

# Previous Long-Term Care Facility Admission as a Risk Factor For Scabies in a Medical Facility

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## Short report

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## Abstract

The aim of study was to elucidate simple and effective risk factors for scabies infection in medical environment for early detection and prevention of exposure to other patients and medical staffs. We conducted a case-control study of patients who were diagnosed with scabies among hospitalized patients between 2008 and 2019 in an acute-care teaching hospital. Each case was matched sex and age with two randomly selected controls without scabies during hospitalization. Clinical characteristics of cases at the time of hospital admission were compared to those of control group. Scabies group included 34 patients and 68 patients were included in control group. Scabies group was admitted more via emergency department and had more history of long-term care facility admission. Scabies group had more indwelling catheters, was more in severe medical status, incommunicable, in a bed ridden condition. Scabies patients also had higher C-reactive protein and lower albumin levels. After adjustment, previous long-term care facility admission alone was associated with scabies (risk ratio 12.74, 95% confidence interval 1.42-114.31,  $P = 0.023$ ). Careful examination particularly patients with previous long-term care facility admission might useful for early detection of scabies infection.

## Background

Scabies is a tropical disease caused by the mite *Sarcoptes scabiei* that affects 300 million individuals annually [1]. It can be spread via direct or indirect transmission in medical environment [2]. Scabies infection can increase morbidity in elderly patients through secondary bacterial infection [3]. It can cause an outbreak and occasionally lasts in a couple of months [4]. Tracking contacts and post-exposure treatment requires a considerable cost and inconvenience [5, 6]. Meticulous suspicion and early diagnosis is required to prevent scabies from entering a medical institution. Although pruritus is main symptom of scabies, sometimes skin symptom is non-specific in elderly patients and sometimes it is difficult to communicate with elderly patients to get subjective complaint [7]. In addition, itching or skin lesion was not a significant factor to detect scabies [8]. Therefore, finding risk factors for scabies infection in a medical environment at the time of patients' admission is necessary. This study evaluated risk factors of scabies based on the status at the time of admission in various clinical aspects including symptom and skin lesion.

## Methods And Materials

This study is a case-control study. Scabies cases were collected from data of infection control team of an acute-care teaching hospital of Republic of Korea between January 2008 and December 2019. Control group were selected from the same hospital as many as twice of scabies cases. To match the scabies group and control group similarly other than the patients' medical status at the admission date, we selected controls as a person who has same sex and  $a \geq$ , and the person who hospitalized at the same day as admission date was selected.

Clinical information and laboratory data were retrospectively collected from electrical medical record system. We investigated admission date, date of scabies diagnosis, history of scabies, previous admission to long-term care facility, previous corticosteroid use (more than prednisolone 20 mg/day in any duration), medical history of chronic diseases (hypertension, diabetes mellitus, malignancy, dementia etc.), severity when admission (intensive care unit admission, shock, inotropic agents use), catheter indwelling status, skin lesion or itching sensation, and laboratory results of white blood count, hemoglobin, albumin, creatinine, C-reactive protein, erythrocyte sedimentation rate. Laboratory results in the period of one week before or after the admission day were collected.

McNemar's test was conducted to compare distribution of categorical variables and t-test was conducted to compare mean of continuous variables. Then with significantly different variables, a Cox proportional hazards regression model was designed to elucidate independent risk factor. Variables were selected from those that showed a significant difference in univariate analysis, except for variables with many missing values and variables expected to have multicollinearity. Variables with a  $P$ -value of  $< 0.05$  were considered to be statistically significant. All statistical analyses were performed using SPSS (IBM SPSS statistics for Windows, version 27.0. Armonk, NY: IBM Corp.).

This study was ethically approved from the Institute Review Board of Soonchunhyang university Seoul hospital (No. 2018-04-031). Informed consent was waived by the board considering the nature of this retrospective study.

## Results

A total of 35 cases of scabies infection were diagnosed during the study period. One case of outpatient clinic was excluded. Then 34 cases were finally analyzed in the study. Annually, there were median 6 (ranged 0–11) of scabies infection between 2008 and 2019 (Fig. 1A). Although the number of scabies cases varied by month (Fig. 1B), it was similar by season (9 in spring, 8 in summer, 9 in fall, 8 in winter, respectively). Scabies infection was diagnosed within 10 days after admission in 15 (44.1%), 11–20 days in 3 (8.8%), 21–30 days in 3 (8.8%) cases. Three cases got diagnosis after 81 days after admission (Fig. 1C).

Scabies group had 17 men and 17 women. Mean age was 61.4 (range 31–96). The scabies group showed higher proportion of admission for via emergency department although the difference was not significant (64.7% vs. 22.1%,  $P = 0.701$ ). Previous scabies infection was only in the scabies group (2.9%) and not in the control group. Long-term care facility admission history was more in the scabies group although the difference was not significant (58.8% vs. 10.3%;  $P = 0.189$ ). Scabies group was medically severe, had more indwelling catheters (38.2% vs. 8.8%;  $P = 0.006$ , 61.8% vs. 19.1%;  $P = 1.000$ ). Scabies group had a higher prevalence of hypertension and dementia (73.5% vs. 64.7%;  $P < .001$ , 14.7% vs. 5.9%;  $P < .001$ ). Scabies group was more incommunicable and had higher proportion of bedridden status (47.1% vs. 5.9%;  $P = 0.004$ , 50.0% vs. 8.8%;  $p = 0.035$ ). The scabies group showed more skin lesion and itching symptom (88.25% vs. 7.4%;  $p = 1.000$ , 70.6% vs. 1.5%;  $P = 0.012$ ). Regards medication, scabies group used more corticosteroid than control group (17.6% vs. 1.5%;  $P < 0.001$ ).

After adjustment of other variables` effect, previous long-term care facility admission was associated significantly with scabies (risk ratio 12.74, 95% confidence interval 1.42-114.31,  $P= 0.023$ , Table 2).

Table 1  
Characteristics comparison of scabies group and control group in a hospital environment

	Scabies (n = 34)	Control (n = 68)	P
Admission route (ED)	22 (64.7)	15 (22.1)	0.701
Previous Scabies infection	1 (2.9)	0	< .001
Previous long-term care facility admission	20 (58.8)	7 (10.3)	0.189
Bedridden status	17 (50.0)	6 (8.8)	0.035
Dementia	5 (14.7)	4 (5.9)	< .001
Hypertension	25 (73.5)	44 (64.7)	< .001
Diabetes mellitus	9 (26.5)	26 (38.2)	1.000
Malignancies	8 (23.5)	16 (23.5)	0.164
Arrhythmia	5 (14.7)	4 (5.9)	< .001
CVA	9 (26.5)	7 (10.3)	0.002
CKD	13 (38.2)	15 (22.1)	0.405
ICH	5 (14.7)	4 (5.9)	< .001
Severe condition*	13 (38.2)	6 (8.8)	0.006
Indwelling catheter**	21 (61.8)	13 (19.1)	1.000
Steroid use	6 (17.6)	1 (1.5)	< .001
Skin lesion	30 (88.2)	5 (7.4)	1.000
Itching	24 (70.6)	1 (1.5)	0.012
Incommunicable mental status	16 (47.1)	4 (5.9)	0.004
WBC ( $10^3 /\mu\text{L}$ )	10.94	8.68	0.049
Hemoglobin (g/dL)	14.00	12.12	0.332
Erythrocyte sedimentation rate (mm/hr)	65.73	47.00	0.068
Creatinine (mg/dL)	3.18	2.87	0.857
Albumin (g/dL)	3.28	4.09	< .001
C-reactive protein (mg/dL)	9.16	2.37	0.004
hs-CRP (mg/dL)	4.63	1.72	0.287
Values are counts (%) or mean.			
ED, emergency department; CVA, cerebrovascular accident; CKD, chronic kidney disease; ICH, intracranial hemorrhage; WBC, white blood cell count			
*Severe condition includes intensive care unit admission, inotropic agents use, or shock diagnosis.			
**Indwelling catheter includes percutaneous gastrostomy, tracheostomy, Levin tube, foley catheter, or central venous line.			

Table 2  
Risk factors for scabies

	RR	95% CI	P
Previous LTCF admission	12.735	1.419-114.305	0.023
Hypertension	0.813	0.114-5.785	0.837
Dementia	0.829	0.081-8.506	0.875
Severe condition	1.314	0.195-8.849	0.779
Incommunicable mental status	6.986	0.545-89.544	0.135
RR, relative ratio; 95 CI, 95% confidence interval; ER, emergency department; LTCF, long term care facility; ICH, intracranial hemorrhage			

## Discussion

This study showed the characteristics of scabies patients at the admission date in nosocomial environment comparing control group. Previous long-term care facility admission alone was significantly associated with scabies infection in those patients. Patients with scabies infection were more incommunicable, bedridden status, more in medically severe status although these variables were not significant after adjustment.

Long-term care facility was associated in previous researches albeit the circumstances was different according to the country. In Taiwan, living in a nursing home was confirmed as a risk factor for scabies in a tertiary hospital with bedridden status, indwelling catheter, clinical severe status [9]. In Japan, rapid turnover of patients was risk factor among psychiatric and long-term care hospitals [10]. Dementia history was a risk factor in another report from Japan. Besides national differences or study design, long-term care facilities are variously operated and heterogenous in private medical sector, making it difficult to generalize. In patients with long-term care facility admission history, additional attention to scabies might help early diagnosis. We tried a couple of definition of long-term care facility history such as long-term care facility admission within 1 year, during the lifetime, or direct transfer from it. These definitions showed no statistical difference, so we selected the simplest definition, long-term care facility admission within 1 year.

Dermal screening for all the residents of long-term care facility is not a solution to prevent scabies introduction to acute care hospital. Because of incubation period, scabies patients do not necessarily develop symptoms at the time of admission. Sensitivity of skin scrapes is limited because the number of adult mite on a human with ordinary scabies is low and fewer than 15 [2]. The sensitivity of microscopic diagnosis might be even lower when the exam was not done from a clearly suspected lesion. Based on our results, scabies patients were very few among many patients who come from long-term care facilities to acute care hospitals. It is difficult to diagnosis all the cases with a low prevalence by a low sensitive test. Therefore, it is necessary to educate health-care workers about atypical presentation and pay attention to skin of patients practically. Particularly in patients with long-term care facility admission history, thorough skin examination and include scabies in the differential diagnosis of all the patients with pruritic skin lesion, papules, vesicles, pustules, and pruritus would be helpful for early detection of scabies [11].

There are limited reports about regional data of scabies prevalence in long-term care facilities. A Japanese research reported 41% of psychiatric and long-term care hospitals experienced scabies in 2004 [10]. Another Canadian report reported 25% of 130 chronic healthcare institutions experienced scabies cases during a one-year period [12]. A following study about regional data on prevalence of scabies in long-term care facility would help assessing region-specific risk of scabies in medical environment.

Interestingly, patients with scabies were medically severe at the admission date and more admitted via emergency department. Patients with severe status need intensive acute treatment and it is hard for scabies to get attention in this situation. Overcrowding and time constraints were reported as risk factors of missed diagnosis of scabies during emergency department stay in another study [13]. It might be burdensome to check many risk factors in a situation of acute medical care for medically severe patients. We confirmed the other variables were not independent each other. In that aspect, this study is meaningful for identifying a single independent risk factor that can be used to suspect scabies in a hospital environment.

This study has limitation from the retrospective nature. In particular, skin lesion and itching symptom was reported in the scabies group more than 70%, it was detected while scabies infection was suspicious and diagnosed, not at the time of admission. Only limited information was extracted from the admission note, and it might reflect that medical staff cannot afford to take a meticulous examination of skin lesion during the admission process, which gives reason for elucidating representative risk factors of scabies infection in these patients.

In conclusion, scabies infection in acute medical environment is associated with patient's previous long-term care facility admission.

## Declarations

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### Authors' contributions

Conceptualization: Eunyong Lee, Se Yoon Park; Data collection: Eunyong Lee, Se Yoon Park; Formal analysis: Eunyong Lee, Writing original draft: Eunyong Lee; Writing review & editing: Se Yoon Park, Eunjung Lee, and Tae Hyong Kim, All authors critically assessed the manuscript through the writing process and read and approved the final version.

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### Availability of data and materials

All data generated or analyzed during this study are included in this published article

### Ethics approval and consent to participate

This study was approved by the Institutional Review Board of Soonchunhyang University Seoul Hospital. The requirement for written informed consent was

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## Consent for publication

Not applicable.

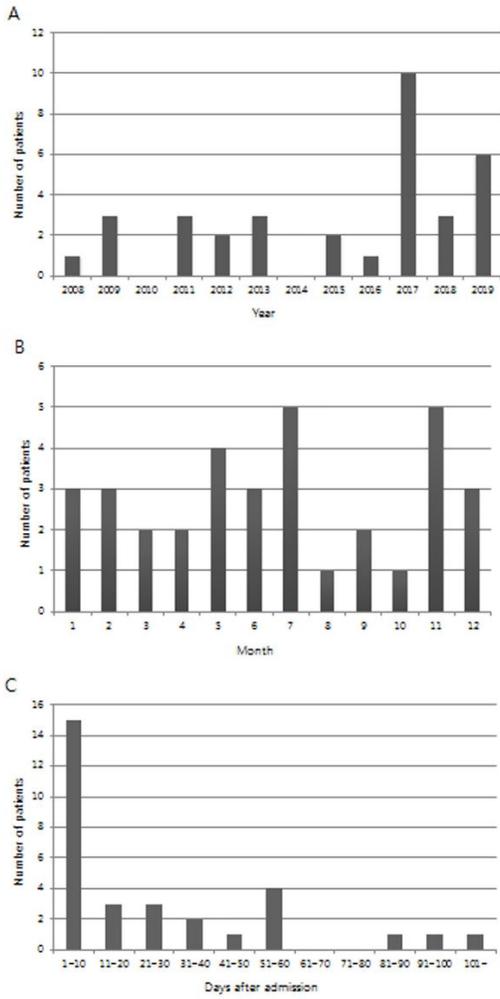
## Conflicting interest

All authors report no conflicts of interest relevant to this article.

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## Figures



**Figure 1**  
 Temporal characteristics of scabies infection in a medical center during 2008 to 2019. (A) Annual number of scabies cases, (B) Monthly number of scabies cases, (C) Duration of scabies diagnosis after admission