



## A Large Scabies Outbreak at a Prison in Southern Thailand, April-August 2017

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### Abstract

Scabies is a neglected contagious skin disease and mostly occurs in crowded environment. After an increase in scabies cases at a prison, an investigation team was deployed. The objectives were to describe the epidemiological characteristics of cases, identify risk factors for infection and implement control measures. We defined a scabies confirmed case as a person with at least one itchy skin lesion, and diagnosed as scabies by both a physician and a dermatologist. We inspected the prison environment and observed sanitation practices. A case-control study was conducted among male inmates to identify risk factors for scabies. The overall attack rate was 29.4% among inmates. All 251 confirmed cases were typical scabies and 250 were male. The environmental inspection revealed poor hygiene and overcrowded at men's zones. Sharing a bedroom (Adjusted odds ratio AOR = 9.72, 95% CI = 5.33-14.73) and sharing clothes with cases (AOR = 3.61, 95% CI = 1.66-7.84) were significantly associated with having scabies. After interventions of setting scabies surveillance, separation of new comers, universal treatment for all inmates, and disinfection of bedrooms, bedding and clothes with detergents, no more new cases were found. Improving sanitation especially in bedrooms, enhancing scabies detection, and early interventions after case detection could help prevent scabies outbreak in prisons.

**Keywords:** Scabies, outbreak, prison, Thailand, control measure

### Introduction

Human scabies is a common skin disease, caused by the infestation of mites (*Sarcoptes scabiei* var. *hominis*).<sup>1</sup> According to the World Health Organization, the global prevalence ranges between 0.2-71%.<sup>2,3</sup> Scabies is highly contagious and usually spreads by direct, skin-to-skin contact for around 20 minutes.<sup>4,5,6</sup> The scabies diagnosis is mainly made by clinical suspicion, possibly followed by identification of mites.<sup>7</sup> The known risk factors include extreme age, poverty and living in a crowded condition.<sup>2,8</sup>

There are two categories of scabies: typical and crusted. Typical scabies caused itchy rash between fingers by low number of scabies mite. Crusted scabies is triggered by large number of mites, it appears with widespread scale and crusted without significant itching, and results in high mortality if untreated.<sup>2,6,9,10</sup>

In Thailand, scabies outbreaks commonly occur in crowded institutions such as hospitals, nursing homes,

schools and prisons.<sup>6,11,12,13,14</sup> In 2017, there were approximately 2,500 scabies cases reported from all prisons monthly.<sup>15</sup> Even a protocol of control and prevent of scabies was announced to eradicate scabies from prisons in March 2017<sup>15</sup>, the scabies outbreak in prisons still occurred. Furthermore, risk factors of scabies infection among prisoners were not well identified so that most effective interventions can be implemented.

On 30 Aug 2017, the Department of Disease Control, Ministry of Health was notified of a scabies outbreak at a prison in the southern Thailand. Over 200 inmates were reported to have itchy rash within 10 days. An interdisciplinary team from the Department of Disease Control, the Office of Disease Prevention and Control 11, and the district hospital jointly conducted an investigation. The objectives of the investigation were to confirm the outbreak, describe the epidemiological characteristics of the cases, identify the risk factors for scabies infection and implement control measures.

## Methods

### Outbreak Setting

The prison is located in the southern part of Thailand and only accepts inmates aged over 18 years. The detention period of inmates has to be lower than 15 years. The inmates are detained or released every week. There are four zones in the prison, including zones A-C for male and D for female. As of 1 Sep 2017, 911 people were in the prison, including 56 prison officers and 855 inmates. Of all inmates, 685 were male and 170 were female, with a gender ratio of 4:1. In each zone, they spent 10 hours in the shared bedroom during the night, and during the day at dining area, workspace and bathroom. When inmates were sick, symptomatic treatments were provided at the first-aid unit of the prison. If the symptoms persisted or worsened, the ill inmates were sent to the district hospital for further evaluation and treatment.

### Case Finding and Outbreak Investigation

Active case finding was carried out in the prison. To identify the magnitude of scabies in the prison, all electronic medical records of the district hospital were reviewed from 1 Jan 2014 to 31 Aug 2017, based on the international classification of diseases (ICD) 10 diagnosis codes for scabies (B86) and dermatitis (L20, L21, L23, L25, L30). All inmates and prison officers were also screened for any skin lesions. People with specific diagnosis codes or skin lesions were examined by a primary care physician and a dermatologist.

We defined a suspected case as a person with at least one itchy skin lesion and clinically diagnosed by a physician as scabies. A confirmed case was a suspected case confirmed by a dermatologist, or skin scraping test positive for scabies mites. For environmental inspection, inmates and prison officers were interviewed about the personal hygiene regulations, disinfection activities and outbreak interventions. We also observed the setting of prison and calculated the average population density in every zone.

### Case-control Study

An unmatched case-control study was performed among male inmates to identify risk factors associated with scabies. Information of all male inmates such as demographic data, signs and symptoms, activities and risk behaviors (direct contact with a suspected person at any places, sharing bedroom/dining area/personal belongings with any suspected cases) were also collected by administering a questionnaire through face-to-face

interviews. We compared features of inmates with confirmed scabies (cases) and inmates with no itchiness or any skin lesions (controls) during 1 Apr - 1 Sep 2017. We planned to enroll 180 cases and 180 controls selected by random sampling in the case-control study.

Data were analyzed by Epi Info version 7.2.0.1. Univariate and multivariate analyses were conducted using logistic regression to identify factors associated with scabies using odds ratio (OR) with 95% confidence interval (CI). The factors with p-value less than 0.1 from univariate analysis were eligible to be included in the initial multivariate model. If two factors were highly correlated with absolute R more than 0.7, one with higher OR were chosen. Then, in the final model of multivariate analyses, the factors with p-value equal or more than 0.05 were excluded.

## Results

### Case Finding and Outbreak Investigation

There were no sporadic cases of scabies among inmates during 2014-2016 by reviewing the electronic medical records. However, 10 inmates were diagnosed as scabies in April 2017 with individual treatment. Overall, we identified 268 suspected cases; all of them were inmates. Among them, 251 were confirmed, including 250 (99.6%) male. The overall attack rate among inmates was 29.4%. The median age of confirmed cases was 29 years (range 19-58 years). There were no hospitalized or severe cases. Thirteen (5.2%) cases had underlying diseases such as diabetes mellitus and human immunodeficiency virus (HIV), including a psychosis patient with cellulitis as a complication. All cases were diagnosed as typical scabies.

All of the cases reported general itching (100%), along with a history of rash (93.2%) and night itching (84.1%). The most common skin manifestation was vesicle (62.2%) and mostly on the fingers. Of all male scabies cases, 88.0% had directly contacted other prisoners and 26.7% had shared personal belonging with others (Table 1). A total of 176 skin scraping samples from the suspected cases with visible or severe skin lesions were tested and scabies mite was not found.

The outbreak started in April 2017, with the peak in August 2017. After the investigation team recommended all prisoners to apply 25% benzyl benzoate simultaneously on 1 Sep 2017, no more cases were identified (Figure 1). The area with highest attack rate in men's zone was in floor 2 of zone A at 53% (133/251).

**Table 1. Characteristics of confirmed scabies cases in a prison, southern Thailand, 2017**

Characteristic	Case	Percent
Gender		
Male	250	99.6
Female	1	0.4
Age group (year)		
19-29	120	51.3
30-49	101	43.2
50-58	13	5.5
Zone		
A	203	83.9
B	38	15.7
C	0	0
D	1	0.4
Underlying disease		
Diabetes	2	0.8
HIV infection	2	0.8
Psychosis	1	0.4
Others (asthma, allergic rhinitis, gastritis)	8	3.2
Symptom		
Itching	251	100
History of rash	234	93.2
Night itching	211	84.1
Skin manifestation		
Vesicle	156	62.2
Rash	146	58.2
Excoriated	128	51.0
Tiny linear burrow	10	4.0
Lesion distribution		
Finger web	166	66.1
Buttock	111	44.2
Chest	106	42.2
Genitalia	98	39.0
Risk behavior		
Direct contact with others	221	88.0
Sharing personal belongings	67	26.7
Lifelong history of scabies	41	16.3

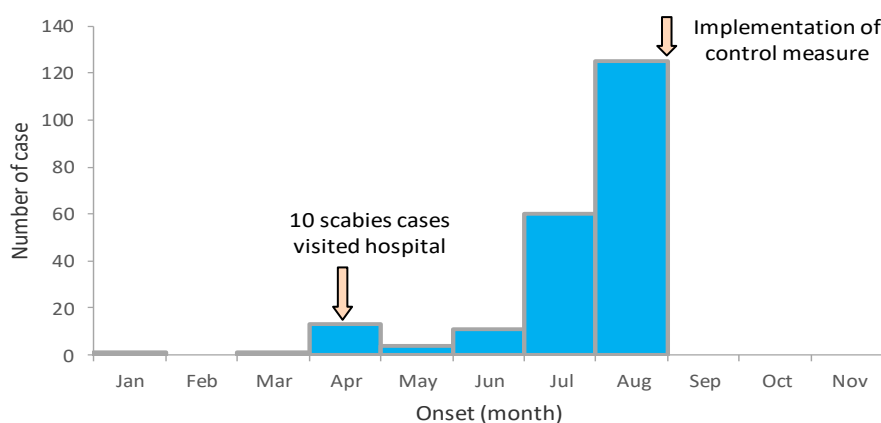
There was only one female case, who had been assigned to wash the male inmates' blankets in July 2017. Two weeks later, she developed itchiness and rash, and was diagnosed as scabies. She reported that she did not have any contact with male inmates.

In men's zone A, the average living area per inmate was 0.5 m<sup>2</sup> per person, with the lowest as 0.4 in the most crowded room. Each inmate was provided with three pieces of clothes (pillow, blanket and bedsheet). In men's zones, inmates in each room usually mixed all pieces of clothes together and these pieces were washed only once a month. The floor was never cleaned with disinfectants. However, in women's zone, clothes were washed every week and rooms were cleaned with disinfectants daily. Some inmates from different zones could potentially interact during activities. Occasionally, inmates were moved to other zones during the detention.

### Case-control Study

Of all male inmates, 159 cases and 186 controls were recruited in the case-control study. There were no statistical significant difference (p-value 0.05) for age and nationality between cases and controls. Compared with controls, cases were more likely to having direct contact, sharing room or clothes with suspected scabies (p-value <0.01) (Table 2).

Univariate analysis showed that variables related to sharing rooms or clothes with cases were significant, with OR as 11.37 and 5.44 respectively. There were 11 variables with p-value less than 0.1 from the univariate analysis. However, there were seven variables included in multivariate, after checking for correlation, data validity and exclusion criteria. In the multivariate analysis, the risk factors for scabies were sharing a bedroom (Adjusted OR = 9.72, 95% CI=5.33-14.73) and sharing clothes with cases (Adjusted OR = 3.61, 95% CI = 1.66-7.84) (Table 3).



\*36 confirmed cases were not be able to indicate the onset date.

**Figure 1. Onset of confirmed scabies cases\* in a prison, Southern Thailand, January-November 2017 (n=215)**

**Table 2. Characteristics of cases and controls in a prison, southern Thailand, 2017**

Characteristic	Case (n=159)		Control (n=184)		P-value
	Number/Total	Percent	Number/Total	Percent	
Age group (year)					
19-29	80/154	52.0	77/158	48.7	0.05
30-49	63/154	40.9	78/158	49.4	
50-58	11/154	7.1	3/158	1.9	
Nationality					
Thai	141/155	91.0	145/159	91.2	0.94
Non-Thai	14/155	9.0	14/159	8.8	
Duration of stay					
<6 months	36/153	23.5	68/156	43.6	<0.01
6-12 months	59/153	38.6	38/156	24.4	
>1 year	58/153	37.9	50/156	32.0	
Underlying disease					
Diabetes	2/159	1.3	1/184	0.5	0.48
HIV infection	2/159	1.3	2/184	1.1	0.88
Risk behavior					
Location of direct contact with suspected scabies					
Any place	150/159	94.3	120/182	65.9	<0.01
Bedroom	141/158	89.2	94/178	52.8	<0.01
Workspace	85/158	53.8	58/178	32.6	<0.01
Dining area	70/158	44.3	48/178	27.0	<0.01
Bathroom	73/158	46.2	54/178	30.3	<0.01
Location of sharing room with suspected scabies					
Bedroom	133/158	84.2	58/182	31.9	<0.01
Dining area	104/155	67.1	75/161	46.6	<0.01
Type of shared belonging with suspected scabies					
Clothes	50/157	31.9	14/177	7.9	<0.01
Bedsheet	12/155	7.7	3/159	1.9	0.02
Locker	115/155	74.2	105/159	66.0	0.12
History of scabies	17/159	10.7	19/159	10.3	0.89

**Table 3. Univariate and multivariate result of risk factors for associated with scabies among male prisoners in a prison, southern Thailand, 2017**

Characteristic	Univariate		Multivariate	
	Odds Ratio	95% CI	Odds Ratio	95% CI
Location of direct contact with suspected scabies				
Anyplace	8.61	4.11-18.03	-	-
Bedroom	7.41	4.14-13.28	-	-
Workspace	2.41	1.55-3.75	1.45	0.73-2.87
Dining area	2.15	1.37-3.40	0.72	0.34-1.50
Bathroom	1.97	1.23-3.08	1.16	0.58-2.31
Location of sharing room with suspected scabies				
Bedroom	11.37	6.70-19.30	9.72	5.33-14.73
Dining area	2.34	1.48-3.69	1.36	0.73-2.53
Type of shared belonging with suspected scabies				
Clothes	5.44	2.87-10.33	3.61	1.66-7.84
Bedsheet	4.36	1.21-15.78	2.17	0.50-9.46

## Intervention Measures

The investigation team recommended several interventions measures for all prisoners (100% compliance), including applying 25% benzyl benzoate on the same day for three consecutive days and repeat the protocol in the following week, regular

mopping of the bedroom every day with disinfectants and washing of the bedroom equipment every week. Inmates must wash their clothes with strong detergents and dry under the sun.

Scabies surveillance was set up by screening all prisoners, including both existing and newcomers for

suspect skin lesions, followed by isolating suspected cases. To ensure compliance and effectiveness of the control measures, external public health staff closely monitored the prison with regular visits of the physician from the district hospital. No adverse effect from universal scabies treatment was reported and no case was found after September until December 2017.

## Discussion

We reported a scabies outbreak in a prison in Thailand with a high attack rate about 30%. We found that delay in case detection and applying control measures led to a large outbreak. Male inmates who shared the bedroom with cases were more likely to be infected than other male inmates. Scabies outbreak is an important, yet often neglected public health problem in institutional settings<sup>9</sup>, especially in the prisons<sup>4</sup>. The findings in this study demonstrated that scabies outbreak could be effectively controlled by intensive control measures.

Due to its contagiousness, delayed diagnosis of scabies could increase the risk of disease spreading.<sup>16</sup> The outbreak had likely started in April 2017. However, the first case was reported in late August 2017. Some cases were underdiagnosed because of insufficient ability to identify scabies in prisons. Suspected scabies cases had to be transferred to the district hospital for diagnosis and treatment. Previous studies also showed that poor recognition of initial cases predisposed to scabies outbreaks in Thai prisons.<sup>16</sup> Compared with the scabies outbreaks in other settings<sup>10,11,17,18</sup>, the recognition of the disease in this outbreak was delayed and then led to delayed implementation of control and preventive measures. To improve case detection and prevent further disease transmission, it is crucial to follow the national scabies control and prevention guidelines, including establishment of surveillance to detect cases in prison<sup>19,20,21</sup>, screening the newcomers, and universal treatment for all inmates in the same bedroom with cases.

Transmission through direct contact was commonly reported in previous outbreaks.<sup>9,12,22</sup> In this outbreak, not only direct contact<sup>4</sup> that increase risk of disease transmission, but indirect contact through room sharing, equipment sharing and poor sanitation in male dormitory also played an important role in accelerating disease spreading. Similar to findings from this outbreak, a previous report showed that almost all prisons in Thailand were facing the same overcrowded conditions<sup>15</sup>. To better manage in future outbreaks, the protocol implemented in this outbreak, including cleaning the bedroom daily, washing bedroom equipment weekly with disinfectant

detergent to keep better hygienic condition, should be applicable in other prisons for preventing spread of scabies mites and other direct contact pathogens.<sup>9,19,17</sup>

## Limitations

Our study was subjective to at least three limitations. First, we did not identify scabies mites from any skin scrapping of cases. Although no positive laboratory sample for scabies mite, the diagnosis was very likely to be scabies due to the compatible clinical manifestations and good response to scabicide treatment. Second, inability to access medical records in the prison might under-estimate the exact number of cases. To reassure number of cases and diagnosis, we gathered more information of cases from the medical records and also invited clinicians to help examining the inmates.

Finally, recall and memory biases might happen among inmates during administering questionnaires, because of long incubation period and delayed interventions. For instance, one-month interval was applied to time axis of epi-curve instead of shorter interval due to imprecise information on onset and bedroom zone among control group, frequent change during outbreak period, and therefore, excluded from the analytic study.

## Conclusion

Delayed diagnosis, poor sanitation and overcrowded environment were likely lead to the scabies outbreak in this prison. Proper intervention measures, including setting up surveillance, universal treatment for all inmates, and cleaning bedroom daily and equipment weekly with disinfectants such as detergent<sup>23</sup> could prevent and control outbreaks in prisons. We recommended all prisons in Thailand to follow both the intervention measures and the national guidelines.

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