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Awareness among sample of Iraqi nursing staff in the intensive care units regarding contaminated stethoscopes as a source of nosocomial infections

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Abstract

Background: Nosocomial infection is one of the main causes of increased morbidity and mortality in hospitalized individuals, especially in developing countries. Stethoscopes are thought to have the potential to spread infectious organisms, which could lead to healthcare-associated infections.

Aim: Assessment of the awareness of the nursing staff in the intensive care units regarding the stethoscope as a potential source of nosocomial infection.

Method: A cross-sectional study was conducted in intensive care units during the period from 1st of January to 1st of July 2025. A convenient sample of 100 nurses was enrolled in the current study. The data was collected by a self-administered questionnaire. The questionnaire included closed-ended questions to assess the knowledge and practice toward the stethoscope as a potential source of nosocomial infection. The awareness was calculated as each correct answer was signed as 1 while the incorrect answer was signed 0, consequently, the score of awareness ranges from 0 to 10.

Results: More than half of the participants had moderate knowledge (51%), 27% of them had good knowledge, and 22% had poor knowledge. More than half of the participants followed the correct practice regarding the interval to clean and disinfect their stethoscopes. The proportion of participants with good knowledge was significantly higher among participants who were employed for more than 20 years than among others (P-value=0.004). Furthermore, it was significantly higher among participants who had training about cleaning and disinfection of medical instruments (P-value=0.002). The percentages of participants with good knowledge were significantly higher among participants who followed correct practice regarding the cleaning interval for intact and non-intact stethoscopes (P-values were 0.027 and 0.030, respectively).

Conclusion: Most of the participants had a moderate to good level of knowledge, and more than half of them obeyed correct practice regarding the cleaning and disinfection of the stethoscope. Duration of employment and training programs significantly affected the level of knowledge, which in turn affected the practice of participants.

Keywords: Nosocomial infections, stethoscope contamination, nursing staff awareness, intensive care units, infection control practices, Iraq

Introduction

Nosocomial infections, or hospital-acquired infections, are illnesses that patients get during their healthcare treatment in hospitals or other medical institutions. These infections often emerge after 48 hours of admission and are neither present nor incubating at the time of admission^[1]. Nosocomial infections are a primary contributor to elevated morbidity and death rates in hospitalized individuals, especially in developing countries^[2]. In addition, it led to several impacts on the healthcare system, patients and their families, and the community, including economic and social impacts^[3]. Worldwide, nosocomial infections impact around 100 million people annually^[4]. The incidence of nosocomial infection is substantially higher in developed countries, with an average prevalence of 15.5%^[5]. In intensive care units, nosocomial infections are more severe, with prevalence rates varying from 9.1% in the United States to around 23.0%-23.5% in Europe and England, and much higher in low- and middle-income countries, with a pooled prevalence of 35.2%^[5]. The most common nosocomial infections incorporate central line-associated bloodstream infections, followed by catheter-associated urinary tract infections, then surgical site infections, and ventilator-associated pneumonia^[6, 7]. Pathogens from the patient's indigenous flora may

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induce infections if they are introduced to the tissue wound or surgical site. Furthermore, the transfer of infections occurred during treatment by direct contact with patients (saliva, hands, and other bodily fluids) and by staff via direct contact or other environmental sources (food, water, other bodily fluids). Moreover, viruses residing in the healthcare environment, such as water, food, and equipment, might serve as a transmission source^[6]. Approximately 90% of hospital-acquired illnesses are attributable to bacteria. Common bacteria responsible for nosocomial infections include *Staphylococcus* spp., particularly *S. aureus*, *Bacillus cereus*, *Streptococcus* spp., *Acinetobacter* spp., *Pseudomonas aeruginosa*, *Enterococcus* spp., *Proteus mirabilis*, *Escherichia coli*, *Salmonella* spp., *Klebsiella pneumoniae*, and *Serratia marcescens*, with *E. coli*, *Enterococcus* spp., *S. aureus*, and *P. aeruginosa* being the predominant pathogens^[8]. Many viruses are considered a cause for nosocomial infections, including hepatitis B and C, respiratory syncytial virus, enteroviruses, rotavirus, Ebola, cytomegalo virus, HIV, herpes simplex virus, influenza viruses, and varicella-zoster virus^[9]. In addition, the fungal infection may cause nosocomial infections, especially among very sick patients or those with a weak immune system^[10]. Stethoscopes are believed to possess the capability to disseminate infectious agents, potentially resulting in healthcare-associated illnesses^[11]. This is due to its universal use by healthcare providers and its direct contact with patients than medical devices used in invasive interventions^[12, 13]. Thus, the cleaning of stethoscopes mitigates infection transmission, especially in managing the dissemination of Methicillin-Resistant *Staphylococcus aureus* (MRSA) in hospitals, since it is clinically pertinent for infection management^[11]. The Centers for Disease Control classify the stethoscope as a “non-critical medical device” and advise decontamination after each patient interaction. In the event that a stethoscope gets contaminated with blood, such as during hemodialysis, a tuberculocidal disinfectant or one with explicit claims for viral hepatitis and human immunodeficiency virus must be used (for instance, a 1:100 dilution of a hypochlorite solution containing 500-600 ppm free chlorine)^[14]. Ethanol at 90%, chlorhexidine, Ethanol-Based Hands Sanitizer, triclosan, 66% ethyl alcohol, sodium hypochlorite, isopropyl alcohol, and benzalkonium chloride show to reduce bacterial presence on the surface of stethoscopes^[15]. The assessment of awareness is a potent research instrument used in both quantitative and qualitative studies. The gathered data enables researchers to discern probable misconceptions, formulate future studies, and direct the populace towards ideal health results. Furthermore, these investigations may identify unique strengths and weaknesses, which can inform the structuring or updating of educational programs to enhance overall awareness within a particular group^[16].

Aims of the study: Assessment of the awareness of the nursing staff in the intensive care units regarding the

stethoscope as a potential source of nosocomial infection.

Subjects and Methods

A cross-sectional study was conducted in intensive care units in Baghdad during the period from 1st of January to 1st of July 2025. A convenient sample of 100 nurses who completed the questionnaire form was enrolled in the current study. The data was collected by a self-administered questionnaire. The questionnaire included closed-ended questions and was adopted by the researcher to assess the knowledge and practice toward the stethoscope as a potential source of nosocomial infection. The awareness of each participant was calculated as each correct answer was given a score of 1 while the incorrect answer was signed 0, consequently, the score of awareness ranges from 0 to 10. Participants who had a score of ≤ 4 were considered to have poor knowledge, 5-7 moderate knowledge, and those who had a score of >7 were considered to have poor knowledge

Statistical Analysis: The collected data were analyzed using SPSS, version 22. Descriptive statistics were presented as frequencies and were applied to explain the characteristics of participants. The study groups were compared by the chi-squared test. A P-value less than 0.05 was considered statistically significant.

Ethical Considerations: All participants were assured of anonymity and confidentiality of responses.

Results

A total of 100 participants were enrolled in the current study, and males constituted the largest percentage of the sample (52.2%). The largest percentage of the participants were employed for 11-20 years. About 60% of the participants revealed that they had training about cleaning and disinfection of medical instruments (table 1).

Table 1: Distribution of the participants according to gender and stage, duration of employment

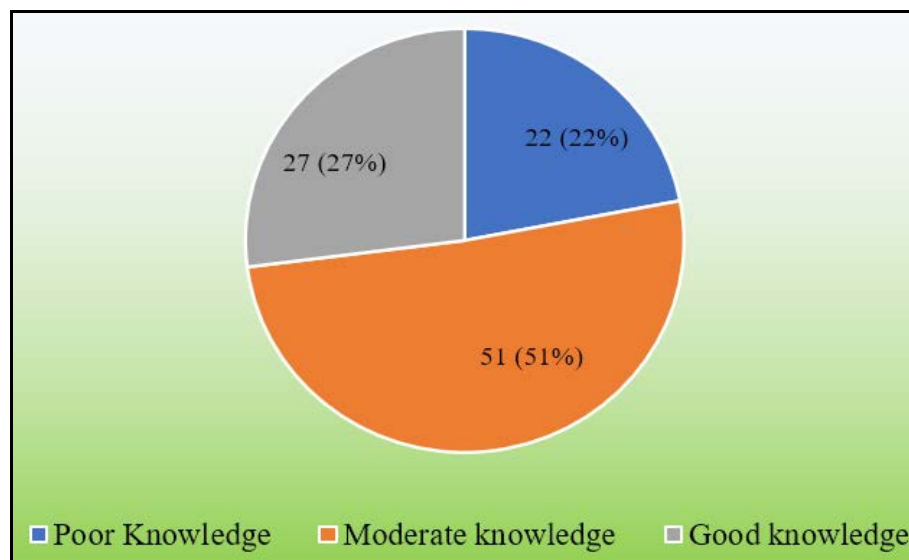
Characteristics		N (%)
Gender	Male	52 (52.0)
	Female	48 (48.0)
Duration of employment (years)	<10	38 (38.0)
	11-20	46 (46.0)
	>20	16 (16.0)
Have you had training about cleaning and disinfection of medical instruments?	Yes	60 (60.0)
	No	40 (40.0)

About 98% of the participants answered truly about nosocomial infection is one of the main causes of increased morbidity and mortality in hospitalized individuals, 86% of the participants answered truly about stethoscope are contaminated with pathogenic bacteria and could serve as a mode for transmission of infection while only 43% gave a true answer considering the proper way of disinfection of stethoscope if it is contaminated with blood, as shown in table 2.

Table 2: Awareness about the stethoscope as a source of hospital-acquired infection

Items	True answers
	N (%)
1. Nosocomial infections are those that proliferate inside a medical environment.	96 (96.0)
2. Nosocomial infection can cause an increase in morbidity and mortality in hospitalized individuals.	98 (98.0)
3. The environment is a conduit for the transmission of nosocomial illnesses via "air, water, and inert surfaces."	80 (80.0)
4. Stethoscopes are infected with dangerous microorganisms and may function as a vector for infection transfer.	86 (86.0)
5. The cleaning of the stethoscope, along with disinfection, is important in the prevention of nosocomial infection.	62 (62.0)
6. The stethoscope is considered a non-critical object, and it is recommended to disinfect it after each patient contact	56 (56.0)
7. An alcohol swab is used to disinfect non-critical medical devices, including the stethoscope.	46 (46.0)
8. If the stethoscope is contaminated with blood, a tuberculocidal disinfectant or one with special claims against viral hepatitis and human immunodeficiency virus should be used.	43 (43.0)
9. The stethoscope is usually cleaned before clinical practice.	70 (70.0)
10. Cleaning of all parts of the stethoscope is a recommended practice.	84 (84.0)

More than half of the participants had moderate knowledge (51%), 27% of them had good knowledge, and 22% had poor knowledge, as shown in figure 1.

**Fig 1:** Distribution of the participants according to the level of knowledge

More than half of the participants followed the correct practice regarding the interval to clean and disinfect their stethoscopes, as shown in table 3.

Table 3: Practice of the participants regarding stethoscope disinfection

Items	Correct practice
	N (%)
What is the interval for stethoscope cleaning when you use it on intact skin (noncritical contact)?	56 (56.0)
What is the interval for stethoscope cleaning when you use it on non-intact skin (critical contact)?	66 (66.0)

The proportion of participants with good knowledge was significantly higher among participants who were employed for more than 20 years than among others (P-value=0.004).

Furthermore, it was significantly higher among participants who had training about cleaning of medical instruments and their disinfection (P-value=0.002), as shown in table 4.

Table 4: Association between receiving training about cleaning and disinfection of medical instruments and the mean of awareness.

Characteristics of the participants		Knowledge level			P-value
		Poor N (%)	Moderate N (%)	Good N (%)	
Duration of employment (years)	<10	6 (15.8)	25 (65.8)	7 (18.4)	0.004
	11-20	14 (30.4)	22 (47.8)	10 (21.7)	
	>20	2 (12.5)	4 (25.0)	10 (62.5)	
Had training about cleaning and disinfection of medical instruments?	No	7 (11.7)	31 (51.7)	22 (36.7)	0.002
	Yes	15 (37.5)	20 (50.0)	5 (12.5)	

The percentages of participants with good knowledge were significantly higher among participants who follow correct practice regarding the cleaning interval for intact and non-

intact stethoscopes (P-values were 0.027 and 0.030, respectively), as shown in table 5.

Table 5: Association between receiving training about cleaning and disinfection of medical instruments and practice.

		Knowledge level			P-value
		Poor N (%)	Moderate N (%)	Good N (%)	
What is the interval for stethoscope cleaning when you use it on intact skin?	Correct	10 (17.9)	25 (44.6)	21 (37.5)	0.027
	Incorrect	12 (27.3)	26 (59.1)	6 (13.6)	
What is the interval for stethoscope cleaning when you use it on non-intact skin?	Correct	11 (16.4)	33 (49.3)	23 (34.3)	0.030
	Incorrect	11 (33.3)	18 (54.5)	4 (12.1)	

Discussion

The stethoscope, essential for medical diagnosis, connects healthcare professionals and patients. Given the risk of nosocomial infections, it is essential to comprehend stethoscope contamination and the awareness of medical students [11]. This study was one among other studies that tried to assess the healthcare providers' awareness regarding the responsibility of stethoscopes (as a sample of medical equipment) in spreading infection in the hospitals and the right practice to overcome this problem. This study showed that more than half of the participants had training in cleaning and disinfection of medical instruments. In Pakistan, most healthcare providers received training regarding the cleaning in addition to disinfection of medical instruments [17]. The main finding of the current study was that more than half of the participants had moderate knowledge, while less than one-third had good knowledge. In comparison to another study that was done in Pakistan, Approximately 86.4% recognized stethoscopes as a cause of nosocomial infections, attributing their knowledge to educational components of their degree curriculum, informational posters and brochures, internet resources, hospital directives, and many other sources [18]. In another study that was done in Bangladesh, 77% of healthcare providers were aware about the importance of cleaning along with disinfection of stethoscopes [19]. Regarding practice, more than half of the participants obeyed the correct practice about cleaning, besides disinfection of critical and non-critical stethoscopes. In comparison to another study, another study done in Turkey revealed that about half of the participants cleaned and disinfect their stethoscopes in the right manner [13]. In Pakistan, a noticeably lower prevalence of stethoscope cleaning correctly was observed, 37.7% [20]. While in the United States, seventy-six percent felt that illness transmission occurred via stethoscopes, although only twenty-four percent reported sanitizing them after each usage [21]. In Pakistan, approximately 4.35% of consultants, residents, and medical students have ever cleaned their stethoscopes [17]. In the current study, the duration of employment and training programs about training about cleaning in addition to disinfection of medical instruments of the participants positively affected the level of knowledge. Furthermore, the increased level of knowledge positively affected the practice of the participants. As reported by many studies, as a significant predictor of stethoscope hygiene is prior education on stethoscope cleaning practices [22]. Khalid *et al.* conducted research indicating that proper stethoscope hygiene can only be adopted when users understand its importance and emulate their role models [17]. In the same line, Ali *et al.* reported that a significant association was revealed between receiving education and the proper time of cleaning the stethoscope [23].

Conclusion

Most of the enrolled participants had a moderate to good level of knowledge, and more than half of them obeyed correct practice regarding the cleaning and disinfection of the stethoscope. Duration of employment and training programs significantly affected the level of knowledge, which in turn affected the practice of participants.

Conflict of Interest

Not available

Financial Support

Not available

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