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ORIGINAL ARTICLE

Risk factors for scabies in Taiwan

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Background: Scabies is a global problem. Transmission of scabies is usually due to direct or indirect contact. Delay in diagnosis may result in the spread of the scabies mite. Prompt diagnosis and treatment are important.

Methods: In this study, we collected data from 52 scabies patients and analyzed the risk factors for scabies with the case-control method.

Results: Our study has revealed that the patients who were bedridden [odds ratio (OR) 6.72, $p < 0.0001$], living in a nursing home (OR 9.89, $p < 0.0001$), had a higher clinical severity status before admission (OR 1.25, $p < 0.0001$), and a catheter inserted (including nasogastric tube, Foley catheter, Port-A, or Hickman catheter) (OR 9.05, $p < 0.0001$) were significantly more likely to acquire scabies infection.

Conclusion: To prevent scabies, proper management of the nursing home setting, including adequate cleaning of the contaminated clothing, bedding and equipment, in combination with treating all suspected scabies patients, and contact isolation are important and necessary.

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Introduction

Scabies is an ectoparasitic infection which has the long troubled humanity. It is caused by the mite *Sarcoptes*

scabiei. Scabies occurs worldwide and its prevalence is estimated to be about 300 million cases yearly.¹ The classic manifestations of scabies include generalized itching which often becomes worse at night,² and abnormal skin lesions (papules, pustules, nodules, and occasionally urticaria).^{3,4} The skin lesions are often noted on wrists, finger webs, axillae, the periumbilical region, abdominal wall, genitals and buttocks.⁵ Complications and mortality may occur due

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to secondary bacterial infections.^{6–8} According to the literature, risk factors for scabies are war, overcrowding, malnutrition, sporadically sexual contact, and poor hygiene.^{9–11} There are also reports of scabies outbreaks in long-term care facilities, nursing homes, and hospitals.^{11–14} However, according to our knowledge, there is still no report concerning risk factors for scabies in Taiwan. Healthcare workers cannot ignore the patients infected with scabies who were not diagnosed on admission. We have performed a case-control study to identify the risk factors of acquiring scabies in Taiwan, with a view to aid early diagnosis and treatment.

Materials and methods

We reviewed the charts of adults admitted to our hospital with a diagnosis of scabies after admission from June 2007 to June 2010. Chang Gung Memorial Hospital at Keelung is a 1088-bed, tertiary-care, teaching hospital with approximately 50,000 admissions per year. The diagnosis of scabies was based on the presence of typical skin lesions (Figs. 1–3), discovery of scabies mites (Fig. 4), or dermatologist's consultation, along with a good response to antiscabies treatment. To treat scabies infection, we used 1% γ -benzenehexachloride (lindane) applied thoroughly on the skin from neck to soles and then repeated it once again one week later. In addition, we used crotamiton ointment topically on skin lesions two times a day for about 2 weeks till skin lesions subsided.

We enrolled 52 scabies case patients in this study and also selected 104 nonscabies control patients, each of whom was admitted to our hospital within 3 days of a scabies case-patient. Scabies case patients and nonscabies control patients were matched for age and sex. We collected the data of the case patients and control patients including the patient history, the interval between admission and the diagnosis of scabies, the duration of hospitalization, the usage of catheters (nasogastric tube, Foley catheter, Port-A, or Hickman catheter), the APACHE (Acute Physiology, Age, Chronic Health Evaluation) II score¹⁵ on admission, history of care in nursing homes, and factors causing bedridden status. Underlying diseases were also evaluated. Chronic steroid therapy was defined as using



Figure 2. Crusted plaques on the finger slit.

prednisone more than 10 mg per day over 7 days. Liver cirrhosis was diagnosed based on the finding of the abdominal ultrasound and blood examinations. The existence of rheumatologic diseases, including systemic lupus erythematosus and rheumatoid arthritis, are investigated in this study. The use of indwelling catheters including the nasogastric tube, Foley catheter, Port-A and Hickman catheter, are also recorded.

Descriptive statistics, such as means, standard deviation, frequency, and percentage, were determined. Chi-square test and Fisher's exact test were used to compare data between the two groups where appropriate. Logistic regression with forward selection was used to determine the days of hospitalization. Odds ratios (ORs) with 95% confidence interval (CI) were calculated to identify the risk factors of scabies. The p value < 0.05 was considered statistically significant.

Results

In this study, there were 52 scabies patients (24 males and 28 females) with a mean age of 79.1 years (range, 47–98 years) and 104 nonscabies patients (48 males and 56 female) with a mean age of 71.82 (range, 25–102 years). The clinical features of scabies patients and nonscabies patients are summarized in Table 1. Among the 52 patients with scabies infection, 41 patients (78.8%) had at least one



Figure 1. Crusted plaques on the palm.



Figure 3. Crusted plaques on the penis.



Figure 4. Scabies mite.

underlying disease. Diabetes mellitus (DM) was the most common disease (31/52; 59.6%), followed by end-stage renal disease (ESRD) on hemodialysis (9/52; 17.3%), cancer (5/52; 9.6%), liver cirrhosis (3/52; 5.7%), chronic obstructive pulmonary disease (COPD; 3/52, 5.7%), and rheumatologic disease (2/52; 3.8%). There were six patients (11.5%) undergoing chronic steroid therapy. There were 42 patients (80.7%) with bedridden status. The mean APACHE II score of scabies patients was 19.0 (range, 11–28). Twenty-four patients (46.2%) had an APACHE II score over 20. A total of 42 patients (80.7%) lived in the nursing home. In

addition, 19 patients (36.5%) expired during the period covered by this study. The mean duration of hospitalization was 32.6 days (range, 6–101 days). We calculated the interval between admission and diagnosis of scabies. In 27 patients (51.9%) scabies was diagnosed within 7 days, in 15 scabies patients (35.7%) between 8 to 30 days, and in 10 patients (19.2%) over 30 days.

Among the 104 nonscabies control patients, 76 patients (73.0%) had at least one underlying disease. DM was also the most common disease (55/104; 52.3%), followed by COPD (13/104; 12.5%), cancer (8/104; 7.7%), ESRD under hemodialysis (18/104; 17.3%) and liver cirrhosis (5/104; 4.8%). There were 11 patients (10.6%) undergoing chronic steroid therapy. Forty patients (38.5%) were in bedridden status. The APACHE II score was 13.6 with a range of 6–24.7 patients (6.7%) had an APACHE II score of over 20. A total of 31 patients (29.8%) lived in the nursing home. Finally Seven patients (6.7%) expired during the period covered by this study. The mean duration of hospitalization was 17.1 days (range, 3–123). The comparison results after analysis between the case patients and control patients are summarized in Table 1. Briefly, by univariate analysis, the case-patients were more likely to have bedridden status, higher clinical severity (especially, the APACHE score >20 points) and catheter use, and more probably came from the nursing home. In addition, scabies patients have significantly higher mortality rate than control patients (36.5% vs. 6.7%). Finally, the scabies case patients had longer hospitalization durations by multivariate analysis (OR, 1.05).

Table 1 Basic clinical data of scabies patients and control patients admitted to the general ward of Chang Gung Memorial Hospital at Keelung from June 2007 to June 2010

	Scabies patients (n = 52)	Non-scabies patients (n = 104)	Univariate		Multivariate OR	
			OR(95% CI)	**p	OR(95% CI)	**p
Male sex	24	48	1.0(0.51–1.95)	1.0000(C)		
Age(mean/range)	79.1(47–98)	71.82(25–102)		0.255(F)		
Underlying diseases						
Chronic obstructive lung disease	3	13	0.43(0.12–1.58)	0.1915(C)		
Diabetes mellitus	31	54	1.32(0.67–2.58)	0.4957(C)		
ESRD under hemodialysis	9	18	1.0(0.41–2.41)	1.0000(C)		
Cancer	5	8	1.28(0.40–4.12)	0.7610(F)		
Liver cirrhosis	3	4	1.21(0.28–5.28)	1.0000(F)		
Immunological disease	2	0	10.35(0.49–219.54)	0.1097(F)		
No underlying disease	11	28	0.73(0.33–1.61)	0.4328(C)		
Steroid therapy	6	11	1.10(0.38–3.17)	0.8558(C)		
Bedridden status	42	42	6.72(3.04–14.88)	<0.0001(C)		
APACHE II score (mean/range)	19.0/11–28	13.0/6–24	1.25(1.12–1.36)	<0.0001(C)		
APACHE II score \geq 20	24	8	11.88(4.63–30.44)	<0.0001(C)	8.54(3.04–23.97)	<0.0001(L)
Catheters*	45	53	9.05(3.33–24.57)	<0.0001(C)		
Living in a nursing home	42	31	9.89(4.41–22.18)	<0.0001(C)	7.75(3.27–18.38)	<0.0001(L)
Days of hospitalization (mean/range)	32.6/6–101	17.6/3–123			1.05(1.02–1.07)	0.0015(C)
Expiration during study period	19	8	7.98(3.08–20.68)	<0.0001(C)		

* Catheters include nasogastric tube, Foley catheter, Port-A, and Hickman catheter.

** C: Chi-square; F: Fisher's exact test; L: Logistics.

Discussion

As far as we know, this is the first study to identify risk factors for scabies in Taiwan.^{16,17} Scabies is a global problem and has been reported in Japan¹⁸, America¹⁴, and Spain.¹⁹ Early diagnosis of scabies infection is important because of its highly contagious nature. However, scabies is not an infectious disease mandated to be reported to the national hygiene organization in most countries, perhaps due to its minimal fatality rate and treatable nature.²⁰ In our study, bedridden status, living in the nursing home, poor clinical status on admission, and the long-term use of a catheter are identified as significant risk factors for scabies infection. Since delayed diagnosis of scabies may result in its direct or indirect spread in hospitals, we have to be particularly alert with patients having these risk factors.

One report showed that a scabies patient might transmit scabies to 50% of the patients and staff in the same ward.²¹ In addition, an unprotected staff caring for scabies patients might infect 40–70% of the patients in the ward if his fingers had burrows harboring scabies mites.²¹ One survey reported that scabies was discovered in 25% residents in the long-term care institutions in Canada in 1986.²² In our study, 80.7% of the patients with scabies infection came from a nursing home. We often suspected a scabies infection in these patients upon the discovery of abnormal skin lesions during their hospitalization. However, the nursing home staff did not recognize the patients' skin lesions before their hospital admission. The failure of staff to diagnose scabies in patients on admission might be due to a lack of pruritus in these patients, the long incubation period of scabies (1 to 6 months), and inadequate knowledge of this infectious disease.^{1,23,24} Therefore, it is very important to educate nursing home staff concerning scabies. If we can diagnose the disease earlier and take proper precautions, transmission of scabies may be more easily controlled.

Scabies can recur in a nursing home even after all individuals infected with scabies have been properly treated, because the mites can be recovered from bedding, clothing, furniture and floor.²⁵ The nursing home residents may wear contaminated clothing, or sleep on the contaminated beds. The nursing home must be cleaned thoroughly once scabies is discovered. Hospital staff should pay particular attention to patients coming from a nursing home with a confirmed scabies diagnosis for any resident.

The average life expectancy is increasing, partly due to rapid improvement of the medical care standards. The gradually incremental proportion of aged population is a problem to be faced in every country. Taiwan's population has been steadily aging since 1993. By 2021, about 15% of the population is expected to be 65 years of age or older. Therefore, it is an important public health responsibility to provide good care for the elderly. The government should pay attention to nursing homes that have had scabies outbreaks in the past.

Delayed diagnosis of scabies will increase the medical disbursement and manpower cost, because those individuals having close contact with a scabies patient have to be treated simultaneously to avoid further transmission of the

disease. Contact isolation should be strictly performed.²⁶ We recommend that hospital staff be particularly alert with examining patients coming from a nursing home, having poor clinical status on admission, or using catheters for an extended duration of time.

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