

KNOWLEDGE AND SCABIES PATIENT MANAGEMENT AMONG NURSING STAFF WORKING AT LONG-TERM CARE INSTITUTIONS IN SOUTH KOREA: A DESCRIPTIVE STUDY

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Abstract. Nursing staff are at risk of contracting scabies infestation and thereby become sources of scabies transmission. In order to develop effective strategies to eliminate scabies, level of knowledge regarding scabies and its transmission and management were determined using a questionnaire among nursing staff at 15 long-term care facilities in three cities of South Korea during August-September 2018. Each participant was asked to fill out a questionnaire asking about scabies knowledge and the management of patients with scabies. Participants ($n = 214$) were 97% females, 48 ± 10 (mean \pm SD) years of age (range = 20-67 years), 49% registered nurses, 39% nursing assistants and 12% care workers. Results of the questionnaire showed a knowledge score of 18 ± 4 (mean \pm SD) (possible score range = 0-28) and 54% of participants stated they isolated a patient with scabies in a private room, 62% used medical devices specific for that patient and 59% treated waste from a scabies patient separately from other patients, 55% restricted visitors of scabies patients, and 54% provided information regarding scabies to patients, family members and care givers. These findings revealed a significant proportion of healthcare participants had an inadequate knowledge on scabies, its management and appropriate nursing care of scabies patients. An education program on scabies and its management needs to be developed and evaluated among nursing staff of long-term care facilities to allow improvement of program methodology and content so that the prevalence of scabies infestation in long-term care facilities in the country can be reduced and controlled.

Keywords: infection, Korea, long-term care facility, nurse education, scabies

INTRODUCTION

Scabies is a skin infestation caused by *Sarcoptes scabiei* var *hominis*, which infests

epidermis of the human skin (Orrico and Krause-Parello, 2010). It is highly contagious and is spread through direct, prolonged, skin-to-skin contact with an infected individual (CDC, 2010). Scabies can at times spread indirectly through contaminated articles, such as clothing, bedding or furniture (CDC, 2010).

Common skin lesions found in patients with scabies infestation include an itchy skin eruption consisting of

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papules, nodules and vesicles (Chandler and Fuller, 2019). The burrows that form when scabies pass through the epidermis are often unidentifiable due to scratching or crusting (Cassell *et al*, 2018). In Norwegian or crusted scabies, often a more severe form of the disease, itching may be minimal or absent and diagnosis is based on skin manifestations, including finding a hyperkeratotic plaque with crust on palm, extensor surface of elbow, scalp, ear, sole of foot, and toe (Johnston and Sladden, 2005). Individuals with crusted scabies have numerous scabies mites and eggs and are more contagious than those with normal scabies (CDC, 2019). Deaths can occur in crusted scabies-infected elderly patients with impaired immunity, neuropsychiatric conditions or debilitating disease (Roberts *et al*, 2005).

An estimated 200 million people world-wide contract scabies (WHO, 2019), with prevalence in Papua New Guinea estimated to be 71% (Romani *et al*, 2015). Prevalence of scabies in East Asia is 136.3 cases per 100,000 population, in Southeast Asia 134.5/100,000 and in Oceania 120.3/100,000 (Karimkhani *et al*, 2017). In South Korea, among individuals 60-80 years of age, incidence of scabies in 2007 was 73,533 and 108,813 in 2011 (Korea CDC, 2018).

Scabies has an incubation period of 4-6 weeks and is contagious during this period (Chosidow, 2006). Scabies occurs frequently in hospitals, nursing homes, military barracks and schools where people gather and live close to one another (CDC, 2019). In 2019, there were reportedly 1,577 long-term care facilities in South Korea (Korea Health Insurance Review and Assessment Service, 2019a), and the number of such facilities increases 8% annually since 2012 (Korea Health Insurance Review and Assessment Service,

2019b). In 2019, 401 institutions had more than 14 beds per room (Shin and Lee, 2019). Between 2014 and 2018, 1,094,163 people in South Korea were admitted to a long-term care facility at least once and 26.9% remain for 1-5 years (Shin and Lee, 2019). The number of the elderly in long-term care facilities drastically increased from 186,280 in 2008 to 459,301 in 2018 (Korea Ministry of Health and Welfare, 2019). Previous study (Kim *et al*, 2020) showed that 71.8% of long-term care facilities had a high incidence of scabies in the last 5 years. Patients aged older than 80 years (45.5%) were diagnosed with the disease, with more women being affected than men (Kim *et al*, 2020). Long-term care in overcrowded rooms increases the risk of scabies and this trend is expected to increase as the proportion of the elderly population in South Korea grows larger.

The problem of scabies infection has moved from long-term care facilities to hospitals owing to transfer of scabies patients from long-term care facilities to hospitals. Eighty-six percent of South Korean hospitals have at least one case of scabies, 30.2% being crust scabies of which 66.7% are patients from long-term care facilities (Kim *et al*, 2019).

Nursing staff (nurse managers, registered nurses, nurse assistants, and other healthcare nursing workers) comprise a large percentage of healthcare workers in long-term care facilities and have direct contact with patients. A lack of knowledge on scabies, its transmission and methods of management can promote the spread of scabies and delay treatment (Vorou *et al*, 2007). Nursing staff should be actively involved in scabies control but this is dependent on their level of knowledge on scabies.

Previous studies of scabies have focused on epidemiology and

pathophysiology (Kim and Cheong, 2019), risk factors (Hewitt *et al*, 2015), incidence (Millership and Kapadia, 2018) and diagnosis and treatment (Salavastru *et al*, 2017; Engelman and Steer, 2018). One study evaluated knowledge of scabies among students (Alshehri *et al*, 2018) and another on general practitioners and dermatologists (Lapeere *et al*, 2005). However, to the best of our knowledge, there has been no published report on knowledge and management practices of scabies among nursing staff. Here, level of knowledge and methods used to eliminate scabies were evaluated among long-term care institution nursing staff to provide baseline data for developing effective strategies in management and control of scabies in these institutions.

MATERIALS AND METHODS

Study design and participants

This was a descriptive, cross-sectional study conducted during August-September 2018 among nursing staff who provided direct care to patients at 15 long-term care institutions in three cities (Busan, Ulsan and Yangsan) in South Korea. Inclusion criterion was being nursing staff involved in direct patient care and exclusion criterion was being academic staff involved only in supervision of nurses and education of student nurses. Sample size was calculated using a G-Power 3.1.6 program (Heinrich Heine University, Düsseldorf, Germany). Minimum number of study subjects calculated was 200 at p -value <0.05 , power $(1 - \beta)$ of 0.80 and a median effect size (f) of 0.25. In order to compensate for incomplete data or drop-outs 214 participants were enrolled in the study.

This study was approved by the Institutional Review Board, Pusan

National University Hospital (approval no. H-1805-010-067). Prior written consent was obtained from each participant.

Study tool

The study tool was a structured questionnaire developed by the research team, which constituted questions regarding demographics, education, occupation, knowledge of scabies, management procedures used with scabies patients, and knowledge of educational background of scabies patients and their immediate families.

Knowledge about scabies

Literature regarding scabies infection; US CDC, Korea CDC and European guidelines; and research papers and textbooks available in Pubmed, CINAHL, RISS, and DBpia databases were reviewed. Then a preliminary questionnaire was drafted and evaluated for content validity by a parasitologist, a dermatologist, a family doctor and a doctor in internal medicine working at a nursing home, a health educator, two infection control specialists, and two nursing staff who looked after scabies patients. Content validity of each item was calculated and any two items for which content validity index <0.75 were deleted. A pilot survey was conducted among three registered nurses, nurse assistants and health-care workers, respectively who worked at a long-term care facility for >5 years. Consequently, the questionnaire was further revised before a final version was adopted.

Knowledge on scabies was divided into four subcategories: epidemiology and risk factors (5 items), signs and symptoms (5 items), prevention and management (13 items), and treatment (5 items). Each item was to be answered as "yes", "no" or "do not know". A correct answer received 1

point and the other answers received 0 point. For comparison purposes, percent score was used. The overall validity (S-CVI) of the tool was 0.94.

Management of patients with scabies

The questionnaire covered infection control measures, use of medication, information provided on scabies to patients, their immediate families and caregivers, and employment status of infected employees. The questionnaire content was evaluated by a parasitologist, a dermatologist, a family doctor, a doctor in internal medicine working at a nursing home, a health educator, two infection control specialists, two nursing staff who cared for patients with scabies, three nursing directors, three registered nurses, three nurse assistants, and three healthcare workers who worked at a long-term care facility ≥ 5 years. A final revised questionnaire was drafted based on the reviewers' comments.

Data analysis

Data was analyzed using a Statistical Package for the Social Sciences (SPSS) version 22.0 (IBM Co, Armonk, NY). Descriptive statistics were used to summarize demographic characteristics of participants. Knowledge of and practices to prevent transmission of scabies were calculated as mean \pm SD. A student's t-test or an analysis of variance test was employed to determine significant differences among groups of different demographic characteristics regarding scabies knowledge and management of scabies patients. A *p*-value of <0.050 is considered statistically significant.

RESULTS

Demographic profile of participants

Of the 214 participants, 23, 32 and

45% were from long-term care facilities in Yangsan City, Ulsan City and Busan City, respectively. Participants were 48 ± 10 years of age, 97% females, 50% registered nurses, 39% nursing assistants, 11% nursing care workers, 54% college/university graduates, and 80% working in wards, of whom 40% having worked for >7 years. Thirty-two percent nursing staff were employed in facilities with 300-400 beds. Number of patients cared for per shift was 54 ± 35 . Sixty-six percent nursing staff were provided with a manual on prevention and management of scabies, 68% received education regarding scabies infection, 34% had a person in charge of controlling scabies infection in their workplace, 72% were provided a system for reporting a patient showing signs or symptoms of scabies. and 18% were diagnosed with scabies during the previous year.

Knowledge on scabies

Mean (\pm SD) knowledge score was 18.0 (\pm 4.0) (possible score range = 0-28), with knowledge on "prevention and management" having the highest and on "treatment" lowest relative mean score among the four categories (Table 1). Among the 28 questions in the questionnaire, the question with the lowest percent correct answers was item 1 ("People who come into contact with a person with scabies should seek treatment if they develop similar signs or symptoms.") (13%), and highest item 28 "Crusted scabies can spread via contamination of clothing, bedding and towels used by an infected person." (98%) (Table 2).

Differences in knowledge on scabies according to demographics of nursing staff

Significant lower mean knowledge score on scabies is obtained among

Table 1

Evaluation of knowledge on scabies among nursing staff participants ($n = 214$) at 15 long-term care facilities in Busan, Ulsan and Yangsan, South Korea conducted during August-September 2018.

Knowledge category	Score (mean \pm SD)	Possible score range	Percent maximum score (mean \pm SD)
Epidemiology and risk factors	3 \pm 1	0-5	60 \pm 20
Signs and symptoms	3 \pm 1	0-5	60 \pm 20
Prevention and management	9 \pm 2	0-13	69 \pm 15
Treatment	2 \pm 1	0-5	40 \pm 20
Total	18 \pm 4	0-28	65

Table 2

Numbers of nursing staff participants with correct answer to each item on knowledge of scabies.

Item	Number of participants with correct answer (%) ($n = 214$)
1. People who come into contact with a person with scabies should seek treatment if they develop similar signs or symptoms.	27 (13)
2. Scabies can survive more than one week outside the human skin.	46 (22)
3. Crusted (Norwegian) scabies may not exhibit the usual signs and symptoms in a person with immune deficiency or with an autoimmune disease.	55 (26)
4. People who have had scabies before are more likely to exhibit symptoms much later when contracting it the second time.	56 (26)
5. Scabies treatment should be applied to a 5-cm area surrounding site of infection.	58 (27)
6. Scabies mites will die if exposed to a temperature of 50-60°C for 10 minutes.	73 (34)
7. Careful vacuuming of furniture and carpets in rooms used by a person infected with crusted scabies is recommended.	100 (47)
8. Application of a cream or lotion for treatment of scabies is best done in the morning and rinsed off immediately after application.	102 (48)
9. People with crusted (Norwegian) scabies are very contagious and can easily transmit the infestation to other people.	113 (53)
10. If a person with scabies does not have any symptom, then he/she cannot transmit it to others.	127 (59)
11. Bedding and clothing used by patients with scabies can be used immediately after washing in hot water and drying with heat.	134 (63)
12. Lindane lotion is recommended for a person with seizures because it has less systemic absorption, rapid excretion and few side effects.	136 (64)
13. Patients infested with crusted scabies should be isolated from other uninfected patients.	145 (68)

Table 2 (Continued)

Item	Number of participants with correct answer (%) (n = 214)
14. Diagnosis of a scabies infestation is usually made based on customary appearance and distribution of rash and presence of burrows.	146 (68)
15. Items that cannot be washed or dry-cleaned can be decontaminated by isolating the items for 24 hours.	159 (74)
16. Staff should collect and transport bedding and clothing used by a person with crusted scabies in a plastic bag and this should be emptied directly into a washing machine.	161 (75)
17. Skin-to-skin contact with scabies patients should be avoided for at least eight hours after treatment.	165 (77)
18. If a person has never had scabies, symptoms may appear four to six weeks after contact with mites.	168 (78)
19. It is not necessary to restrict visitors to patients infested with scabies.	169 (79)
20. Scabies is usually spread by prolonged, direct skin-to-skin contact with an infected person.	176 (82)
21. There is no risk of scabies infestation from blood pressure device previously used on a person infested with scabies.	179 (84)
22. Crowded areas, such as nursing homes, extended care facilities, and childcare facilities, are common sites for scabies infestation.	184 (86)
23. Scabies lesions in normal adults are usually found between fingers, on inner wrist, on inner elbow, in armpit, on back of knee, on breast of female, on genitalia of male, and on buttock.	185 (86)
24. People coming into contact with an infested patient should wear personal protective equipment, such as disposable long-sleeved gowns and gloves.	192 (90)
25. The most common signs and symptoms of scabies are intense itching that becomes worse at night and a pimple-like itchy rash.	200 (93)
26. If a person with scabies scratches vigorously, this can lead to a secondary infection.	201 (94)
27. Scabies is a skin infestation by a human itch mite.	205 (96)
28. Crusted scabies can spread via contamination of clothing, bedding and towels used by an infected person.	209 (98)

nursing staff participants from Ulsan compared to the other two cities, ≤ 29 years of age, with high school education or lower, working in institutions with ≤ 99 beds, and lack of provision of manual on scabies prevention and management, no reporting, no educational experience regarding scabies infestation (Table 3).

Management of patients with scabies

From the questionnaire, the majority of nursing staff participants practiced good management care of their patients and 94% used 1% gamma-benzene hexachloride as treatment, but slightly over half isolated scabies patients from other patients, restricted visiting time to

Table 3

Score of knowledge on scabies according to demographics of nursing staff participants enrolled from 15 long-term care institutions in three cities, South Korea (August-September 2018).

Demographic feature	Knowledge score (mean \pm SD) [#]	F/t (<i>p</i> -value)*
Institution location		
Busan	18 \pm 3	5.121 (0.007)*
Ulsan	17 \pm 5	
Yongsan	19 \pm 3	
Age (years)		
\leq 29	15 \pm 6	2.699 (0.032)*
30-39	18 \pm 4	
40-49	19 \pm 4	
50-59	18 \pm 3	
Gender		
Male	17 \pm 3	-0.443 (0.658)
Female	18 \pm 4	
Job position		
Registered nurse	18 \pm 3	3.716 (0.006)*
Assistant nurse	17 \pm 4	
Nursing director	20 \pm 2	
Care worker	17 \pm 3	
Institution unit		
Ward	18 \pm 4	0.248 (0.780)
Intensive care unit	18 \pm 3	
Others	19 \pm 3	
Service experience (years)		
<1	17 \pm 4	0.735 (0.569)
1 - <3	18 \pm 4	
3 - <5	18 \pm 3	
5 - <7	19 \pm 5	
\geq 7	18 \pm 3	
Education level		
\leq High school	17 \pm 5	4.025 (0.019)*
College or university	19 \pm 3	
Postgraduate degree	20 \pm 2	
Number of hospital beds		
\leq 99	14 \pm 5	9.499 (<0.001)*
100 - <200	19 \pm 4	
200 - <300	18 \pm 3	
300 - <400	19 \pm 3	
\geq 400	15 \pm 3	
Number of patients cared for per shift		
\leq 49	19 \pm 4	1.867 (0.063)
\geq 50	18 \pm 4	

Table 3 (Continued)

Demographic feature	Knowledge score (mean \pm SD) [#]	F/t (<i>p</i> -value)*
Workplace has a manual for the prevention and management of scabies infection		
Yes	19 \pm 4	3.271 (0.001)*
No	17 \pm 4	
Workplace has infection control personnel		
Yes	18 \pm 5	1.029 (0.305)
No	18 \pm 4	
Workplace has system to report scabies infestation		
Yes	18 \pm 4	2.281 (0.024)*
No	17 \pm 4	
Received education regarding scabies infestation		
Yes	18 \pm 4	2.301 (0.022)*
No	17 \pm 4	
Diagnosed with scabies infestation during the previous year		
Yes	18 \pm 3	-0.445 (0.657)
No	18 \pm 4	

[#]Score range = 0-28; *Significant at $p < 0.050$; SD: standard deviation; F/t: F value as a result of analysis of variance test or t value as a result of t-test.

scabies patients and provided education on scabies to patients, immediate families and caregivers (Table 4). The majority of participants did not separate laundry of scabies patients from those other patients or used laundry facilities dedicated to scabies patients. Only 26% of the nursing staff requested leave of absence for treatment once they had signs or symptoms of scabies.

Factors affecting five management practices of scabies patients

Demographic features of nursing staff participants affecting five management practices (disinfection of medical devices after use, disinfection of patient's room, visitors' restriction, education of patient on scabies, and education of patient's family or caregivers on scabies) were further evaluated. These five management practices were chosen because these practices can be improved through the

efforts of the facility staff. Having a reporting system of scabies infestation significantly favored implementation of all five practices; infection control personnel at workplace favored four practices; received education regarding scabies favored three management practices; location of institution, personnel status, number of patients cared for per shift, and manual for the prevention and management of scabies infection favored two management practices; and age and working unit favored one management practice (Table 5).

DISCUSSION

The descriptive study evaluated knowledge of scabies and management of patients with scabies by nursing staff caring elderly patients vulnerable to scabies infection in long-term care facilities in three cities of South Korea.

Table 4

Methods of scabies patients' management employed by nursing staff participants enrolled from 15 long-term care institutions in three cities, South Korea (August-September 2018).

Method/Parameter	Number of participants (%)
Number of times daily have patient wash hand	
1-2	79 (53)
3-4	47 (32)
5-6	9 (6)
≥7	14 (9)
Subtotal	149
Isolate patient	
Yes	82 (54)
No	70 (46)
Subtotal	152
Use separate set of medical devices for each patient	
Yes	96 (62)
No	58 (38)
Subtotal	154
Use personal protective equipment (multiple responses possible per participant)	
Glove	149 (94)
Mask	95 (60)
Gown	61 (39)
Head cover	12 (8)
Shoes cover	12 (8)
Other protective equipment	1 (1)
Subtotal	158
Washes hands after caring for a scabies patient	
Yes	157 (99)
No	1 (1)
Subtotal	158
Placement of patient's used items in covered collection trolley	
Place directly into separate covered collection trolley	6 (5)
Place in sealed plastic bag prior to covered collection trolley	122 (92)
Put in common covered collection trolley	2 (1)
Other procedures	3 (2)
Subtotal	133
Use laundry equipment dedicated for scabies patient	
Yes	32 (20)
No	126 (80)
Subtotal	158

Table 4 (Continued)

Method/Parameter	Number of participants (%)
Use tableware dedicated for scabies patient	
Yes	29 (18)
No	128 (82)
Subtotal	157
Washing machine for tableware for scabies patient only	
Yes	33 (21)
No	122 (79)
Subtotal	155
Disinfect room of scabies patient	
Yes	121 (77)
No	37 (23)
Subtotal	158
Type of scabies treatment employed (multiple responses possible)	
1% gamma-benzene hexachloride	149 (94)
5% or 10% crotamiton	59 (37)
5% permethrin cream	1 (1)
Other treatments	3 (2)
Subtotal	158
Disinfect medical devices after use with scabies patient	
Yes	132 (85)
No	23 (15)
Subtotal	155
Treat waste of scabies patient separately from others	
Yes	94 (59)
No	64 (41)
Subtotal	158
Restrict visiting period of patient	
Yes	87 (55)
No	71 (45)
Subtotal	158
Educate patients regarding scabies	
Yes	85 (54)
No	73 (46)
Subtotal	158
Educate immediate family or caregivers regarding scabies	
Yes	86 (54)
No	72 (46)
Subtotal	158
Action taken upon becoming infected with scabies	
Continue working	104 (74)
Take a leave of absence from work to receive treatment	36 (26)
Subtotal	140

Table 5
Demographic categories affecting five management practices of scabies patients by nursing staff participants (n = 158) enrolled from 15 long-term care institutions in three cities, South Korea (August-September 2018).

Category	Disinfection of medical devices after use			Disinfection of patient's room			Visitors' restriction			Education of patient on scabies			Education of patient's family or caregivers on scabies		
	Yes n (%)	No n (%)	χ^2 (p-value)*	Yes n (%)	No n (%)	χ^2 (p-value)*	Yes n (%)	No n (%)	χ^2 (p-value)*	Yes n (%)	No n (%)	χ^2 (p-value)*	Yes n (%)	No n (%)	χ^2 (p-value)*
Location of institution			7.501 (0.024)*			5.326 (0.070)			0.387 (0.824)			3.035 (0.219)			6.685 (0.035)*
Busan	59 (79)	16 (21)		56 (75)	19 (25)		42 (56)	33 (44)		36 (48)	39 (52)		40 (53)	35 (47)	
Ulsan	40 (98)	1 (2)		38 (88)	5 (12)		22 (51)	21 (49)		23 (53)	20 (47)		18 (42)	25 (58)	
Yangsan	33 (85)	6 (15)		27 (68)	13 (32)		23 (58)	17 (42)		26 (65)	14 (35)		28 (70)	12 (30)	
Age (years)			2.283 (0.684)			23.887 (<0.001)*			8.339 (0.080)			5.306 (0.257)			7.177 (0.127)
≤20	6 (75)	2 (25)		3 (37)	5 (63)		1 (12)	7 (88)		2 (25)	6 (75)		1 (12)	7 (88)	
30-39	18 (78)	5 (22)		11 (48)	12 (52)		14 (61)	9 (39)		10 (43)	13 (57)		14 (61)	9 (39)	
40-49	42 (86)	7 (14)		40 (82)	9 (18)		31 (63)	18 (37)		28 (57)	21 (43)		30 (61)	19 (39)	
50-59	52 (87)	8 (13)		50 (82)	11 (18)		33 (54)	28 (46)		33 (54)	28 (46)		32 (52)	29 (48)	
≥60	13 (93)	1 (7)		16 (100)	0 (0)		7 (44)	9 (56)		11 (69)	5 (31)		8 (50)	8 (50)	
Gender			0.017 (0.898)			2.457 (0.117)			0.339 (0.560)			0.416 (0.519)			0.376 (0.539)
Male	5 (83)	1 (17)		3 (50)	3 (50)		4 (67)	2 (33)		4 (67)	2 (33)		4 (67)	2 (33)	
Female	127 (85)	22 (15)		118 (78)	34 (22)		83 (55)	69 (45)		81 (53)	71 (47)		82 (54)	70 (46)	
Personnel status			2.287 (0.683)			11.980 (0.018)*			4.107 (0.392)			10.129 (0.038)*			4.991 (0.288)
Registered nurse	35 (80)	9 (20)		28 (64)	16 (36)		19 (43)	25 (57)		18 (41)	26 (59)		20 (45)	24 (56)	
Assistant nurse	52 (87)	8 (13)		49 (82)	11 (18)		36 (60)	24 (40)		30 (50)	30 (50)		31 (52)	29 (48)	
Nurse manager	23 (85)	4 (15)		19 (70)	8 (30)		17 (63)	10 (37)		17 (63)	10 (37)		19 (70)	8 (30)	
Nurse director	5 (83)	1 (17)		5 (83)	1 (17)		4 (67)	2 (33)		4 (67)	2 (33)		4 (67)	2 (33)	
Care worker	16 (94)	1 (6)		20 (100)	0 (0)		11 (55)	9 (45)		16 (80)	4 (20)		12 (60)	8 (40)	
Institution department			2.594 (0.273)			3.386 (0.184)			0.290 (0.865)			1.469 (0.480)			8.226 (0.016)*
Ward	105 (87)	15 (13)		98 (80)	25 (20)		66 (54)	57 (46)		65 (53)	58 (47)		60 (49)	63 (51)	
Intensive care unit	22 (76)	7 (24)		19 (66)	10 (34)		17 (59)	12 (41)		15 (52)	14 (48)		20 (69)	9 (31)	
Other units	4 (80)	1 (20)		3 (60)	2 (40)		3 (60)	2 (40)		4 (80)	1 (20)		5 (100)	0 (0)	
Service experience (years)			5.042 (0.283)			0.196 (0.996)			2.509 (0.643)			4.417 (0.353)			3.248 (0.517)
<1	28 (76)	9 (24)		29 (76)	9 (24)		21 (55)	17 (45)		19 (50)	19 (50)		24 (63)	14 (37)	
1 - <3	40 (91)	4 (9)		35 (78)	10 (22)		26 (58)	19 (42)		27 (60)	18 (40)		22 (50)	23 (50)	
3 - <5	31 (91)	3 (9)		26 (74)	9 (26)		17 (49)	18 (51)		18 (51)	17 (49)		19 (54)	16 (46)	
5 - <7	13 (81)	3 (19)		12 (75)	4 (25)		7 (44)	9 (56)		11 (69)	5 (31)		10 (62)	6 (38)	
≥7	19 (83)	4 (17)		18 (78)	5 (22)		15 (65)	8 (35)		9 (39)	14 (61)		10 (43)	13 (57)	

Table 5 (Continued)

Category	Disinfection of medical devices after use			Disinfection of patient's room			Visitors' restriction			Education of patient on scabies			Education of patient's family or caregivers on scabies		
	Yes n (%)	No n (%)	χ^2 (p-value)*	Yes n (%)	No n (%)	χ^2 (p-value)*	Yes n (%)	No n (%)	χ^2 (p-value)*	Yes n (%)	No n (%)	χ^2 (p-value)*	Yes n (%)	No n (%)	χ^2 (p-value)*
Education level			1.669 (0.434)			3.548 (0.170)			1.697 (0.428)			3.865 (0.145)			1.444 (0.486)
≤High school	56 (88)	8 (12)		56 (84)	11 (16)		38 (57)	29 (43)		40 (60)	27 (40)		35 (52)	32 (48)	
College / university	70 (82)	15 (18)		60 (71)	25 (29)		44 (52)	41 (48)		40 (47)	45 (53)		46 (54)	39 (46)	
Postgraduate	5 (100)	0 (0)		4 (80)	1 (20)		4 (80)	1 (20)		4 (80)	1 (20)		4 (80)	1 (20)	
Number of hospital beds			1.337 (0.855)			0.584 (0.965)			3.239 (0.519)			5.141 (0.273)			4.385 (0.356)
≤99	15 (94)	1 (6)		12 (75)	4 (25)		7 (44)	9 (56)		7 (44)	9 (56)		7 (44)	9 (56)	
100-200	42 (84)	8 (16)		40 (77)	12 (23)		33 (63)	19 (37)		27 (52)	25 (48)		29 (56)	23 (44)	
200-300	25 (86)	4 (14)		24 (80)	6 (20)		14 (47)	16 (53)		15 (50)	15 (50)		13 (43)	17 (57)	
300-400	43 (83)	9 (17)		38 (73)	14 (27)		28 (54)	24 (46)		33 (63)	19 (37)		33 (63)	19 (37)	
≥400	4 (80)	1 (20)		4 (80)	1 (20)		3 (60)	2 (40)		1 (20)	4 (80)		2 (40)	3 (60)	
Number of patients cared for per shift			5.297 (0.021)*			0.348 (0.555)			0.050 (0.823)			17.081 (<0.001)*			2.425 (0.119)
≤49	60 (92)	5 (8)		53 (78)	15 (22)		36 (53)	32 (47)		48 (71)	20 (29)		41 (60)	27 (40)	
≥50	66 (79)	18 (21)		62 (74)	22 (26)		46 (55)	38 (45)		31 (37)	53 (63)		40 (48)	44 (52)	
Manual for the prevention and management of scabies infection			2.281 (0.131)			4.863 (0.027)*			0.037 (0.847)			15.000 (<0.001)*			2.914 (0.088)
Yes	85 (89)	11 (11)		80 (82)	17 (18)		54 (56)	43 (44)		64 (66)	33 (34)		58 (60)	39 (40)	
No	47 (80)	12 (20)		41 (67)	20 (33)		33 (54)	28 (46)		21 (34)	40 (66)		28 (46)	33 (54)	
Infection control personnel at workplace			1.218 (0.270)			4.944 (0.026)*			4.331 (0.037)*			13.472 (<0.001)*			8.274 (0.004)*
Yes	44 (90)	5 (10)		43 (88)	6 (12)		33 (67)	16 (33)		37 (75)	12 (25)		35 (71)	14 (29)	
No	88 (83)	18 (17)		78 (72)	31 (28)		54 (49)	55 (51)		48 (44)	61 (56)		51 (47)	58 (53)	
Reporting system of scabies infestation			6.824 (0.009)*			10.480 (0.001)*			5.869 (0.015)*			21.031 (<0.001)*			7.028 (0.008)*
Yes	94 (90)	10 (10)		90 (84)	17 (16)		66 (62)	41 (38)		71 (66)	36 (34)		66 (62)	41 (38)	
No	38 (75)	13 (25)		31 (61)	20 (39)		21 (41)	30 (59)		14 (27)	37 (73)		20 (39)	31 (61)	
Received education regarding scabies			9.397 (0.002)*			8.960 (0.003)*			3.218 (0.073)			15.023 (<0.001)*			2.794 (0.095)
Yes	90 (92)	8 (8)		85 (84)	16 (16)		61 (60)	40 (40)		66 (65)	35 (35)		60 (59)	41 (41)	
No	42 (74)	15 (26)		36 (63)	21 (37)		26 (46)	31 (54)		19 (33)	38 (67)		26 (46)	31 (54)	

*Significant at $p < 0.050$ comparing between "Yes" and "No".

The survey revealed a poor knowledge and management of scabies among the participants. There have not been many studies conducted concerning scabies. To the best of our knowledge, no study has been conducted on nursing staff knowledge and management of scabies; previous studies were conducted among medical students in Nigeria (Sule *et al*, 2014) and in Saudi Arabia (Alshehri *et al*, 2018); nurse students in Saudi Arabia (Bilal *et al*, 2018) and students in boarding school in East Jakarta (Rosandi and Sungkar, 2014). Sule *et al* (2015) reported medical students having an overall mean knowledge score of 8 ± 2 , out of 14 questions. In addition, Sule *et al* (2015) reported a lack of knowledge among their participants on features of complicated scabies (44.3%), pathognomonic feature of scabies (5.0%) and Norwegian scabies (5.7%). Alshehri *et al* (2018) did not report medical students' knowledge scores, but noted a satisfactory level of knowledge on scabies' causative agents, risk factors, features, diagnosis, and prevention. Bilal *et al* (2018) reported 75.4% of nursing students having good knowledge on scabies. Rosandi and Sungkar (2014) showed >80% boarding school students achieve a ten-fold (7.7 to 73.1%) increase in knowledge after attending a lecture on scabies. Inconsistencies of results might be due different scales employed to measure knowledge on the subject. Methods should be introduced to harmonize these testing methods to enable instructive comparisons of results and identification of common and unique problems in educating healthcare workers on this common infestation.

As the number of long-term care facilities increases, nursing staff are at high risk of infection and transmission of scabies during their working hours,

and the inadequate knowledge of scabies infection and proper management of patients with the disease is troubling. There is an urgent need to initiate an education program to rectify this deficiency and to install and enforce proper scabies treatment and management measures in long-term care facilities across the country. Importantly, the findings from the present study have identified various demographic features associated with poor management practices, which should facilitate focus of education programs on these specific problems to obtain optimal outcomes beneficial to patients and nursing staff alike.

The study suffers from two major limitations. Firstly, there was a lack of a standard instrument to measure knowledge and management practices of patients with scabies; however, opinions of experts and target population were sought out to ensure content validity, and a pilot study was conducted before employing the testing tool. Secondly, the study was limited to nursing staff at long-term care facilities and the results cannot be generalized to other healthcare professionals and types of institutions.

In conclusion, the study reveals a poor knowledge on scabies treatment and management practices among nursing staff at long-term care institutions in three cities of South Korea. The findings not only highlight the urgent need to improve nursing staff education on this disease but also certain problems that require immediate attention for the welfare of patients and healthcare workers alike. In addition, studies should be conducted with other healthcare professionals working in the same institution and an international effort be launched to harmonize testing tools to allow meaningful comparison of investigations

conducted in other institution in South Korea and in other countries.

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