

네팔 서개발지역 간호사들의 의료관련감염에 대한 지식, 태도, 이행

김은경¹ · 정인숙¹ · 사쿤탈라 탄주²

부산대학교 간호대학¹, 탄센간호대학²

Knowledge, Attitude, and Compliance of Healthcare-associated Infection Control among Nurses in the Western Development Region, Nepal

EunGyeong Kim¹, Ihnsook Jeong¹, Shakuntala Thanju²

College of Nursing, Pusan National University¹, Yangsan, Korea, Tansen Nursing School², Palpa, Nepal

Background: Healthcare-associated infection (HAI) affects the morbidity and mortality of inpatients worldwide. Nepal is a developing country in which HAIs pose a major problem in terms of patient safety. Therefore, this study was designed to assess the level of knowledge and attitude toward HAIs and compliance for infection control among nurses.

Methods: A cross-sectional survey was conducted using a self-administered questionnaire including general characteristics, and knowledge of, attitude toward, and compliance with HAI control practices, on a sample of 259 nurses from 11 hospitals in 3 cities in Nepal, from July 17 to August 5, 2014.

Results: The average score on knowledge of HAI was 6.56, on a 13-point scale. In total, 59 nurses had undergone HAI control training and 211 nurses reported that they were governed by some guidelines, but there were no significant differences. The overall level of compliance with HAI control guidelines was 79.2 points based on a 100-point scale, which did not differ in terms of age, exposure to infection control training, and the presence of any guidelines.

Conclusion: The level of knowledge of HAI control among nurses was very low and a majority had never undergone any HAI control training. Evidently, there is an urgent need to provide HAI control training to nurses, and to develop infrastructure to provide training for them.

Keywords: Attitude, Compliance, Healthcare-associated infection, Knowledge, Nepalese nurses

Introduction

A healthcare-associated infection (HAI) or nosocomial infection (NI) refers to a case in which a symptom of infection appears in patients within a

healthcare setting, not at the time of hospitalization, but during or after their hospitalization. Such infections not only increase the duration of hospital stay but also cause deterioration in the patients' condition [1-3]. In the United States, HAI decreased gradually from 4.5% of all inpatients in 2002 to 4% in 2011, while in four European countries, it was reported to occur in 7.6% of inpatients [4]. The resultant annual economic burden was approximately US \$ 6.5 billion in the U.S. and about €7 billion in Europe [3]. HAIs occur in 15.5% to 27% of inpatients in underdeveloped countries, which is more

Received: February 11, 2016

Revised: May 2, 2016

Accepted: June 20, 2016

Correspondence to: Ihnsook Jeong, College of Nursing, Pusan National University, 49 Busandaehak-ro, Mulgeum-eup, Yangsan 50612, Korea

Tel: 051-510-8342, Fax: 051-510-8308

E-mail: jeongis@pusan.ac.kr

severe than the rate observed in developed countries [3-6]; however, the degree of actual economic loss and mortality as a result of HAIs has not been accurately reported [7,8]. The World Health Organization carried out the "Clean Care is Safer Care" program in 2005 to prevent HAI in underdeveloped countries, making it the first priority in healthcare [1,2].

In Nepal, an underdeveloped country, there have been no governmental efforts to control HAI. Studies are being conducted on HAI, but they are still insufficient, and most of these have been conducted in the capital city Kathmandu or in other large cities [9-12]. One survey revealed that out of 17 hospitals in Kathmandu, Nepal, nine hospitals were using guidelines for HAI control, but these guidelines were more than five years old or included inappropriate content. Seven hospitals had never provided education on infection control (IC), 7 hospitals provided such education for a small number of personnel, 2 hospitals had provided the same to their entire staff, and 1 hospital did not mention details about such education [11]. To guarantee high quality healthcare and patient safety, HAI control is very important [11], but even hospitals in the large cities in Nepal have not been found to follow any guidelines for HAI control or to conduct related educational programs.

One of the most effective methods of preventing HAI is to adhere to guidelines on isolation precautions [13]. However, in general, nurses lack accurate information on the isolation precautions. Thus, often due to insufficient knowledge or time, or negligence, nurses do not practice the isolation precautions. Moreover, most nurses do not receive any systematic education about the isolation precautions [7,10,11]. Thus, in order to increase the practice of HAI control, education on IC [7,14-16], including isolation precautions are very important [10,14].

The Western Development Region of Nepal has low accessibility to healthcare services due to low

economic status, insufficient healthcare institutions, and its geographical condition: being surrounded by the highest mountains in the world [10,11,17]. In addition, the poor hygiene conditions of hospitals make things worse [11]. In such an environment with a high necessity of HAI control, there is almost no training or study on HAI control for nurses. Therefore, to improve the awareness of HAI control and the practice of education for nurses, important resources such as personnel for HAI control education are needed in western Nepal. The present study was conducted to assess the level of knowledge and attitude toward HAI control, including isolation precautions, and compliance with HAI control among nurses, and to develop an educational program for Nepalese nurses.

Materials and Methods

1. Study design

A cross-sectional survey was conducted to identify the level of knowledge of and attitude towards HAI control, including isolation precautions, and compliance with HAI control among nurses from 11 hospitals in 3 cities, Tansen, Ranigaon, and Butwal, in the Western Development Region of Nepal.

2. Setting and participants

The participants in this study were nurses working in hospitals in Western Development Region, Nepal, who agreed to participate in the investigation after understanding its purpose and intention. In total, 13 hospitals in 3 cities were approached, but 2 hospitals were excluded because 1 hospital did not agree to participate in the study while another did not have registered nurses except the superintendent. Thus, all the 381 registered nurses (RN) who worked in the 11 selected hospitals were the target of this study. A total of 310 copies of the questionnaire were distributed to RNs who agreed to participate in the study and 305 were collected. Out of these, 46 questionnaires, 3 of which had not been com-

pleted, more than 50% of questionnaires, 3 answered by assistant nurses (Auxiliary Nurse Midwife; ANM), 38 by head nurses, 1 by a supervisor, and 1 by a superintendent were excluded. Therefore, only 259 were included in the final analysis.

3. Instruments

The study instrument was a self-reported questionnaire (47 questions) that included items on the participants' general information (14 questions), knowledge of IC (13 questions, hereafter referred to as "knowledge"), attitudes toward HAI control (5 questions, hereafter referred to as "attitude"), and compliance with HAI control (15 questions). The questionnaire for this study was used in previous studies [9,14], and was reviewed for content validity by 2 Korean HAI control practitioners working in IC units.

General information included age, gender, years of professional experience, working department, and exposure to training sessions.

Knowledge of HAI control was measured with items designed by Sax et al. [14], and three Nepalese nursing professors approved the English level in the questionnaire for use with Nepalese nurses in the present study. It has 13 multiple-choice questions that are scored 1 point for a correct answer and 0 for an incorrect answer. The total knowledge scores ranged from 0 to 13.

Attitude toward HAI control included items on the preferred single prevention measure, self-assessment of knowledge on standard precautions, preferred source of information on HAI control, peer action against healthcare workers' noncompliance with HAI control, and obstacles to compliance with guidelines. Four out of the 5 questions on attitude involved choosing the best answer out of 4 or 5 possible answers, and the last question on obstacles was measured on a 3-point scale (not important, important, very important). The score on attitude towards HAI control was not the sum of the item scores but was analyzed with frequency and

percentage.

The questionnaire for compliance with HAI control was developed by Paudyal et al [9]. Compliance with HAI control was measured by a set of 15 questions which were categorized as always (1 point) or sometimes or never (0 points). Therefore, compliance scores ranged from 0 to 15.

4. Ethical considerations

The study was conducted after receiving approval from the Pusan National University Institutional Review Board (PNU IRB: 2014_48_HR4). After providing information about the purpose of study, and guaranteeing anonymity and credibility for voluntary participants, written informed consent was obtained from all participants who agreed to participate in the study, and a gift about 50-cents was given to those who participated in the study.

5. Data collection

Data were collected in the 11 selected hospitals between July and August 2014. Before visiting the 11 hospitals, we contacted the matron and asked for permission after explaining the purpose of the study. We also conducted a short interview with the matrons to ascertain the presence or absence of an IC team and guidelines before distributing the questionnaire. In total, 4 researchers collected the data. Two research assistants and 2 researchers were trained on the main aspects to be assessed and the scoring system. Every hospital was visited by 2 or 4 researchers for 1 or 2 days with permission of the hospital directors and matrons. Data were collected after all questionnaires were filled, except for 3 hospitals, where data were collected the next day.

6. Statistical analysis

Statistical analysis was performed using the SPSS software version 21.0 (IBM, Armonk, NY, USA). Descriptive statistics, including frequencies, percentages, means, and standard deviations were used to identify the general characteristics of the partic-

ipants, and their knowledge, attitude, and compliance levels. The correlation between knowledge and compliance was analyzed with the Pearson's correlation coefficient. The difference in the mean of the compliance with IC by general characteristics was analyzed with the t-test.

Results

All participants were female and their mean age was 22.8 (± 3.78) years. Their average number of years of job experience was 2 years, and only 19 nurses (7.3%) had more than 5 years' experience. Further, 59 nurses (22.8%) had undergone HAI control training and 211 (81.5%) nurses answered that they were governed by some guidelines, which

were mainly limited to the hand washing posters developed by WHO. None of 11 hospitals had any guidelines except for the hand washing posters.

Table 1 illustrates the differences in knowledge according to the general characteristics of the participants. The mean knowledge score was 6.56 ± 1.76 (50.5%). There were no significant differences in knowledge by age group ($t=0.85$, $P=0.395$), those who had undergone HAI control training ($t=-1.94$, $P=0.053$), and being governed by guidelines ($t=0.53$, $P=0.595$).

Table 2 shows the findings related to knowledge of HAI control. The proportion of participants who answered the question "the indication for mask use in a regular care situation" correctly was the highest (83.8%), followed by that for the question "the bi-

Table 1. Differences in knowledge according to the general characteristics of participants (N=259)

Characteristics	Category	No. of correct answer (maximum score=13) mean \pm SD	100 based score of the mean	t	P
Total knowledge score		6.56 \pm 1.76	50.5		
Age (years)	<25	6.60 \pm 1.73	50.8	0.85	0.395
	\geq 25	6.36 \pm 1.90	48.9		
Ever undergone infection control training	Yes	6.16 \pm 1.89	47.4	-1.94	0.053
	No	6.67 \pm 1.70	51.3		
Had any guidelines	Yes	6.59 \pm 1.75	50.7	0.53	0.595
	No	6.43 \pm 1.83	49.5		

Table 2. Knowledge about healthcare-associated infection control (N=259)

Contents	Correct answer (%)
1. The most important vehicle in pathogen transmission	67.2
2. The main purpose of glove use	52.9
3. The main benefit of hand hygiene	65.3
4. The adequate preventive measures in a complex care situation	52.5
5. The adequate preventive measures in a regular care situation	48.3
6. The indication for mask use in a regular care situation	83.8
7. The anticipated timing of isolation precaution	41.3
8. The adequate procedures in contact precaution	15.8
9. The basic concept of standard precautions	27.4
10. The risk-guided application of a preventive strategy	66.0
11. The ubiquitous risk of coming in contact with body fluids	38.2
12. The bidirectional risk of pathogen transmission	71.8
13. Being aware of environment-associated risks for immunosuppressed patients	25.5
Total	50.5

Table 4. Compliance with Healthcare-associated Infection Control (N=259)

Contents	Always n (%)	Sometimes n (%)	Never n (%)
1. Washing hands before and after examining a patient	243 (93.8)	16 (6.2)	
2. Drying hands after washing them	214 (82.6)	42 (16.2)	3 (1.2)
3. Wearing gloves whenever there is a possibility of exposure to blood or other body fluids	234 (90.3)	25 (9.7)	
4. Washing hands after removing disposable gloves	246 (95.0)	13 (5.0)	
5. Wearing a waterproof apron whenever there is a possibility of exposure to blood or other body fluid splashing	132 (51.0)	88 (34.0)	39 (15.0)
6. Wearing a face mask whenever there is a possibility of exposure to blood or other body fluid splashing	170 (65.6)	80 (30.9)	9 (3.5)
7. Wearing a clean washed uniform everyday	234 (90.3)	24 (9.3)	1 (0.4)
8. Putting all the contaminated items in a disposal bag	251 (96.9)	8 (3.1)	
9. Immediately wiping up all spills of blood or any other body fluids	250 (96.5)	9 (3.5)	
10. Covering broken skin before coming to work	198 (76.4)	58 (22.4)	3 (1.2)
11. Changing usual care methods if the patient has an infectious disease	154 (59.5)	59 (22.8)	46 (17.8)
12. Consuming food and beverages in patient/resident care areas*	167 (64.5)	40 (15.4)	52 (20.1)
13. Protecting oneself against the blood and body fluids of all patients, regardless of their diagnosis	237 (91.5)	22 (8.5)	
14. Putting used needles and other sharp objects into the designated sharp containers	255 (98.4)	3 (1.2)	1 (0.4)
15. Recapping used needles*	92 (35.5)	20 (7.7)	147 (56.8)

*Reverse coding.

Table 5. Compliance for infection control according to the general characteristics of participants (N=259)

Characteristics	Category	Compliance (maximum score=15) mean±SD	100 based score of mean	t	P
Total compliance		11.88±1.87	79.2		
Age (years)	<25	11.52±1.81	76.8	1.412	0.799
	≥25	11.21±1.85	74.7		
Ever undergone infection control training	Yes	11.49±1.66	76.6	-0.106	0.169
	No	11.52±1.85	76.8		
Had any guidelines	Yes	11.61±1.73	77.4	1.847	0.067
	No	11.08±2.08	73.9		

nurses in the capital city of Nepal, Kathmandu (80.7%), as reported in Paudyal et al.'s study [9]. This score was also lower than that of nurses in Korea, whose mean score for knowledge of HAI control was 8.6 (66.3%) out of 13 [18], and lower than nurses in Ethiopia and Nigeria [16,19].

The proportion of correct answers was the higher for the question “the indication for mask use in a regular care situation” (83.8%) in this study, which was much higher than that reported in Sax et al.'s study (53.2%) [14]. However, the lowest proportion

of correct answers was to the question “the adequate procedures in contact precaution” (15.8%), which was much lower as compared to that reported in Sax et al.'s study (63.1%) [14]. In this regard, more than half of the respondents (66.4%) reported that mask, gloves, and antisepsis should be applied for contact precaution. However, most of the participants (83.8%) were not aware of contact precaution, which may be attributed to a lack of proper education and training about transmission-based precaution. In Sax et al.'s study, the highest

proportion of correct answers was for the item “the most important vehicle in pathogen transmission” (97.3%) [14], which was substantially lower in the present study (67.2%). Based on these findings, it is evident that nurses in the Western Development Region of Nepal need to learn about more specific behaviors related to HAI control, including isolation precaution.

The majority of the study participants (81.5%) reported that they were governed by some guidelines but it was mainly related to the chart for hand-washing with soap. Only 22.8% of the nurses had been trained in IC, which was slightly lower than the 27% reported in Paudyal et al.’s study [9]. Considering the lower level of knowledge and exposure to HAI control training, it is evident that education on HAI control, including isolation precaution, is an urgent need for nurses in the Western Development Region of Nepal.

In the present study, nurses preferred “hand hygiene” (79.5%) as a prevention measure for HAI control; however, this was substantially lower than that reported in Sax et al.’s study (97.6%) [14], which used the same measurement instrument. Most respondents showed a positive attitude toward HAI control in terms of self-assessment of knowledge on standard precautions and peer action to healthcare workers’ noncompliance with HAI control. In the present study, lack of knowledge was reported as the most important obstacle to compliance with guidelines, followed by lack of time, lack of means, and forgetting. In the study by Sax et al. [14], this order was lack of knowledge, lack of time, forgetting, and lack of means. Evidently, lack of knowledge and time are common obstacles to compliance with guidelines for nurses in developing and developed countries. However, lack of means is one of the important obstacles for nurses in developing countries. Therefore, in addition to systematic education on HAI control, including isolation precautions, Nepalese nurses and Nepalese health authorities should try to optimize the IC practices

within the limited resources.

The mean score on compliance with HAI control was 79.2 points on the 100-point scoring scale. This finding of high compliance in a context of low knowledge regarding HAI control was somewhat unexpected. The score is also high when compared to that reported in Paudyal et al.’s study (70%) [9], which used the same tool in hospitals in Kathmandu, and another previous study [16]. The highest compliance score was for the item “putting used needles and other sharp objects into the designated sharp containers” (98.4%). On the other hand, the score for “recapping of used needles” was reported by 56.8% of the participants, which was lower than that reported in Paudyal et al.’s study (69%) [9]. Recapping of used needles causes needle stick injuries and occupational transmission of blood-borne pathogens [20]. Therefore, effective education for the safe handling of needles is necessary for reducing the frequency of recapping.

In the present study, the compliance score was not related with age, having ever undergone IC training, being governed by any guideline, and knowledge of HAI control. This finding was similar to that reported in a previous study on healthcare workers in Nepal. In that study, the compliance with use of masks showed no relationship with age, profession, and HAI control training [9]. Interestingly, though the present participants perceived lack of knowledge as the most important obstacle to compliance with guidelines, the knowledge score did not correlate with the score on compliance with HAI control. In the present study, knowledge was measured with objective questions, but compliance was assessed subjectively. Therefore, the latter may have been overestimated due to a social desirability bias, which failed to show a relationship with knowledge. Further observational studies are needed to accurately determine actual behaviors related to HAI control.

In conclusion, the level of knowledge on HAI control among nurses was very low and a majority

had never undergone any IC training. Therefore, there is an urgent need to provide HAI control training, including isolation precautions, to the nurses in Nepal. Additionally, enhanced infrastructure, such as an HAI control team, is needed for appropriate HAI control. However, this study was conducted only on nurses from 3 towns in western healthcare facilities, which may limit the generalizability of the present findings to other professions and areas. Further studies covering various areas and healthcare workers are needed to improve the generalizability of the findings. Additionally, we could not measure the reliability of the instruments, and recommend assessment of the test-retest reliability of each instrument used in the present study.

Summary

배경: 의료관련감염은 전세계적으로 환자의 안전을 위협하며 사망률과 이환율을 증가시키고 있다. 저개발국가중 하나인 네팔은 의료관련감염에 대한 국가적 통계가 거의 없고, 의료관련감염에 관한 몇몇의 연구는 수도인 카트만두나 대도시를 중심으로 연구는 이루어졌다. 네팔 서개발 지역에 근무하는 병원 간호사들의 의료관련감염 관리지식, 태도, 이행을 조사하여 추후 의료관련 감염관리를 위한 교육 중재를 위한 기초자료 제공하는 것이 본 연구의 목적이다.

방법: 횡단적 조사연구로 네팔 서개발지역 3개 도시의 11개 병원에 근무하는 259명의 간호사를 대상으로 일반적 특성, 의료관련감염관리지식, 태도, 이행 등을 포함하는 자기보고식 질문지를 통해 자료가 수집되었으며, 자료 수집기간은 2014년 7월 17일에서 2014년 8월 5일까지였다.

결과: 평균 지식은 13점 만점에 6.56점이었다. 59명(22.8%)의 간호사들만 의료관련감염관리 교육을 받은 적이 있었다. 의료관련감염관리 이행은 100점 기준으로 79.2점이며 연령, 의료관련감염관리 교육이수여부, 지침보유여부에 따라 유의한 차이를 보이지 않았다.

결론: 간호사들의 의료관련감염관리 지식은 매우 낮고 대부분은 관련 교육을 받은 적이 없었다.

따라서, 간호사들을 대상으로 한 주의지침을 포함한 의료관련감염관리 교육이 요구되며, 이를 위한 체계적인 교육프로그램과 팀구축이 필요하다.

Acknowledgements

This research was supported by Global Education Support Project through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (2014048930).

References

1. WHO. WHO web sites on World alliance for patient safety: forward programme 2008-2009. http://www.who.int/patientsafety/information_centre/reports/Alliance_Forward_Programme_2008.pdf (Updated on 25 June 2008).
2. Pittet D, Allegranzi B, Storr J, Donaldson L. 'Clean care is safer care': the global patient safety challenge 2005-2006. *Int J Infect Dis* 2006;10:419-24.
3. WHO. WHO web sites on Healthcare-associated infections fact sheet. http://www.who.int/gpsc/country_work/gpsc_ccisc_fact_sheet_en.pdf (Updated on 2013).
4. Klevens RM, Edwards JR, Richards CL Jr, Horan TC, Gaynes RP, Pollock DA, et al. Estimating health care-associated infections and deaths in U.S. hospitals, 2002. *Public Health Rep* 2007;122:160-6.
5. Magill SS, Edwards JR, Bamberg W, Beldavs ZG, Dumyati G, Kainer MA, et al; Emerging Infections Program Healthcare-Associated Infections and Antimicrobial Use Prevalence Survey Team. Multistate point-prevalence survey of health care-associated infections. *N Engl J Med* 2014;370:1198-208.
6. Smyth ET, McIlvenny G, Enstone JE, Emmerston AM, Humphreys H, Fitzpatrick F, et al; Hospital Infection Society Prevalence Survey Steering Group. Four country healthcare asso-

- ciated infection prevalence survey 2006: overview of the results. *J Hosp Infect* 2008;69:230-48.
7. Allegranzi B, Bagheri Nejad S, Combescure C, Graafmans W, Attar H, Donaldson L, et al. Burden of endemic health-care-associated infection in developing countries: systematic review and meta-analysis. *Lancet* 2011;377:228-41.
 8. Pittet D, Allegranzi B, Storr J, Bagheri Nejad S, Dziekan G, Leotsakos A, et al. Infection control as a major World Health Organization priority for developing countries. *J Hosp Infect* 2008;68:285-92.
 9. Paudyal P, Simkhada P, Bruce J. Infection control knowledge, attitude, and practice among Nepalese health care workers. *Am J Infect Control* 2008;36:595-7.
 10. Timilshina N, Ansari MA, Dayal V. Risk of infection among primary health workers in the Western Development Region, Nepal: knowledge and compliance. *J Infect Dev Ctries* 2011;5:18-22.
 11. Ohara H, Pokhrel BM, Dahal RK, Mishra SK, Kattel HP, Shrestha DL, et al. Fact-finding survey of nosocomial infection control in hospitals in Kathmandu, Nepal-a basis for improvement. *Trop Med Health* 2013;41:113-9.
 12. Shakya B, Shrestha S, Mitra T. Nasal carriage rate of methicillin resistant *Staphylococcus aureus* among at National Medical College Teaching Hospital, Birgunj, Nepal. *Nepal Med Coll J* 2010;12:26-9.
 13. Kanouff AJ, DeHaven KD, Kaplan PD. Prevention of nosocomial infections in the intensive care unit. *Crit Care Nurs Q* 2008;31:302-8.
 14. Sax H, Perneger T, Hugonnet S, Herrault P, Chraïti MN, Pittet D. Knowledge of standard and isolation precautions in a large teaching hospital. *Infect Control Hosp Epidemiol* 2005;26:298-304.
 15. Baylina P and Moreira P. Healthcare-associated infection-on developing effective control systems under a renewed healthcare management debate. *Int J Healthc Manag* 2012;5:74-84.
 16. Tenna A, Stenehjem EA, Margoles L, Kacha E, Blumberg HM, Kempker RR. Infection control knowledge, attitudes, and practices among healthcare workers in Addis Ababa, Ethiopia. *Infect Control Hosp Epidemiol* 2013;34:1289-96.
 17. Shankar PR. Attracting and retaining doctors in rural Nepal. *Rural Remote Health* 2010;10:1420.
 18. Jeong IS and Park SM. Knowledge and attitude towards pathogen transmission precautions among healthcare workers in a general hospital. *Korean J Health Promot* 2012;12:31-9.
 19. Ogoina D, Pondei K, Adetunji B, Chima G, Isichei C, Gidado S. Knowledge, attitude and practice of standard precautions of infection control by hospital workers in two tertiary hospitals in Nigeria. *J Infect Prev* 2015;16:16-22.
 20. Muralidhar S, Singh PK, Jain RK, Malhotra M, Bala M. Needle stick injuries among health care workers in a tertiary care hospital of India. *Indian J Med Res* 2010;131:405-10.