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Knowledge, attitude, and practice of nurse aids and service staff about nosocomial infection control: A case study in Iran

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Abstract

Background: Hospital-acquired infection (HAI) or nosocomial infection is a major public health concern. In this study, the status of knowledge, attitude, and practice (KAP) of service staff and nurse aids in reference to HAI was investigated.

Methods: This descriptive-analytic study was carried out to investigate KAP in two steps design and measurement. Twenty-five hospitals were included in this study. To collect data, a questionnaire comprised of 8 divisions and 45 questions was designed and validated, and the three sections of KAP were listed. The questionnaire was distributed to 405 nurse aids and service staff to determine their level of KAP towards HAI. The data were analyzed using SPSS 18.

Results: The mean ± standard deviation values of KAP of the included staff were 7.07 ± 1.97, 23.08 ± 4.38, and 35.83 ± 8.25, respectively. A statistically significant difference was observed in the level of KAP of personnel among different hospitals ($P<0.001$). The type of employment status and education was found to be significantly influential on knowledge ($P=0.027$, $P<0.001$) and level of education. Marital status, education and career experience were found to be significantly influential on attitude ($P=0.034$, $P=0.004$ and 0.045). Level of education, job category, career experience, and gender were the significant influential factors on practice ($P<0.05$).

Conclusion: The knowledge and practice levels were low in many nurse aids and service staff. An educational plan and compiled programs in hospital infection control seem to be necessary to effectively control the major concern of HAI in hospitals in Iran.

Keywords: Cross infection, Health knowledge, Attitude, Practice, Nurses

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Introduction

Healthcare systems are one of the most critical health-oriented organizations in any country confronting serious issues. One of such issues is the hospital-acquired infection (HAI) or nosocomial infection defined as infections or complications secondary to procedures taking place in hospitals (1).

HAI has always been a grave problem for healthcare systems, and it continues to grow in importance, challenging global and national health systems and adds heavy costs and financial burden (2-4). Nowadays, with the increased number of healthcare centers, the emergence and re-emergence of novel and existing diseases, increasing microbial resistance, and the demand for various medical services, the occurrence of HAI during the provision of health services has become

inevitable (5). Thus, hospital infection control is currently a global priority. HAIs are categories of infections that take place as a result of admission either in hospitals or other health centers with criteria of not being infected nor being in the incubation period of the infection in the pre-hospitalization period. Additionally, HAIs are classified as the appearance of symptoms at least 48 to 72 hours post-hospitalization and the occurrence of infection for a maximum of 6 weeks after hospital discharge excluding the incubation period.

The risk of HAI exists in developed countries and in the most modern and equipped hospitals and centers (6,7). The determining risk factors of HAI in hospitals are inappropriate storage and unsanitary disposal of hospital wastes, patient's age, patient's health status, and organ transplants demanding the use of immunosuppressive drugs. The lack of knowledge about HAI in staff and healthcare workers can lead to improper execution of medical procedures, poor practice of infection control policies, and incorrect use of invasive devices such as catheters, lack of guidelines, and the presence of antibiotic-resistant microorganisms (8-10).

The pathogens that cause hospital infections can be bacteria, viruses, and parasitic fungi. The prevalence of such pathogenic agents depends on the number of patients with different complications, medical facilities and equipment, and hospital environment and sanitation (11,12). Any organ of the body exposed to pathogens can be infected, but the most common hospital infections are urinary tract infections, surgical wound infections, lower respiratory tract infections (e.g., pneumonia), and infections of the circulatory system. It has been reported that 50% of all surgical infections occur due to antibiotic resistance (13,14).

According to the World Health Organization (WHO) report, the estimated prevalence of HAI in the United States, high-income countries, and developing countries are 4.5%, 7.6%, and 5.7-19.1%, respectively (8). In Iran, based on a systematic review, the estimated prevalence of hospital infection was 0.32% to 9.1% (15). Knowledge, attitude, and practice (KAP) of hospital personnel, especially nurse aids and service staff who directly and indirectly contact patients, are decisive in the prevalence and control of HAI's (16-18). The service staff are responsible for proper disposal of hospital wastes, environmental cleaning, and disinfection of surfaces and the environment. Their lack of knowledge about the principles and protocols of disinfection, sterilization, sanitary disposal, and cleaning of different hospital wards affects the prevalence and control of HAI's (16-19). Previous research was primarily focused on evaluating knowledge, attitude, and clinical staff practice, and no research has been conducted to study the nurse aids and service staff. Therefore, this research project addresses the level of KAP of nurse aids and service staff.

Materials and Methods

Study area

This descriptive-analytic study was conducted in the selected hospitals of Tehran, the capital of Iran, in 2019. In Iran, hospitals are classified based on their ownership such as public, private, military, charity, and social security organization hospitals. Additionally, based on the number of beds, hospitals are classified into small (less than 100 beds), medium (100-320 beds), large (up to 600 beds), very large (up to 1000 beds), and complex hospitals (greater than 1000 beds). The study sites were chosen based on the above-mentioned categories.

Questionnaire design

In this study, the questionnaire was designed based on literature review, and national and international databases were used to measure the KAP among the hospital staff (20-34). After consulting with hospital infection control experts and university faculties, the questions were selected from a question bank. A total of 45 questions were included that were subdivided into three sections of KAP, each containing 15 questions. The questionnaire covers basic concepts, hand sanitation, personal protection, standard cautions, sterilization, immunization, waste, and occupational exposure (see Supplementary file). The measurement criteria in the knowledge section were based on "correct" and "false" responses. The statements of the attitude section were set in three options of "often," "sometimes," and "never" based on the Likert scale. The statements of the practice section were also based on the Likert scale with five scaled options of "always," "often," "sometimes," "seldom," and "never," each with their own given scores.

After finalizing the design, the content validity index (CVI) and content validity ratio (CVR) were used to quantitatively assess the content validity (24,35). The content validity ratio and content validity index of the questionnaire were 0.8-1. To measure the questionnaires reliability, 3 to 15 people were assessed as a sample (25). For each item, four people were evaluated for each question. Consequently, 180 questionnaires were distributed, and finally, 130 questionnaires were completed and returned. The questionnaires were analyzed using SPSS version 18. The Kuder-Richardson test for the knowledge section and the Cronbach's alpha test for the attitude and the practice sections were used. The Kuder-Richardson index was calculated to be KR20 = 0.7 for the knowledge. Cronbach's alpha coefficient was 0.76 and 0.71 for the attitude and practice, respectively (25).

Sampling, data collection, and analysis

To save time and costs, proper coordination with the hospitals, and increasing reliability of the results, one hospital from every six hospitals that were affiliated with an organization was selected. Eventually, 25 hospitals were

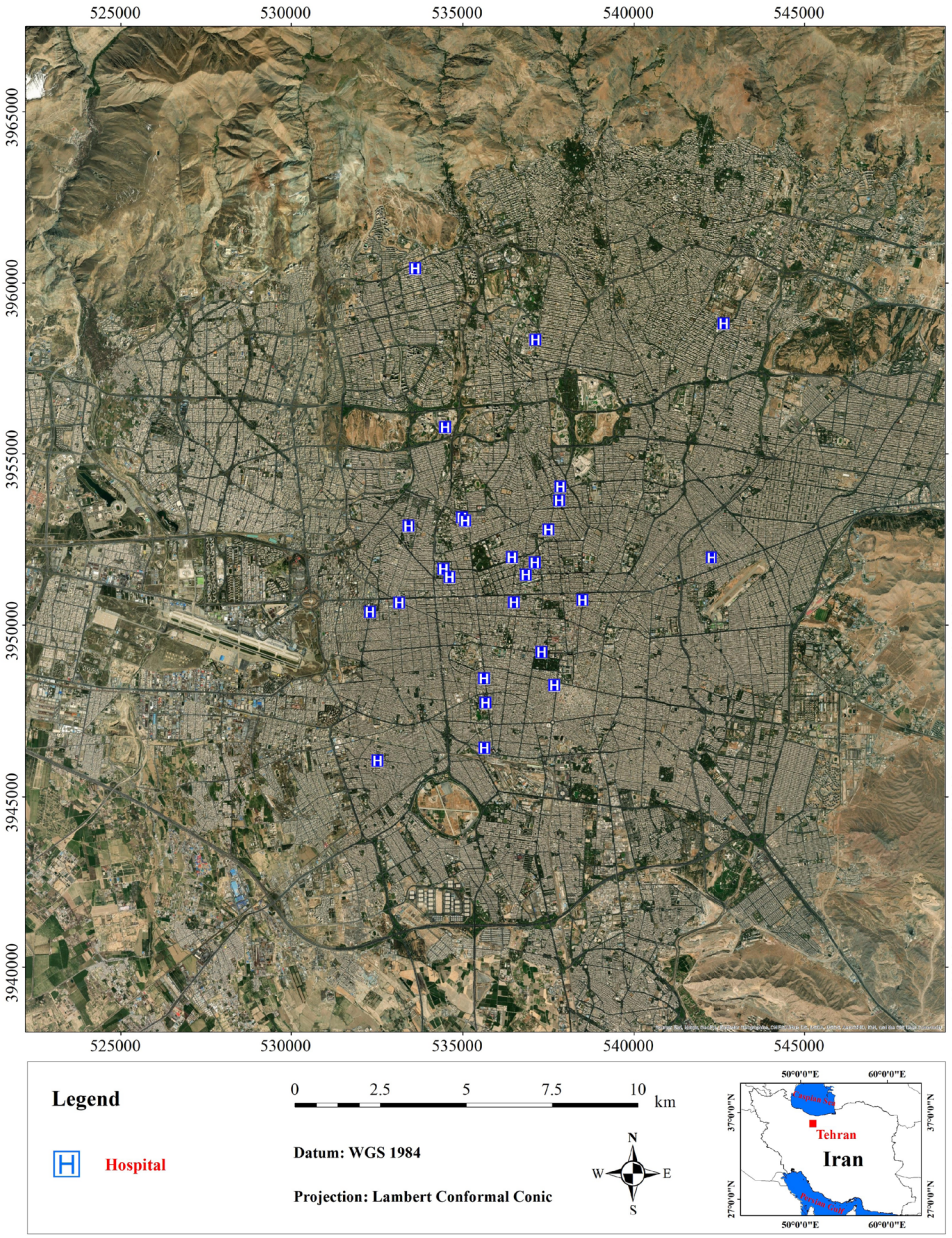

Figure 1. Geographic location of Tehran province and hospital sampling stations (19)

selected, including public university hospitals, private hospitals, charity hospitals, social security hospital, and one military hospital (Figure 1). The included study population were all service staff personnel and nurse aids of all hospital wards. The inclusion criteria were occupation in hospital and providing informed consent prior to the study. To determine the sample size (since no previous study was carried out concerning KAP in non-clinical personnel), nine participants per each question was selected. The questionnaire was finally distributed among 405 non-clinical staff of the selected hospitals. The sample size of each hospital was defined based on job categories and the questionnaire was distributed in a stratified way.

After completing the questionnaires, the data were analyzed using SPSS version 18. The criteria for measuring the level of knowledge were the number of correct responses, assigning 1 point for a correct response, and 0 for an incorrect response. After counting the points, the level of knowledge of each person was classified into three levels: weak (0-4), average (5-9), and good (10-15). In addition, the attitude statements were classified into three groups of disagree (0-9), neither agree nor disagree (neutral or impartial) (10-19), and agree (20-30). The responses of the practice section were scored and categorized based on doing or not doing one of the intended standards into three levels of poor (0-19), average (10-19), and good (40-60). The results of the Kolmogorov-Smirnov test for evaluating the normal distribution of the data indicated that the data follow a

normal distribution ($P>0.05$). To compare KAP between different groups, one-way ANOVA and t-test were used. To examine the relationship between knowledge, attitude, and clinical personnel practice, the Pearson's correlation coefficient was used.

Results

Characteristics of participants and assessment of KAP

Among 405 questionnaires distributed among service staff and nurse aids in the selected hospitals, 95.5% of them were completed and returned to the investigators. According to the results, 49.1% of the participants were female, and 50.9% were male; 81.7% were formally hired while 17.1% were contracted and 5% were yearly; 24% of the participants aged below 30 years; 53.7% aged 31-40 years; 38.2% of the participants were nurse aids while 61.7% were service staff (Table 1).

The mean value of knowledge among the service staff and nurse aids was 7.07 ± 1.97. As shown in Table 2, 11.2% of the personnel showed lower knowledge, 79.8% average knowledge, and 8.5% had good knowledge. The highest level of knowledge was related to the familiarity with categories: 64.3% had good knowledge, 26.6% moderate, and 9% poor knowledge. The lowest level of knowledge was related to the reference standard precautions; 23% had good knowledge, 69% moderate, and 8% poor knowledge (Table 2).

The mean value of attitude in the study population was 23.08 ± 4.38. In this section, 0.8% of the personnel had a negative attitude, 17.6% had a neutral attitude, and 81.7% showed a positive attitude (Table 2). The highest positive attitude (97.7%) was related to occupational exposure and hand hygiene, and the lowest attitude level (70.8%) was related to immunization (Table 2).

In the practice section, the personnel's mean score was 35.83 ± 8.25, and 1.8% showed low scores; 62.8% had average practice, and 35.4% showed good practice (Table 2). The highest practice score (97.2%) was observed in hand hygiene and the lowest practice score (31%) was related to standard precautions and personal protection. Overall, 30% of personnel had good practice, 60.5% moderate, and 9.6% had low practice scores (Table 2).

Table 1. Characteristics of participants included in measuring knowledge, attitude, and practice of service staff and nurse aids in the selected hospitals of Tehran, Iran

Variable		Number	Percent
Age	≤30	93	24
	31-40	208	53.75
	41-50	66	17
	≥51	20	5.16
Field of profession	Nurse aids	148	38.24
	Service staff	239	61.75
Education	Associate degree	316	81.65
	Bachelor	66	17
	Master of science	5	1.29
Employment status	Officially hired	7	1.80
	Contract	35	9
	Contractual	243	62.79
	Corporate	102	26.4
Gender	Female	190	49.1
	Male	197	50.9
Marital status	Single	96	24.8
	Married	291	75.19

Investigation of correlation of KAP sections and basic characteristics

Based on Table 3, the effects of age, education, job category, career experience, employment status, working shifts, and gender as influential factors on KAP were investigated. It was found that employment status was significantly influential on the level of knowledge ($P=0.027$); there is a statistically significant difference between workers with different educational levels ($P<0.001$). This difference was notable between the employees who obtained an associate's degree and the employees with bachelor's ($P=0.04$) and master's degrees ($P=0.001$). Furthermore, the mean of attitude score showed a statistically significant difference between workers with different career experience ($P=0.045$).

Mean comparison of practice scores in personnel with different education, the field of work, career experience, and gender were different ($P<0.05$). There was a significant difference between employees' average performance and their education ($P=0.005$), and career experience ($P=0.049$). According to the results, the average practice score of nurse aids was higher than service staff employees (Table 3).According to Table 4, the results revealed a significant difference in KAP among the staff of different hospitals (with $P=0.009$, $P<0.0001$, and $P<0.0001$, respectively).

Discussion

This study investigated KAP towards HAI in nurse aids and service staff in Iran. The major finding of this study was that the level of knowledge and practice of the studied personnel was mediocre/moderate. Also, the attitude was positive in most of the hospital's nurse aids and service staff. Such discrepancies in the results can be due to hospital educational programs, instructions, protocols, supervision, actions of the infection control committee, personnel interest of their vocation, and educational level.

The infection prevention process requires an effective interventions between the susceptible host and the pathogenic microorganisms (22), a significant component of safe and high-quality service. HAI is highly associated with intervention strategies such as hand hygiene. According to the results of this study, the highest level of

Table 2. Frequency and mean of responses to knowledge, attitude, and practice (KAP) questions by service staff and nurse aids in the selected hospitals of Tehran, Iran

Scope of Items		Knowledge	Practice	Attitude	
Familiarity with concepts	Poor	35	-	Disagree	87
	Moderate	103	-	Neither disagree nor agree	12
	Good	249	-	Agree	288
Standard precautions and personal protection	Poor	31	120	Disagree	66
	Moderate	267	193	Neither disagree nor agree	34
	Good	89	74	Agree	287
Sterilization	Poor	67	24	Disagree	11
	Moderate	227	274	Neither disagree nor agree	94
	Good	93	89	Agree	282
Immunization	Poor	-	-	Disagree	49
	Moderate	-	-	Neither disagree nor agree	64
	Good	-		Agree	274
Hand hygiene	Poor	-	4	Disagree	9
	Moderate	-	7	Neither disagree nor agree	-
	Good	-	376	Agree	378
Solid Waste	Poor	-	37	Disagree	85
	Moderate	-	234	Neither disagree nor agree	26
	Good	-	116	Agree	276
Occupational exposure	Poor	-	10	Disagree	6
	Moderate	-	103	Neither disagree nor agree	3
	Good	-	274	Agree	378
All Items	Poor	45	7	Disagree	3
	Moderate	309	243	Neither disagree nor agree	68
	Good	33	137	Agree	316
Mean of all items		7.07±1.97	8.25±35.83		23.08±4.38

knowledge was observed in familiarity with the categories section. The highest scores of attitude and practice were found in hand hygiene. However, in some other studies, the rate of practice has been low (8,22,23).

Furthermore, the practice of 30% of nurse aids and service staff in waste separation has been good. According to a study in Oman, 75% of service staff personnel have performed satisfactorily in this area. Additionally, in a survey conducted in India, nurses' practice on waste was higher than that of service staff personnel (26).

Standard precautions such as safety, isolation precautions (contact, droplets, and air precautions) (31), patient bathing (32), overuse of antibiotics, vaccination, ambient cleaning, disinfection and antisepticise (33,34), a comprehensive unit-based safety program, and monitoring are the most critical steps in infection control. To control and diagnose nosocomial infections, monitoring real-time data was most helpful to physicians (36,37).

In terms of the practice section, 35.4% of the staff had a good score, similar to a study conducted in a hospital in Egypt (38) and another in Ethiopia (39). However, the practice level was lower than that reported in some other studies (19,39,40). This discrepancy may be due to differences in knowledge about infection prevention, methodology, sample size, community differences, lack of in-service training, and lack of commitment from infection prevention specialists.

According to the results, the average practice score of nurse aids was higher than that of service staff personnel. The reason could be the existence of well-organized and systematic plans of theoretical and practical courses for nurse aids in Iran. Unfortunately, such programs are not intended for service staff personnel. In contrast, the healthcare system's view towards service staff personnel is not scientific and specialized and the position is supposed to be supportive.

According to studies, various factors such as age, career experience, education, occupation, gender and employment classification can affect the level of KAP (19,29,30). In this study, education significantly affected KAP ($P<0.05$). This effect may have been due to higher education in reference to nosocomial infections (19,21). Gender also affects practice.

In this study, the average practice in women was higher than men's, which is not consistent with the results of

Table 3. Mean and standard deviation of scores of knowledge, attitude, and practice (KAP) questions of service staff and nurse aids stratified based on the participants' characteristics

Parameters	Demographic information	Knowledge			Attitude			Practice		
		Mean±SD	Test statistics	*P* value	Mean±SD	Test statistics	*P* value	Mean±SD	Test statistics	*P* value
Age**	≤30	6.89±2.13	0.604	0.613	22.65±5.03	0.913	0.435	34.43±8.32	1.281	0.281
	31-40	7.20±1.93			23.13±4.37			36.42±8.22		
	41-50	6.97±1.90			23.71±3.42			35.79±7.65		
	≥51	7.00±1.84			22.45±3.98			36.40±9.85		
Education**	Associate Degree	7.01±1.93	10.24	<0.001	22.91±4.57	5.62	0.004	35.20±8.11	5.456	0.005
	Bachelor	7.64±1.84			24.26±2.86			38.85±8.39		
	Master of science	3.80±2.49			18.40±4.39			35.80±7.66		
Job category**	Nurse aids	7.22±1.87	0.624	0.267	22.67±4.18	0.694	0.146	37.00±8.08	2.20	0.028
	Service staff	6.99±2.03			23.33±4.49			35.11±8.28		
Career experience job category**	<10	7.15±2.13	0.397	0.672	23.17±4.52	3.117	0.045	35.83±7.88	3.045	0.049
	11-20	6.96±1.72			23.36±3.72			36.60±9.24		
	>20	7.00±1.68			21.20±5.45			32.50±5.38		
Employment status**	Official hiring	7.57±3.36	2.76	0.027	22.29±4.23	0.254	0.90	41.00±5.66	1.795	0.129
	Contract	7.06±2.29			23.51±3.60			37.91±7.71		
	Contractual	7.13±1.74			22.98±4.39			35.21±8.53		
	Corporate	5.44±2.70			23.89±4.04			34.44±10.49		
	The tender	7.20±2.13			23.15±4.69			36.43±7.43		
Shift**	Morning	7.15±2.26	1.39	0.246	23.13±4.14	0.494	0.68	35.50±6.91	2.210	0.086
	Evening	6.87±1.65			23.53±3.43			38.09±8.62		
	Night	7.65±1.81			23.56±3.75			37.71±9.07		
	In circulation	6.96±1.82			22.83±4.88			35.14±8.84		
Gender**	Female	7.12±1.93	0.652	0.252	23.22±3.81	3.49	0.53	36.71±8.05	0.487	0.039
	Male	7.03±2.01			22.94±4.87			34.98±8.37		
Marital status*	Single	6.82±2.26	4.98	0.148	23.02±4.03	0.879	0.034	34.82±7.37	2.661	0.167
	Married	7.16±1.86			23.11±4.49			36.16±8.50		

* *T* test, $P<0.05$.
** One-way analysis of variance, $P<0.05$.

Table 4. The average and standard deviation of knowledge, attitude, and practice (KAP) scores of service staff and nurse aids in different types of hospitals

	Knowledge	*P* value	Attitude	*P* value	Practice	*P* value
Large complex	7.68±1.82	0.009	24.40±2.81	0.000	32.49±4.29	0.000
Large hospital	7.29±1.95		23.90±3.34		39.90±7.96	
Moderate	6.78±1.97		22.09±4.96		34.19±8.23	
Small	7.23±1.21		24.30±4.00		39.81±6.95	
Public hospital	6.94±2.05	0.233	22.52±4.58	0.006	33.63±7.69	0.000
Private	7.09±1.57		24.36±4.18		37.31±7.93	
Military	7.60±2.01		24.30±3.53		42.20±7.55	
Charity	7.38±1.50		23.85±4.16		40.69±6.55	
Social security	7.57±1.93		24.42±2.98		43.34±5.73	

a similar previous study (30). This difference may be due to sample size, participant's education, and career experience. Similarly, in a study conducted in South Africa and Nigeria, the women practice ratings were higher than men (21).

Career experience is another factor that has affected the attitude and practice of personnel. In this study, the level of attitude and knowledge in employees who had 11-20 years of career experience was higher than the other two groups (less than 10 years and over 20 years). According to similar studies, high career experience positively affects personnel's knowledge, due to more career experience,

the amount of training and receiving new training to control HAI (19,21,41).

The results of this study showed that increasing career experience, to a certain extent, can affect attitudes and practice. Because personnel with very high career experience may not have updated infection control guidance, information and their accuracy in following the instructions could have decreased due to increased work load.

Employment status also affected the level of knowledge; personnel who have been formally employed had a higher level of awareness than other employment groups. This could be due to the confidence resulting from the employment stability and increased training of updated policies. In this survey, there was a significant relationship between the KAP sections, which is similar to the result of other studies in this field (20,28).

According to other studies, knowledge is the background of attitude and practice, but high awareness does not lead to a better practice in some cases. In addition to knowledge, other factors such as interest in the work environment, the existence of equipment control, and monitoring of practice are factors that hospitals must support for effective mitigation (20,28). One of the limitations of this survey is covering only hospitals in Tehran, Iran, and potentially missing nation-wide trends that are associated with this survey. However, the included population and the variety of hospitals included in the study are the most important strength points of this survey. Also, the introduced tool for measuring KAP towards HAI could be used in further investigations to study the state of other nurse aids and service staff personnel in Iran.

Conclusion

In this study, more than two-thirds of the nurse aids and service staff personnel had poor levels of knowledge and practice in regard to HAI. Individual factors, gender, education, career experience, occupation, employment type, and hospital type, affected KAP. Therefore, it is essential to develop policies, prevention programs, and conduct ongoing training to increase knowledge, strengthen positive attitudes in staff, correct discrepancies, provide necessary equipment and facilities, and oversee the infection control of all hospital staff, especially nurse aids and service staff personnel, as these staff play a crucial role in hospital environmental health and controlling HAI.

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Authors' contribution

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Competing interests

The authors declare that they have no competing interests.

Ethical issues

The authors certify that this manuscript is the original work of the authors.

Supplementary files

Supplementary file. Questionnaire to measure knowledge, attitude and performance of nurse aids and service staffs in relation to nosocomial infections.

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