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ORIGINAL ARTICLE

Knowledge and Practices of Nurses on Prevention of Nosocomial Infection in Emergency Care Hospitals

Tengiz Verulava

Objective

Developing countries such as Georgia, face up to Nosocomial infections (Nis) which is a key problem of healthcare system. The main reason for reducing relevance to this practice is the lack of knowledge about infection control practices among healthcare workers. While nurses play a unique role in the hospital infection control processes, the goal of the study is to assess the knowledge and practices of nurses regarding NIs in emergency care hospitals.

Method

Descriptive, cross-sectional study was conducted. A total of 150 nurses were enrolled through randomized simple selection.

Results

Most of the nurses had a sufficient level of knowledge about NIs, but their practices to reduce the spread of infection were not up to a satisfactory level. There was a significant relationship between knowledge and practices, which include attending NIs training courses and practices to gain professional experience ($p<0,05$). Though, only 53.7% of interviewed nurses consider that they barely take into account the recommendations about reducing NIs. Also, only 54.5% nurses do hand hygiene activities after contacting subjects around the patient. However, there is no significant statistical connection between the knowledge about principles of hand hygiene and demographic indicators of nurses.

Conclusion

Having adequate education and practice in Nis control and prevention is a must for healthcare workers. The majority of the nurses has sufficient knowledge and practice about NIs control measures. However, possessing adequate knowledge is ineffectual until the proper application of infection control practices. Nurses need further improvement through the regular educational programs.

Prof Tengiz Verulava
MD, PhD
School of Medicine,
Caucasus University,
Tbilisi, Georgia
https://orcid.org/0000-0001-8110-5485

Nosocomial infections (NIs) are the type of infections that are acquired in the health care facility within 48 hours of admission. NIs associated with antimicrobial resistance increase patients' morbidity, mortality, length of hospital stay, and treatment cost.[1] The major risk factors for nosocomial infections are prolonged and irrelevant usage of medical items and antibiotics, improper usage of standards and isolation procedures, inadequate environmental hygiene and waste management, lack of education about the infections, safe injection, and blood transfusion.[2] According to WHO, approximately 15.0% of hospitalized patients acquire nosocomial infections (NIs).[3] Incidence of the NIs in the high-income countries ranges from 3.5% to 12.0%, in the middle- and low-income countries – from 5.7% to 19.1%[4] and about 15.0% to 40.0% of the patients are in critical care units.[5] The frequency of infection transmission in low-income countries is three times more than in high-income countries.[6]

Approximately 44% of infections are related to the usage of invasive medical items, and 2/3 of them are caused by intravenous medical devices like peripheral and central venous catheters.[7] The highest rate of the NIs is recorded in intensive and surgical care units, with a rate of 5.6 cases in every 100 patients.[8] The risks of NIs increase when standard hygienic guidelines are ignored.[9,10] The most influential factors in the prevention of NIs are the knowledge and practices of the nurses.[11] The goal of the study is to assess the knowledge and practices of nurses about NIs in emergency care hospitals in Tbilisi (Georgia).

MATERIAL AND METHODS

A descriptive, cross-sectional study was conducted in four large emergency care settings in Tbilisi Georgia. One facility was an emergency hospital, while the other three were the emergency departments of general hospitals. Three were private medical institutions and one was run by the state. The number of beds varied from 180–600, while the number of staff employed ranged from 350–500. The study was conducted between January and July 2022.

Data were collected using a self-administered questionnaire, developed by Kamunge et al[12] The questionnaire was piloted with 15 nurses before the launch of the main study and some changes were made to the wording to better accomodate the local culture and environment. The first part of the questionnaire asked participants about their demographic characteristics and training, including age, sex, education, employment status, job role, participation in infection control training sessions and workshops, and experience in infection control. The second part contained questions about healthcare-associated infection transmission and effective management. The third part examined infection control measures practised by participants, such as hand hygiene, disinfection and safe injections practice.

A 5-point Likert scale was used ('completely disagree', 'disagree', 'cannot answer', 'agree', 'completely agree'). Results were analysed using the Statistical Package for the Social Sciences version 20. Associations between participant variables and knowledge of healthcare-associated infection prevention and management were assessed using a Chisquare test, with $P<0.05$ indicating statistical significance.

A total of 150 nurses working across the four centres were invited to participate in this study through randomised (targeted) simple selection. This method of sampling enabled the study population to have an equal and independent chance of appearing in the study sample. To be eligible to participate in the study, nurses had to have at least 1 year of experience. A total of 150 questionnaires were distributed via email, of which 134 were completed, giving an 89% response rate. The sample size for this study was selected in consultation with head nurses from selected medical organisations.

The study protocol was granted ethical approval by the Bioethics Committee of the Caucasus University (No 2022–35) in January 2022. Before participating in the study, all participants gave informed consent.

RESULTS

The absolute majority of the respondents were females (n=134; 100%). The demographic data of the respondents are shown in Table 1. The majority of the nurses (69.0%; n=92) had more than 5 years of employment experience in the hospital and 69.4% (n=93) of them had taken the NIs control training course at least once (Table 1).

Most of the nurses had sufficient level of knowledge about hand hygiene. More than two-thirds of the respondents confirmed, that in patients, who are placed in the intensive care unit, the most common means of transmitting infection are hands. (88.1%; n=118) and hand hygiene is necessary after

Table 1 *Distribution of respondents by the demographics (N= 134)*

Demographics	n (%)
Age (years)	
20 - 29	28 (20.9%)
30 – 39	56 (41.8%)
40-49	36 (26.9%)
50 – 59	12 (9.0%)
60	2 (1.5%)
Sex	
Female	134 (100.0%)
Male	0 (0.0%)
Level of education	
Certificate of Vocational Education received at Nursing Trainings	42 (31.0%)
University Bachelor's Degree in Nursing	92 (69.0%)
Hospital employment duration	
≤ 5	102 (76.0%)
> 5	32 (34.0%)
Number of trainings regarding the NIs control	
0	
1-5	41 (30.6%)
6-10	93 (69.4%)
10	0 (0.0%)

contacting the patient (86.6%). The most of the nurses (73.1%; n=118) agreed that the NIs may be transmitted through the medical equipment (Table 2). Most of the nurses know about the 5 principles (70.1%; n=94) and 6 steps (67.2%; n=90) of the hands hygiene provided by the World Health Organization. However relevantly small number of the respondents (38.1%; n=51) consider that hand washing or disinfection is necessary before each contact with the patient. Further details about knowledge of nurses regarding NIs transmission are presented in Table 2.

The most of the nurses had good practices on actual actions utilized to prevent NIs. The study suggested that 84.4% (n=113) of nurses follow recommendations about using the antiseptic solutions before and after the procedure. According to the respondents, the hospital periodically monitors the knowledge regarding infection prevention and control (70.9%; n=9). Tthe majority of nurses (71.6%; n=96) periodically attend the trainings/workshops in order to prevent and control the infections. However only 54.5% (n=73) do hands

Table 2 *Knowledge of nurses regarding NIs transmission*

	Question	Disagree	Can't answer	Agree
1	Hands are most spread mean for NIs transmission	2 (1.5%)	14 (10.4%)	118 (88.1%)
2	NIs may be transmitted by medical equipment like thermometers, syringes, catheters, stethoscopes?	13 (9.7%)	23 (17.2%)	98 (73.1%)
3	NIs are mostly caused by the bacteria brought in by the hospital staff?	23 (17.1%)	41 (30.6%)	70 (52.3%)
4	NIs is an infection that the patient developed whilst at home	11 (8.2%)	37 (27.6%)	86 (64.2%)
5	In case of limited beds, patients with communicable diseases may be placed in the same ward with other patients	109 (81.3%)	16 (11.9%)	9 (6.7%)
6	Infectious patients (e.g., with respiratory system infections) should be placed in separate boxed wards	13 (9.7%)	26 (19.4%)	95 (70.9%)
7	I know 5 principles of the hand hygiene provided by the WHO	23 (17.2%)	17 (12.7%)	94 (70.1%)
8	I know 6 steps of the hand hygiene provided by the WHO	25 (18.7%)	19 (14.2%)	90 (67.2%)
9	Hand hygiene is required before contact with the patient	37 (27.6%)	46 (34.3%)	51 (38.1%)
10	Hand hygiene is required after contact with the patient	6 (4.5%)	12 (9.0%)	116 (86.6%)
11	Hand hygiene is required after contact with patient's objects and items	17 (12.7%)	30 (22.4%)	87 (64.9%)
12	Hand hygiene should be performed after removing sterile or non-sterile gloves	12 (9.0%)	37 (27.6%)	85 (63.4%)

Table 3 *Knowledge of nurses regarding NIs transmission*

	Question	Disagree	Can't answer	Agree
1	I follow recommendations of using antiseptic solutions before and after the surgical interventions	3 (2.2%)	18 (13.4%)	113 (84.4%)
2	The hospital periodically monitors the knowledge of infection prevention and control	25 (18.7%)	14 (10.4%)	95 (70.9%)
3	I annually attend the trainings / workshops related to the infection prevention and control	15 (11.2%)	23 (17.2%)	96 (71.6%)
4	Personal protection equipment is always available	8 (6.0%)	19 (14.2%)	84 (79.9%)
5	I change gloves and perfrorm hand hygiene during the patient care process when moving from the contaminated area to the clean spot (mucous, damaged skin) or after contacting any item in the patient's environment (e.g. bed parts)	16 (11.9%)	20 (14.9%)	98 (73.1%)
6	I always clean my nails	4 (3.0%)	11 (8.2%)	119 (88.8%)
7	I consider the recommendations regarding the reduction of infections transmission less, when the workload increases or during the emergencies?	23 (19.4%)	36 (26.9%)	72 (53.7%)
8	I wash my hands after contacting the items in the patient's environment	23 (17.2%)	38 (28.4%)	73 (54.5%)
9	I remove rings, watch, bracelets before starting the hand hygiene	58 (43.3%)	27 (20.1%)	49 (36.6%)

hygiene after touching the items placed around the patients and only 36.6% (n=49) remove rings, watches, bracelets before the hands hygiene. Further details are given in Table 3.

There is no statistically significant correlation between knowledge of the hands hygiene and demographic characteristics like gender and level of education (p> 0,05). However there is a significant connection between the knowledge gained while attending NIs training courses and professional practice experience (p-value<0.05) (Table 4).

Statistical correlation between the knowledge regarding the NIs and the demographics of the nurses

DISCUSSION

According to the study results, the absolute majority of respondents were women, which confirms the fact that the nursing is predominantly women's profession.[13] In order to explain this case, cultural perspective is a key. For preventing infectious

Table 4 *Statistical correlation between the knowledge regarding the NIs and the demographics of the nurses*

Demographics	Knowledge of 5 principles of hand hygiene	p-value
	94 (70.1%)	
Age (years)		
20 - 29	22 (23.4%)	
30 – 39	36 (38.3%)	
40-49	27 (28.7%)	0.865
50 – 59	8 (8.5%)	
60	1 (1.1%)	
Sex		
Female	94 (100.0%)	0.813
Male		
Level of education		
Certificate of Vocational Education received at Nursing Trainings	28 (28.0%)	0.514
University Bachelor's Degree in Nursing	66 (56.0%)	
Hospital employment duration		
≤ 5	73 (77.7%)	*0.039*
> 5	21 (22.3%)	
Number of trainings regarding the infection control		
0		
1-5		*0.041*
6-10	32 (34.0%)	
10	62 (66.0%)	

diseases, strict compliance with the universal measures of safety is the most significant.[14] The study showed that the nurses are sufficiently aware of how to control NIs transmission. The majority of the nurses who participated in the study, knows the hands hygiene guidelines and are always ready to perform them after contacting the patient. Other studies also showed the similar results[15,16] However the results of this study are not consistent with the results of some other studies.[17,18]

Also the nurses have adequate knowledge about using the antiseptic solutions before and after nursing procedures. Likewise the study also revealed the adequate knowledge of the nurses regarding safety standards of using medical equipment. Other studies also showed the similar results.[19] However despite the guidelines, some studies showed that despite the guidelines, the rates of hands hygiene compliance are still so low.[20]

The high level of the knowledge, which has been revealed in the survey, is the possible result of frequent training courses regarding NIs. In this regards, the study proves that most of the nurses (69.4%) attended annual continuing education courses about infection control at least once. This result is compatible with other studies.[21] However such result are inconsistent with some other studies, which indicated that most of the nurses did nottake any training courses about NIs.[22] This contrast in results could be the result of the actual difference in in-service training-related policy.

It is also noteworthy that 27.6% (n=37) of the nurses disagree the necessity of the hand hygiene before contacting the patient, and 43.3% (n=58) don't agree with the protocol of removing rings, watches, bracelets before starting the hands hygiene, also, 19.4% (n=23) do not fully consider recommendations about reducing the infections transmission during increased workload or emergency situations. The mentioned facts show, that in order to stop the transmission of NIs and to ensure patients safety, high level of knowledge isn't sufficient. Regular monitoring, adequate development of human and material resources are essential.

The study showed that the experience was crucial for nurses to have the better level of knowledge. Our study results correspond with other studies proving that the more professional experience you have, the greater level of knowledge you gain.[23] This results could be due to the existing connection between theory and practice.

There is no statistically significant correlation between knowledge of the hands hygiene and demographic characteristics like gender and level of education (p> 0,05) corresponding with some other studies.[24] Significant statistical correlation exists (p<0,05) between knowledge of the hands hygiene and number of the training courses regarding NIs which is equivalent to other studies.[25] Also there was a significant relationship between knowledge and professional practice experience in the present study. This result is also analogous in other studies.[26]

LIMITATIONS

This study was conducted among a relatively low number of participants, given the size >of the nursing community in Georgia and worldwide. Therefore these results may not be >generalisable to other centres. The study also only assessed nurses' theoretical knowledge and so could not necessarily capture their practice. Future studies should assess nurses in the workplace, examining how closely they implement infection control measures, to shed more light on this area. Since the patients' medical records were not available, differentiating between infection, colonisation and contamination was not possible and associations between the pathogens, severity of infections and outcomes cannot be established.

CONCLUSION

Adequate education and good practice in healthcare-associated infection management and prevention is essential for healthcare workers. Although the majority of the nurses in this study had sufficient knowledge, attitudes and practices about healthcare-associated infection management measures, some recommendations were not always followed. This suggests that more regular education is needed on infection control to improve knowledge about the prevention and management of healthcare-associated infections, according to international standards. There is also an urgent need to establish infection management practices and comprehensive surveillance systems in medical organisations to maximise the quality of patient care. An organisational culture that focuses on infection control practices could reduce the incidence of healthcare-associated infections..

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REFERENCES

1. Prieto-Andrés P, Mareca-Doñate R, Moliner-Lahoz J Impact on Morbidity Mortality and Length of Stay of Hospital-Acquired Infections by Resistant Microorganisms. Clinical Infectious Diseases 2017;65:(4)644–52.
2. Ak O, Batirel A, Ozer S, Çolakoğlu S Nosocomial infections and risk factors in the intensive care unit of a teaching and research hospital: a prospective cohort study. Med Sci Monit 2011;17:(5)PH29-34.
3. Emily RM, Sydnor TMP Hospital epidemiology and infection control in acute-care settings. Clin Microbiol Rev 2011;24:141-73.
4. WHO The burden of health care-associated infection worldwide. 2016. Available from: http://www.who.int/gpsc/country_work/burden_hcai/en/
5. Guideline for Hand Hygiene in Health-Care Settings: Recommendations of the Healthcare Infection Control Practices Advisory Committee and the HICPAC/SHEA/APIC/IDSA Hand Hygiene Taskforce', Morbidity Mortality Weekly Report CDC 2010; 51(RR-16), 1-48
6. Nejad SB, Syed SB, Ellis B, Pittet D Health-care-associated infection in Africa: a systematic review. Bull World Health Org 2011;89:757-65.
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. Rosenthal VD, Maki DG, Mehta Y, Leblebicioglu H, Memish ZA, Al-Mousa HH, et al International Nosocomial Infection Control Consortium (INICC) report, data summary of 43 countries for 2007-2012. Device-associated module. Am J Infect Control 2014;42:942-56.
9. Xiong L, Sheng G, Fan ZM, Yang H, Hwang FJ, Zhu BW Environmental Design Strategies to Decrease the Risk of Nosocomial Infection in Medical Buildings Using a Hybrid MCDM Model. J Healthc Eng. 2021;15:5534607.
10. Borg MA Addressing the challenge of antibiotic resistance in Maltese healthcare settings. Malta Medical Journal 2009;21:(2)7-12.
11. Foga Sebro S, Birhanu M, Bilal A, Sahle T Knowledge and practice toward hospital-acquired infections prevention and associated factors among nurses working at university referral hospitals in Southern Nations Nationalities and Peoples' Region Ethiopia 2021. SAGE Open Med. 2023;24;11:20503121221149362.
12. Kamunge EW, Cahill T, Zipp G, Parasher R Exploring Knowledge Attitudes and Practices of Registered Nurses Regarding the Spread of Nosocomial Infections. Antimicrob Resist Infect Control 2015; 4 (suppl 1):60.
13. Mao A, Cheong PL, Van IK, Tam HL "I am called girl, but that doesn't matter" - perspectives of male nurses regarding gender-related advantages and disadvantages in professional development. BMC Nurs. 2021;20;20:(1)24.
14. Alhumaid S, Al Mutair A, Al Alawi Z et al Knowledge of infection prevention and control among healthcare workers and factors influencing compliance: a systematic review. Antimicrob Resist Infect Control 2021;10:86.
15. Sodhi K, Shrivastava A, Arya M, Kumar M Knowledge of infection control practices among intensive care nurses in a tertiary care hospital. J Infect Public Health 2013;6:269-75.
16. Odetola TD, Adekanye OE Knowledge of Prevention and Contributory Factors of Nosocomial Infections among Nurses in a Tertiary Hospital in Ibadan Nigeria. Ann Nurs Pract 2017;4:1079.
17. Ghadmgahi F, Zighaimat F, Ebadi A, Houshmand A Knowledge attitude and self-efficacy of nursing staffs in hospital infections control. Journal Mil Med 2011;13:167-72.
18. Sodhi K, Shrivastava A, Arya M, Kumar M Knowledge of infection control practices among intensive care nurses in a tertiary care hospital. J Infect Public Health 2013; 6:(4)269-75.

19. Vaismoradi M, Tella S, A Logan P, Khakurel J, Vizcaya-Moreno F Nurses' Adherence to Patient Safety Principles: A Systematic Review. Int J Environ Res Public Health 2020;19;17:(6)2028.
20. Anghele M, Chicoş Şt. Incidence of Surgical wound infections after abdominal surgery in General surgery department. Archives of the Balkan Medical Union 2013;48:(2)141-4.
21. Papagheorghe R, Angelescu N, Burcoş, T, Pârvulescu, M Nosocomial infections with multidrug resistance bacteria in patients with surgical conditions. Archives of the Balkan Medical Union 2010;45:(3)209-16.
22. Fashafsheh I, Ayed A, Eqtait F, Harazneh L Knowledge and practice of nursing staff towards infection control measures in the Palestinian hospitals. J Educ Pract 2015;6:(4)79–90.
23. Rangelova V, Kevorkyan A, Krasteva M Nosocomial infections in the neonatal intensive care unit. Archives of the Balkan Medical Union 2020;55:(1)121-7.
24. Gawad A Assessment of knowledge about standard precautions and nosocomial infection among nurses working in hospitals of Sana'a city, Yemen. Int J Caring Sci 2017;10.(1)
25. Ghadmgahi F, Zighaimat F, Ebadi A, Houshmand A Knowledge attitude and self-efficacy of nursing staffs in hospital infections control. Journal Mil Med 2011;13:(3)167-72.
26. Laustsen CE, Petersson P, Westergren A et al Involvement of professionals in research: knowledge integration, development of practice, and challenges: a group concept mapping study. Health Res Policy Sys 2021;19:115.