

# **Epidemiology & Health Bulletin**

65 Investigation of a Scabies  
Outbreak in a Primary  
School in Hsinchu County  
74 Cases of Notifiable and  
Reportable Diseases,  
Taiwan-Fukien Area

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## Investigation of a Scabies Outbreak in a Primary School in Hsinchu County

### Introduction

On 21 December 1994, the National Quarantine Service, Department of Health, was notified of an outbreak of scabies in a primary school in Hsinchu County, and an investigation followed.

Scabies is a common infectious disease caused by a mite, *Sarcoptes scabiei*. Sarcoptidae have two sub-families. Of the five genera of the Sarcoptidae sub-family, sarcoptes live on the skins of man, other mammals and birds. *Sarcoptes scabiei* is the more important one in the family. *Sarcoptes scabiei*, or itch mite, penetrate the skin, forms tiny linear burrows of several millimeters to centimeters long in the horny skin layer and lay eggs there. Female mites die immediately after ovulation. Eggs take three to four days to hatch into larvae, which move to the skin, again via burrows through hair follicles. The eggs themselves take 8-15 days to grow into adults. After copulation in the epidermis, female mites (about 0.35 millimeter long) either lay eggs in new burrows or move to other hosts; male mites die soon after. Female mites can survive in the burrows for six to nine weeks. Scabies has an incubation period ranging from three to six weeks. Symptoms appear as a result of immune reaction; therefore, the beginning and the end of the disease are often hard to determine.

In diagnosis, female mites or larvae can be located in the skin or the burrow. Eggs or mites can be removed from the burrows by needles, then placed on slides and observed microscopically. Clinically, sporadic and isolated papules are often seen around finger webs, anterior surfaces of wrists and elbows, anterior axillary folds, thighs, genitalia in men, and nipples or the lower buttocks' portion in women. In children, papules appear on head, face, neck or wrists. Intense itching occurs especially at night (an allergic reaction of the host to the feces of mites; itching is more intense at night as an increase in body temperature then reduces the itching threshold)<sup>(1,2)</sup>.

It is generally believed that scabies is related to poverty, crowded conditions, poor hygiene, population mobility, promiscuity and a decline in immunity, but some reports

maintain that scabies is endemic not only under these conditions<sup>(1,3,4)</sup>. The disease is more prevalent in collective groups, in patients or hosts of lower immunity in hospitals, nursing homes<sup>(4,5)</sup> and in close military quarters<sup>(3)</sup>. Upon outbreak, patients as well as physicians, nurses, caregivers, staff workers, janitors and family members can also be infected. Prevention, therefore, is more important than treatment.

## Background

There were 950 students in 22 classes and 44 teaching staff in the primary school. In September 1994, the school nurse and the public health nurses from the local health station, during routine immunization of school children, found a student in the sixth grade who had serious skin inflammation, was scratching and also exhibited symptoms of suspected scabies. Parents were told to take the child for further examination. In October, the parents notified the school of the diagnosis of scabies. The school nurse was informed in early December that other children of the class were also infected. Upon examining the students, Dr. Chen – a physician working under the Sentinel Reporting System of the National Quarantine Service – confirmed that 20 students of the class as well as some of their family members were infected with scabies. The health authorities were informed, and the classroom disinfected immediately. Subsequently, a single student from the first and the fourth grades, respectively, was found to be infected. To prevent the scabies from spreading, assistance was sought from the health authorities.

## Methods and Materials

An epidemiological investigation took place on 22 December. To discover any unreported cases, all students and their family members were surveyed. A questionnaire used contained questions on the background of the respondent, any suspicious symptoms, medical care, number of family members, handling of clothes and bed sheets and knowledge of scabies. A case was defined as one, either a student or a family member, who within the past three months, had had skin rash or intense itching at night and had been treated by a physician.

Data thus collected were used for descriptive analysis to calculate the infection rate and to prepare an epidemic curve.

Since most cases occurred in a sixth grade classroom, a case-matching method was applied for investigation. Students in the class meeting the case definition were matched with other non-infected students to review differences, if any, in age, sex and schooling. Families with infected and non-infected students were also compared according to their laundry practices and knowledge of scabies, with the hopes of identifying some risk factors.

(SAS, Epi-info and Excel were used in the analysis.)

## Findings

Of the 950 copies of the questionnaire distributed, 851 (89.6%) were returned. A total of 5,225 individuals had been studied; of those, 46 (32 students and 14 family members) met the definition of a case. These 32 males and 13 females (one person did not indicate sex) came from 29 families (Table 1). One particular class in the sixth grade had the highest infection rate of 45.0% (18/40).

**Table 1. Confirmed Cases of Scabies Infection**

	Male	Female	Total
Infected students:	25	7	32
Average age	11.3	12.4	
Infected family members:	7	6	13
Average age	49.1	38.1	
Total	32	13	45
All family members:	86	83	169
Average age	32.0	30.4	

Date of investigation: December 1994

Total number investigated: 5,525

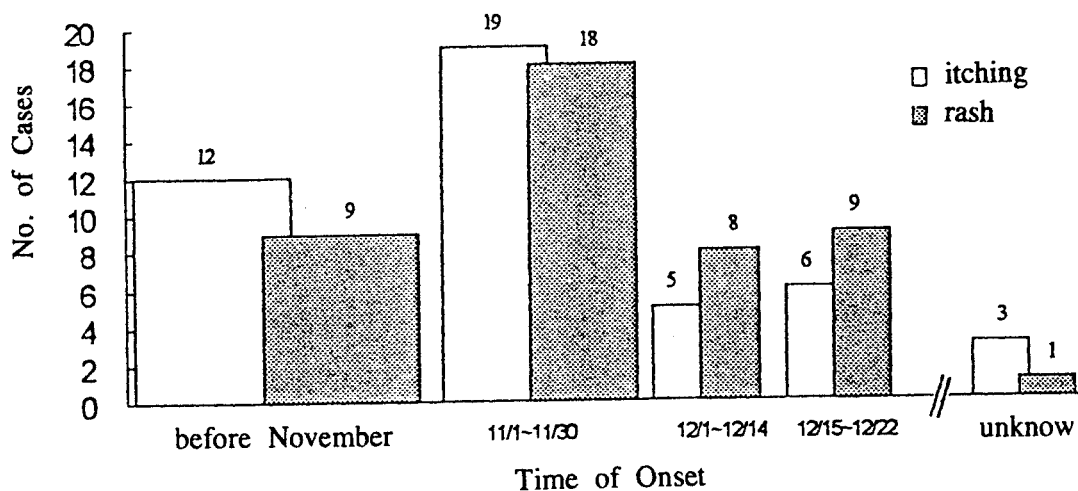
One did not indicate sex

Distribution of dates-of-onset of major symptoms is shown in Figure 1. Itching at night appeared first between 14 and 30 days prior to the investigation, around the end of November.

There were 40 students (24 male and 16 female) in the sixth grade class in question. Of these, 18 met the definition of a case (14 male, 58.3%; 4 female, 25.0%). Among a total of 169 (86 male and 83 female) students' family members, 10 met the definition of a case (6 male, 7.0%; 4 female, 4.8%) (Table 2). Generally speaking, infection rates for males were higher than for females (18.1% vs. 8.1%,  $p=0.032$ ). The average ages of family members were 32.0 years for men and 30.4 for women. The average ages of infected family members were 26.7 years for men and 44.5 for women.

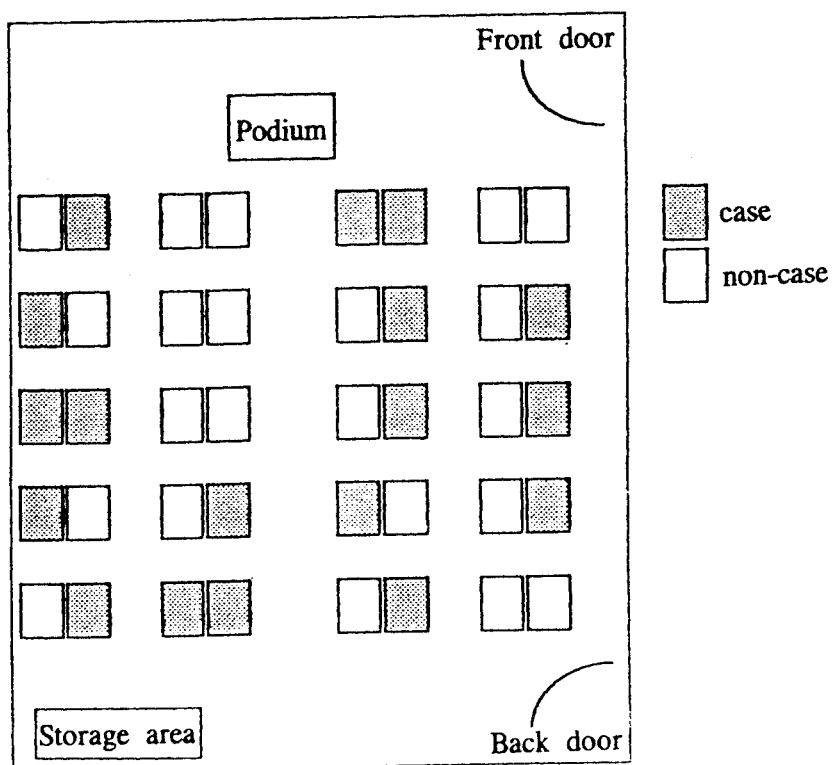
Most students and family members developed their symptoms between 14 and 30 days before the investigation (Table 3). No significant difference was noted between the two groups in the dates of onset of symptoms (Chi-square test,  $p=0.32$ ).

When families with and without cases were compared, infection was found to be related to laundry practice (Table 4). Logistic regression was applied to control other variables, and the incidence of sending clothes and linens to laundry shops was 30

**Figure 1. Dates of Onset of Symptoms**

Total No. of Cases: 45

Date of Investigation: 22 December 1994

**Figure 2. Position of Cases, a Class in Sixth Grade**

**Table 2. Infection of Students in One Sixth Grade Class and their Family Members**

		Case	Infection Rate (%)	Average Age	Total
Students:	Male	13	58.3		24
	Female	5	25.0		16
	Total	18	45.0		40
Family:	Male	6	7.0	26.7	86
	Female	4	4.8	44.5	83
	Total	10	5.9		169
Total		28	13.4		209

**Table 3. Dates of Onset of Symptoms**

Date of Onset (days before investigation)	Family	%	Students	%	Total
Within 7 days	2	20.0	1	5.6	3
7-14 days	1	10.0	0	0.0	1
14-30 days	5	50.0	12	66.7	17
Before 30 days	2	20.0	5	27.8	7
Total	10	100.0	18	100.0	28

$p=0.32$  (not significant)

Based on 22 December 1994 data

times higher in the infected families than in the non-infected families ( $p=0.0001$ ) (Table 5). Family size was found negatively related to infection (OR:0.66,  $p=0.0042$ ). No significant differences were noted in other variables.

## Discussion

Scabies is not under routine surveillance in the current disease control system; therefore, no previous statistics as to the prevalence of scabies are available. The only reports of outbreak investigations come from specific groups such as hospitals and the army<sup>(3,4,5)</sup>. Without such information on scabies' prevalence in this area, there was

**Table 4. Families With and Without Cases**

	With Case		Without Case		Total	RR
Laundry practice						
at home	29	3.52%	796	825	1	
at laundry	3	37.50%	5	8	10.7*	
no answer	0		18	18		
Frequency of changing bed sheet						
every month	22	3.79%	559	581	1	
every 3 months	7	2.97%	229	236	0.78	
every 6 months	2	11.76%	15	17	3.09	
not certain	1	5.88%	16	17	1.55	
Awareness of the Disease						
correct	29	3.82%	731	760	1	
incorrect	0		26	26		
no answer	3	4.62%	62	65	1.21	
Total	32	3.76%	819	851		

RR: relative attack rate of factors based on the first item of each group

\* $p < 0.05$

**Table 5. Logistic Regression Analysis of Risk Factors between Families With and Without Cases**

	Regression Coefficient	OR	P
Laundry practice	3.4237	30.68	0.0001*
Frequency of changing bed sheets	0.2296	1.26	0.5431
Knowledge of scabies	1.2726	3.57	0.2643
Family size	-0.4116	0.66	0.0042*

\* statistically significant

question whether the current infection was an outbreak or a long-existing health problem in the area. However, since the infection concentrated in one sixth grade class, the infection could be considered epidemic when compared with other classes which meet

similar conditions. Yet, with the exception of the class in question, other infections were sporadic, and the school-master and health workers of the local health station mentioned that there had been scabies infections in the area in the past. The infection could also be endemic.

The current infection was first noted by the school nurse and the public health nurses of the local health station at routine immunization of school children. The infection rate in the class where the index case was identified was higher than that of the families concerned (45.0% vs. 5.9%). Distribution of the dates of onset for the two groups were similar. In other classes, more students than family members were also infected. These facts suggest that the infection could have started in the school and then spread to families.

Of all confirmed cases, more and younger boy students were infected. It was likely that younger boy students had more body contacts at play and in regular school activities, increasing their chances of infection. The fact that more symptoms appeared around finger webs and calves of legs, some likely sites of contacts in school activities, seemed to support this finding.

A nearly equal number of male and female family members was infected. Familial infection seemed not related to sex. The youth of female cases might indicate that, because young men were away from home for work most of the time, their chances of being infected at home were less. However, the sample size was too small and the difference, insignificant ( $p=0.45$ ) for such a conclusion. More studies are needed.

Cases seemed to be family-clustered. The 46 confirmed cases came from 29 families. The total number of cases would be 74 had symptomatic, but untreated, individuals been counted as cases. Therefore, the actual number of cases could have been between 46 and 74. The literature<sup>(1,3)</sup> indicates that many family members are infected with scabies at the same time. Cross infection within a family is quite likely.

In the present investigation, medical care was used as one of the conditions for defining a case. Analysis of data showed that the infection rate was lower in larger families. Some cases could have been overlooked.

What was noticeable was that families which sent their clothes and linens to laundry shops had higher risks of being infected with scabies than families who laundered at home. Thus, clothes could also be a route of transmission. In a family, clothes and linens were collected and placed together for a short while before they were sent out to laundries. This practice would have increased the chances of infection. Cleanliness of clothes and underwear, as well as other hygienic practices in the family, should be given the highest priority in order to prevent infection.

Scabies is still a common infectious disease. However, symptoms of scabies at the early stage are mild and not typical; thus the disease is often either overlooked or misdiagnosed. Treatment comes late; patients are left to itch; and an epidemic can result.

Though public health in Taiwan has made marked progress, the public is still not alert enough to health precautions and disease prevalence. In the present investigation, for instance, though health education was conducted at the same time the questionnaires were distributed, some people failed to know about the disease.

The present infection was first noted by the school nurse who then informed the school authorities. They informed the school physician, Dr Chen, a private practitioner who is also Chairman of the school's Parent-Teacher Association. He gave free medical care after diagnosis, held meetings with parent groups to discuss control measures and enlisted the help of local health authorities. Medicines were sent immediately provided by the Department of Health. In the entire process, the school, the community and the health authorities were fully involved, using the community as a point of departure, to solve a community problem by using collectively all available resources. Prof C.C. Chin of the National Taiwan University School of Public Health had once suggested that information about the health status of school children could be used as a source of information for more general disease surveillance. The present investigation further showed that close collaboration between school and health authorities can also serve as a source of information for disease surveillance.

**Prepared by:** W.Y. Shau<sup>(1)</sup>, J.H. Yueh<sup>(1)</sup>, T.H. Lin<sup>(2)</sup>, P.H. Wu<sup>(1)</sup>, K.T. Chen<sup>(1)</sup>

(1) FETP, National Institute of Preventive Medicine, DOH

(2) Vector Control Division, National Institute of Preventive Medicine, DOH

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### Editorial Note:

In the present incident, the health authorities -- upon notice from a school -- took immediate action to conduct an epidemiological investigation and further health education at the same time. This immediate action should help to clarify the infection. Though analyses of the route of infection and risk factors involved were not totally satisfactory, joint action among school, parents and health authorities should have helped to shorten the period of infection and also prevent the further spread of the disease into the community.



Scabies, though it is rarely serious, occurs easily in collective groups such as schools, the army, hospitals and members of the same family. Mites can transmit the disease either through direct contacts or indirect media such as clothes, bed sheets and covers. Unless effectively controlled, the disease spreads to many people in a short period of time.

Scabies infection is seen as an index of public health. In the present outbreak it was not possible to exactly identify the source of infection of the index case; it was either a certain laundry shop which failed to handle clothes properly before and after laundering, or a business establishment or hotel which was unsanitary or failed to change clean bed sheets; some improvement of these conditions should be made in the future. Towels, bed sheets and covers used by business establishments which come into close contact with consumers should be frequently changed and kept clean. Provisions to this effect are already included in regulations governing the sanitary control of business establishments, but penalties are moderate. Once the draft Law for the Control of Sanitary Establishments is legalized, more strict action can be taken.