measures as environmental disinfestation (Ong and Vasanwala, 2018).

In Indonesia, a program, named "DeSkab", for detection of scabies by non-medical personnel was introduced, consisting of training in identification of three major signs of infestation, namely, (1) presence of nocturnal pruritus and its location, (2) presence of papule/excoriation/crust and its location and (3) history of itching in surroundings, such as roommates or housemates or family. In addition, past medical history and current treatment are documented (Widaty *et al*, 2019). In preliminary studies, DeSkab program resulted in no significant difference between detection of scabies by non-medical personnel and clinical diagnosis by dermatologists, with sensitivity and specificity of 80.6% and 36.3% respectively, indicating its potential application as a screening tool in high risk population (Miranda *et al*, 2018; Widaty *et al*, 2019).

Given the substantial prevalence of scabies in Indonesia, the study reported the involvement of non-medical personnel in managing scabies at an Islamic boarding school in Bogor, described by (1) the improvement of teacher's knowledge of scabies detection and management in school settings and (2) the changes of scabies prevalence before and after the implementation. The findings should provide baseline data for development and deployment of the program for wider use among risk communities in the country.

MATERIALS AND METHODS

Study design and study site

This was a single group pre-post implementation study carried out from December 2017 to October 2018, involving teachers in an Islamic boarding school located in Bogor, Indonesia. The boarding school occupied an area of approximately 7,000 m2, housing of 300 residents. A sleeping room had an area of 25-30 m^2 for 15-20 children, which was considered to be overcrowded (Cant *et al*, 2019). The school sanitation system was inadequate, with clothes and linen being washed once a month and dirty clothes were stacked with clean clothes. The boarding school was selected purposively due to its conditions pose potential risk factors for scabies infestation and transmission.

Teachers and school management staff were recruited as non-medical personnel (NMP). In addition, all boarding children 11-15 years of age were recruited, except students who did not receive parent/legal guardian consent or were not present during the investigation period.

The study protocol was approved by the Health Research Ethics Committee, Faculty of Medicine, Universitas Indonesia (authorization no. 0920/UN2. F1/ETIK/2018). Prior written consent was obtained from parents or legal guardian of participating children and from all adult participants.

"Deskab" Scabies early detection program and Peduli ABC Skabies (Care to ABC Scabies) community development approach

"DeSkab" is a program for detection of scabies by non-medical personnel, consisting of training in identification of three major signs of infestation using Deskab checklist. As a continuity and a part of Deskab scabies detection program, the teacher was also trained to educate and involve other students and teacher within the schools in a community empowerment program entitled Peduli ABC scabies or Care to ABC scabies. Three steps of ABC scabies are Amati means Observe, Berantas means Combat, and Cegah means Prevent (Widaty *et al*, 2019).

First step of Amati or "Observe" requires skin examination by trained NMP before school admission, then before and after mid-semester break using DeSkab guidelines, which consist of examination for presence of nocturnal pruritus and/or presence of lesions suggestive of scabies and determination of history of itchiness (Widaty *et al*, 2019).

All screened and suspected scabies students then join the next step: Berantas or "Combat" that requires NMP to refer cases and close contact persons to Primary Healthcare Center (PHC or puskesmas) for medical examination and treatment. If a student is diagnosed with scabies by PHC doctors, the subject and closed contact students were treated with 5% permethrin cream (Galenium Pharmasia Co Ltd, Bogor, Indonesia) applied to the whole-body surface for 8-12 hours assisted by teachers who also monitored that the regimen was strictly adhered to.

The last step is Cegah or "Prevent" requires identification and prevention from of recurrence using health sanitation to clean all potential sources of scabies transmission, such as clothes and mattress. Following mass drug administration, NMP were tasked to perform environmental disinfestation (Ong and Vasanwala, 2018). Students were examined two weeks following mass drug administration and those presenting no signs of improvement were treated with permethrin cream once again. The dermatologists examined the students in December 2017 and October 2018. The whole management program is summarized in a flowchart depicted in Fig 1.

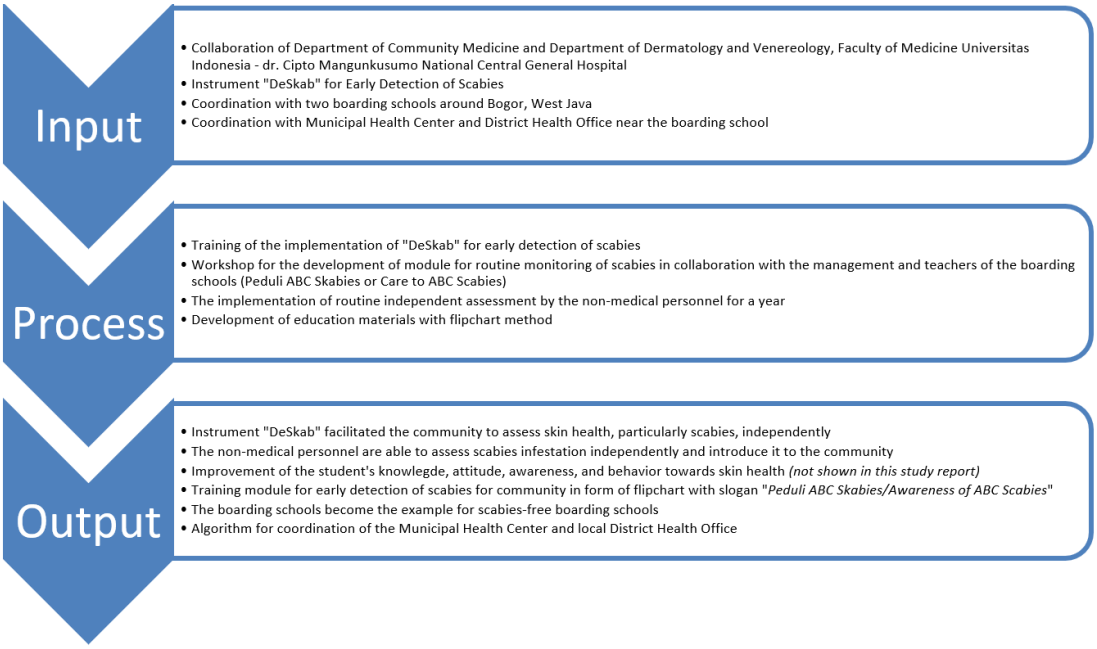

Fig 1 - Flowchart of scabies infestation management program for religious boarding schools, Bogor, Indonesia

Deskab training module for Non-Medical Personnel

An education module was developed to train NMP on identification of signs of scabies according to DeSkab guidelines, prior to first step of Amati or Observe in Peduli ABC Skabies approach. Dermatologists and community medicine experts developed a questionnaire to evaluate teachers' knowledge on scabies. Questions were formulated by an expert panel comprising dermatologists and parasitologists (content validation), followed by improvement in content and language by a board of community medicine specialists, and then pre-tested on a group of NMP for clarity and comprehension (face validation). The final version of questionnaire contained 17 questions and was presented to teachers prior to and following training on DeSkab guidelines, which was carried out on 14 October 2018. Each question has different maximum score based on number of correct answers selected as explained in Table 2. The score before and after training was compared and analyzed using paired t-test if data are normally distributed or otherwise using a Wilcoxon test.

Evaluation of prevalence before and after the program implementation

Scabies infestation prevalence rate was determined based on doctor's diagnosis after being referred by NMP. Proportions of scabies infestation in 2017 and 2018 were compared using McNemar test. A p-value <0.05 is accepted as significant. All data analyses were performed using a Statistical Package for the Social Sciences (SPSS) version 20 (IBM, Chicago, IL).

RESULTS

Children attending a religious boarding school in Bogor, Indonesia were recruited in 2017 (n =127) and 2018 (n = 202), a total of 54% boys and 45% girls, with 69 students present in both years as 58 students had graduated from the school in 2017. The mean of student's age was 14 years old and majority came from Sundanese ethnicity due to school's location (Table 1).

Sixteen teachers agreed to join Deskab Training program as NMP and showed an increase in knowledge regarding scabies and its detection. A significant improvement in total questionnaire scores was shown with pre-test score (mean ± SD) at 36±3 and after training at 46±2 (p-value <0.001). Questions related to scabies predilection area and symptoms, scabies treatment and scabies personal hygiene prevention were amongst those which had significant increase (Table 2). Questions related to scabies medication was not improved significantly.

After having training, teachers performed scabies screening before school admission, before and after mid-semester break to all students. With those program, prevalence of scabies among the 69 students dropped significantly from 76% in 2017 to 49% in 2018 (McNemar test, p = 0.014). Details of students characteristic and change of prevalence in 2017 (before program) and 2018 (after program implementation) are shown in Table 1.

DISCUSSION

Applying the Observe, Combat, Prevent Scabies program to students, parents and community, the prevalence of scabies among students was nearly halved over a period of a year. Sungkar *et al* (2014) reported scabies prevalence in boarding schools in Indonesia ranges 40.7-89.9% higher than national prevalence of 32.1-64.0%.

Management of scabies comprises of non-pharmacological and pharmacological methods, the former comprising education, dissemination of information, improvement in sanitation system, and focus group discussion (Golant and Levitt, 2012). Disinfection of fomites also form an integral part, performed by cleaning and vacuuming residential areas thoroughly, regular laundry, and placing objects that cannot be washed in a plastic bag for at least 72 hours (White *et al*, 2016). All residents of the boarding school - students, teachers, management and other staff - were involved in this aspect of the program. Screening for

scabies infestation is recommended to be carried out monthly (Golant and Levitt, 2012), and in the present study NMP performed this task three times during a semester of six months. High-risk individuals (those in direct contact with an infested individual) should also be treated (White *et al*, 2016).

In visits by the research team over the study period, noticeable changes were observed in NMP behavior: tidier and neater appearance and increase in attention paid to students' health, leading to a belief that the health management program introduced in the school was successful in improving NMP awareness and attitude towards not only scabies infestation but a healthier lifestyle. In a comprehensive review of public health management measures of various skin

Table 1

Characteristics of students and prevalence of scabies at a religious boarding school, Bogor, Indonesia in 2017 and 2018

Characteristic	Number (%)† (n = 69)
Age in years, mean (± SD)	14 (±1)
Gender	
Male	34 (49)
Female	35 (51)
Ethnicity	
Sundanese	51 (74)
Javanese	2 (3)
Other	16 (23)
Weight in kg, mean (± SD)	46 (±10)
Height in cm, median (minimum-maximum)	154 (124.0-157.5)
Prevalence of scabies	
Year 2017	53 (77)
Year 2018	34 (49)*

*p-value = 0.014; †unless specified

cm: centimeter; kg: kilogram; SD: standard deviation

Table 2

Knowledge of scabies pre- and post-training using "Deskab" guidelines on identification of scabies among 16 teachers at a religious school, Bogor, Indonesia

Item number	Knowledge item	Pre-training score Mean (SD)	Post-training score Mean (SD)
1	Skin area where scabies can be found (max = 8)	5 (1)	6.9 (0.3)*
2	How scabies mites multiply in the skin (max = 1)	0.5 (0.5)	0.9 (0.3)*
3	When itchiness due to scabies most occurs (max = 1)	0.9 (0.3)	1.0 (0)
4	Scabies ulceration predilection area (max = 5)	3.7 (0.8)	4.6 (0.6)*
5	Reason why scabies needs to be treated immediately (max = 3)	2.7 (0.6)	2.9 (0.3)
6	Correct form of scabies treatment (oral or topical, using antibiotic or traditional medicine) (max = 1)	0.0 (0.4)	0.3 (0.5)
7	How to apply scabies medication (whole body or only in area with lesion) (max = 1)	0.2 (0.8)	0.7 (0.7)*
8	When and how long scabies medication need to be administered (max = 1)	0.7 (0.7)	1.0 (0)*
9	After first, when does scabies medication need to be repeated (max = 1)	0.3 (0.6)	0.9 (0.3)*
10	How to perform group medication in boarding school (max = 1)	0.5 (0.7)	0.7 (0.5)
11	How scabies can be easily transmitted in boarding school (max = 3)	2.6 (0.6)	2.9 (0.3)*
12	Personal belongings as means of scabies transmission (max = 3)	2.9 (0.3)	2.9 (0.3)
13	How to prevent infected person in boarding school from transmitting scabies to other students (max = 1)	0.6 (0.5)	0.8 (0.4)
14	Whether scabies is foodborne or airborne disease (max = 1)	0.7 (0.5)	0.9 (0.3)*

Table 2 (cont)

Item number	Knowledge item	Pre-training score Mean (SD)	Post-training score Mean (SD)
15	Personal hygiene measures to prevent scabies transmission (max = 3)	2.4 (0.6)	2.8 (0.4)*
16	Sanitary ways to prevent scabies transmission (max = 3)	2.9 (0.5)	3 (0)
17	How to behave around a person with scabies (max = 2)	1.7 (0.5)	1.9 (0.3)*
	Total score	(36 ± 3)	(46 ± 2)*

max: maximum score in each question should the subject select all correct options

*p-value <0.05 using paired t-test

SD: standard deviation

infections eg impetigo, scabies and tinea, in a community, it was concluded that a comprehensive skin health intervention is an important factor in decreasing scabies prevalence, but the outcome is low-to-moderate (May *et al*, 2019). A randomized controlled trial will be necessary to establish the efficacy of this management strategy (May *et al*, 2019).

For pharmacological treatment, there are several drugs that can be used to treat scabies infestation, such as benzyl benzoate, crotamiton, ivermectin, lindane, malathion, and permethrin, among which permethrin has 90% efficacy with exceptional safety profile and is safe to use with newborns, children, and pregnant and breastfeeding mothers (Golant and Levitt, 2012). In a review comparing ivermectin and permethrin in managing scabies, there is no significant difference in efficacy between ivermectin and permethrin and no major adverse events (Rosumeck *et al*, 2018). A comparison among crotamiton, permethrin and sulfur in treating scabies showed permethrin is superior compared to other agents, causes more rapid improvement at the first two-week follow-up but is more expensive than other two agents (Mila-Kierzenkowska *et al*, 2017). As oral ivermectin is not available in Indonesia, 5% permethrin cream (Galenium Pharmasia Co Ltd, Bogor, Indonesia) was chosen for mass drug treatment in the present study.

An earlier systematic review comparing topical and systemic agents in managing scabies showed the most

effective agent was permethrin that also reduces persistent itch better than any other agent and results in adverse events (Strong and Johnstone, 2007). A more recent review noted no significant differences in efficacy among 5% permethrin cream, 10% crotamiton cream and systemic ivermectin (Dressler *et al*, 2016).

Training helped to improve NMP capability in recognizing signs and symptoms of scabies infestation (FitzGerald *et al*, 2014; Osti *et al*, 2019). In the present study, training was extended beyond scabies detection to cover pertinent knowledge on type and duration of effective scabies treatment and personal hygiene and sanitation to prevent scabies relapse. This knowledge significantly improves following training was considered a contributing factor in decreasing scabies prevalence within one year. Based on the knowledge improvement result, NMP were deemed capable of educating students, their family and community on scabies detection and control according to the "Peduli ABC Skabies" program.

In conclusion, the study demonstrates that involvement of non-medical personnel is an essential and effective strategy to improve management of scabies. Further studies with a larger cohort and randomized controlled procedures are necessary to establish the efficacy of this approach.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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