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Knowledge of Intensive Care Unit Nurses Toward Central Line Catheters Care, at Public Hospitals in Sana'a-Yemen

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Abstract:

*Background: Central line catheters are often used as mandatory devices when caring critically ill patients for administration of drugs as well as nutrients and continuous assessment of the cardiovascular system. **The objective of the study** was to assess knowledge of intensive care unit nurses toward central line catheter care. **Method:** A descriptive, cross-sectional study was conducted among intensive care unit nurses at public hospitals in Sanaa City, Yemen. A convenience sampling method was done to selecting a sample of 137 intensive care unit nurses. A closed ended questionnaire was using to collecting the data. **Results:** Most (78.8%) of nurses had moderate knowledge level toward central line catheters care, followed by (14.6%) poor knowledge. There was a statistically significant association between level of nurses' knowledge toward central line catheters care with age group at (P=0.05). **Conclusion and recommendation:** More than two-thirds of nurses toward central line catheters care had moderate knowledge level. We recommended increasing knowledge of intensive care unit nursing staff through the courses training, workshop, and curriculums. Further research should be conducted to test knowledge and practice levels of nurses prior to and after the educational program on evidence-based guidelines for central line catheter care.*

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Introduction

Central line catheter (CLC) is one of the regularly used invasive procedures in various areas of patient care like intensive care unit, operating room, and emergency department. The practice of CLC varies widely. Central line defined, as an intravascular catheter that terminates at or close to the heart, or in one of the great vessels. Central Venous Catheter" is defined here as a central line placed in one the large venous great vessel, which include internal jugular vein, brachiocephalic vein, subclavian vein, superior vena cava, iliac vein, femoral veins, inferior vena cava. [1]

Central venous catheter (CVC) plays a vital role in infusing medications, withdrawing venous samples and strict monitoring in critically ill patients. Utilization of CVC has been concerned with various risks and complications. The most common risk is catheter-related blood-stream infection (CRBSI). Several identified risk factors of CRBSI have been categorized into catheter-related factors, patient-related factors or technical related factors. [2]

Infections are usually caused by bacterial (most notably Staphylococcal) species, but fungal infections are also common, especially in immune suppressed patients. A study suggests that some local or systemic infection occurs in between 1 and 14% of patients with a central venous catheter [3]**.** CVC break the body's natural defense barrier (the skin), and so put the patient at risk of catheter-related infection, of which an estimated 200,000 cases occur worldwide each year. [4]

Despite the advantages of CLC use, there are a lot of risks associated with its use, among them the colonization of the catheter and the bloodstream infection. Central line associated bloodstream infection are a serious complication of CVC implantation and impact on pediatric health outcomes. [5]

In a patient with an inserted CLC, the nurse carries out the aseptic technique for monitoring a catheter entry point, dressing a catheter, flushing a catheter, taking smears of a catheter entry point, adjusting the prescribed infusion liquids, parenteral nutrition, transfusion of blood and blood products, taking blood samples, measuring the central venous pressure and application of medication. [6]

Catheter-related infections take the second line among nosocomial infections occurring in intensive care units. [7] Central venous catheters pose a greater risk of device-related infections than any other types of medical device and are major causes of morbidity and mortality. They are also the main source of bacteremia and septicemia in hospitalized patients. These infections are viewed as resulting from the cumulative exposure to a series of known potential risk factors. These risk factors can be categorized according to the two phases of catheter care: insertion and daily management. [8]

Patients in intensive care units (ICUs) are at an increased risk for Central venous catheter related-bloodstream infections (CVCR-BSIs) as 48% of those patients have CVC, accounting for 15 million catheter days per year in the United States (US) ICUs. The rate of CVCR-BSIs is ranged from 5.3-6 per 1000 catheter/days in the developed countries ICUs 8-10 and from 7.7-18.5 (mean, 12.5) per 1000 catheter/days in developing countries. Approximately 250,000 cases of CVCR-BSIs occur in US hospitals annually. Approximately 82,000 of these cases occur in ICUs and resulted in an estimated 28,000 attributable deaths in ICUs annually in the US alone. the attributable mortality has an estimated rate of 18% (0-35%) for each CVCR- BSIs. the attributable cost per CVCR-BSIs is estimated as $18,432–$56,000,7,11,12

and the annual cost of caring for patients with CVCR-BSIs ranges from $296 million to $2.3 billion in the US. [9]

The study was expected to describe the nurse's knowledge toward central line catheter care. This subject is important because we are found a gap in the nurse's knowledge. Central venous catheter-related infection is considered a common cause of increased morbidity, mortality, and medical care costs in intensive care units. infections represent a serious complication in treatment, which worsens prognosis, prolongs hospitalization, and increases treatment costs. [10]

There is a lack of studies evaluating ICU nurses' knowledge toward CLC central line catheters care in Yemen hospitals. Consequently, the extent to which CVCR-BSI prevention knowledge and practices are used by Yemen hospitals is unknown. Several studies indicated that, lack of knowledge and skills is one of the main barriers for implementing evidence- based nursing practice. The objective of the study was to assess knowledge of intensive care unit nurses toward central line catheter care.

Research Methodology

A descriptive, cross-sectional study, was conducting from January to March 2022 in intensive care unit in three shift work duty through the morning, evening, and night shift duty at public hospitals in Sana'a, City-Yemen. Through the period from January to March 2022. The total population was 324 ICU nurses. The sample size was 137 nurses determined by using the Epicalc 2000 program, considering the following 5.00 to determine the accuracy and 95% for the level of confidence. A convenience sampling method was used A convenience sampling method was used to selecting a sample of 137 intensive care unit nurses.

A close-ended questionnaire with an information letter and consent form attached and handed to diabetes patients by the researchers. A code number was applied. A structured questionnaire was administered to assess knowledge of intensive care unit nurses regarding central line catheter care [10] [11] . That content two parts as follows:

Part I: Demographic characteristics of ICU nurses: this part contains the following: age, sex, marital status, educational level, experience period, course training of CLC care, and course training of CLC infection control.

Part II: knowledge of ICU nurses toward central line catheter care, which included twenty-four questions. Knowledge of ICU nurses about general information on central line catheter care (Definition, types, site insertion, indications contraindication, complication of CLC); and knowledge for intervention care toward central line catheter care.

Scoring system for nurses' knowledge; each correct answer scored one grade and score zero for the incorrect response. The total level of knowledge was categorized as follows: *good level was assigned to nurses who got 76%-100%, moderate 50%-75% and poor 0% - 49%.*

The questionnaire was filled in the presence the researcher and participants were free to ask questions or clarifications. The content validity was established by a panel of in Razi University, who reviewed the English and Arabic version of the questionnaires for clarity, relevance comprehensiveness and applicability for implementation and according to their opinion, some modifications were applied. The reliability was a test for questionnaire tool by using Cronbach's coefficient Alpha (r=0.79). A pilot study was conducted on (13) nurses to lest the feasibility and applicability of the tools. The analysis of the pilot study revealed that

minimal modifications are required. These necessary modifications were done, and the pilot study subjects were excluded from the actual study.

Data were processing, and statistically analyzed using the Statistical Package for Social Sciences (SPSS) version 24.0. The data were organized, tabulated, summarized, and analyzed using appropriate statistical methods. The demographic characteristics was tabulated, and percentages were found by using number, and percent. The association between the demographic characteristics and knowledge were analyzed by chi square test. The ≤0.05 level was used as the cut off value for statistical significance.

Approval of the study was obtaining prior to carrying out this study from the ethical committee of the Al Razi University-Faculty of Medicine and Health Sciences.   Formal permission obtained from the authorities for the collection of data. The data was collecting from the hospital sitting. The investigator first introduced her and explained the need and purpose of the study. The knowledge level assessing after obtaining permission from the ICU nurses.

Results

Table 1 showed that, more than two thirds (72.3%) of ICU nurses were male, and (67.2%) of them were aged between 22 to 30 years. Fifty (50.4%) of them were married, and (50.4%) of them were had diploma. Majority (83.2%) of them had years' experience less than 5 years. As regarding training. More than three quarters of nurses hadn't training courses in CLC care, and infection control (78.1% and 83.2% respectively).

Table 2 showed that, majority (82.6%) of ICU nurses were known definition, (67.2%) types, (67.2%) indications, (59.2%) contraindication and (51.1%) complication of central line catheter, while (54.0%) of

Table 1. Distribution of demographical characteristics for ICU nurses (n=137).

Demographic characteristics		F	%
Age (year)	< 22 years	19	13.9
	22 to 30 years	92	67.2
	31 to 40 years	24	17.5
	> 40 years	2	1.5
Sex	Male	99	72.3
	Female	38	27.7
Marital status	Single	68	49.6
	Married	69	50.4
Educational level	Diploma	69	50.4
	Bachelor's degree	65	47.4
	Master's degree	3	2.2
Years' experience	< 5 years	114	83.2
	5 to 10 years	11	8.0
	11 to 15 years	10	7.3
	> 15 years	2	1.5
Training courses in CLC care	Yes	30	21.9
	No	107	78.1
Training courses in infection control	Yes	23	16.8
	No	114	83.2

Table 2. Distribution of demographical characteristics for ICU nurses (n=137).

Items	Correct		Incorrect	
	F	%	F	%
Definition of CLC	113	82.6	24	17.5
Types of CLC	96	70.0	41	30.0
Site insertion of CLC	63	46.0	74	54.0
Indication of CLC	92	67.2	45	32.8
Contraindication of CLC	81	59.2	56	40.8
Complication of CLC	70	51.1	67	48.9
Pre intervention of CLC	72	52.6	55	47.4
During intervention of CLC	75	55.0	62	45.0
Post intervention of CLC	73	53.3	64	46.7

them were don't know site insertion of CLC. As regarding to knowledge for intervention CLC. More than half of ICU nurses were known pre, during and post central line catheter intervention (52.6%, 55.0%, and, 53.3% respectively).

Figure 1 demonstrated that, more than three-quarters (78.8%) of ICU nurses were had moderate knowledge level, and (14.6%) of them were had poor knowledge

level, while only (6.6%) them had good knowledge level toward central line catheter care
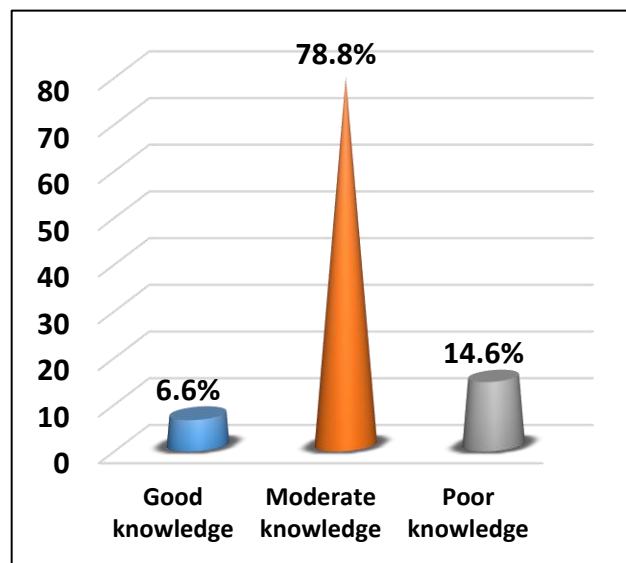

Figure 1: Level of ICU nurses' knowledge toward central line catheter care (n=137).

Table 3 shows that, there was no statistical association between knowledge level toward central line catheters

care and demographical characteristics of ICU nurses regarding to sex, marital status, qualifications level, years' experience and training courses in central line catheter care or infection control.at (*p*-value > 0.05), while there was a statistically significant association between knowledge level toward central line catheters care and age of ICU nurses at (*p*-value =0.05).

Discussion

A central line is a catheter inserted into a large vein, it can be inserted in subclavian vein in chest, internal jugular vein in neck, axillary vein, femoral vein or peripheral vein in the arms. CVCs are widely used for measurement of central venous pressure, admiration of medication, transfusion of blood and blood products, used for patients who need long term parenteral nutrition, and in case of inappropriate use of peripheral venous route. [12] The present study was conducted on a sample of 137 ICU nurses who working in different department. Most (72.3%) of nurses were

Table 2: Distribution of patients' knowledge about modifiable cardiovascular risk factors (n=178).

Demographical Characteristics		Knowledge Level						*p*-value
		Good knowledge		Moderate knowledge		Poor knowledge		
		F	%	F	%	F	%	
Age (year)	< 22 years	0	0.0	15	78.9	4	21.1	**0.05**
	22 to 30 years	9	9.8	68	73.9	15	16.3	
	31 to 40 years	0	0.0	23	95.8	1	4.2	
	> 40 years	0	0.0	2	100	0	0.0	
Sex	Male	8	8.1	78	78.8	13	13.1	0.371
	Female	1	2.6	30	78.9	7	18.4	
Marital status	Single	4	5.9	53	77.9	11	16.2	0.843
	Married	5	7.2	55	79.7	9	13.0	
Educational level	Diploma	4	5.8	54	78.3	11	15.9	0.614
	Bachelor's degree	5	7.7	52	78.5	9	13.8	
	Master's degree	0	0.0	3	100	0	0.0	
Years' experience	< 5 years	8	7.0	86	75.4	20	17.5	0.123
	5 to 10 years	1	9.1	10	90.9	0	0.0	
	11 to 15 years	0	0.0	10	100	0	0.0	
	> 15 years	0	0.0	2	100	0	0.0	
Training course in CLC care	Yes	1	3.3	25	83.3	4	13.3	0.653
	No	8	7.5	83	77.6	16	15.0	
Training course in infection control	Yes	1	4.3	20	87.0	2	8.7	0.547
	No	8	7.0	88	77.2	18	15.8	

male, while the half of them were married, and (67.2%) of them were aged between 22 to 30 years. Majority (83.2%) of them had years' experience less than 5 years, and (50.4%) of them were had diploma while (78.1%) of them don't have training courses in CLC care.

Our result was in agreement with the study of George & Muninarayanappa, 2013 [13] who clarified that (68.8%) of sampling aged were between 22-29 years. In addition, Verma & Saluja 2019 [14] who mentioned that most (63%) of his study sample were between (20-29) years and two third (65.7%) of ICU nurses had (1 to 5) years' experience. Moreover, study by Deshmukh & Shinde (2014) [3] found that, (56.7%) of ICU nurses were having diploma in general nursing. Furthermore, Aloush 2018 [15] who reported that, three quarter of participants had not previous education about CVC-RI prevention Osman et al., 2019 [16] who reported that, (45.5%) has less than 5 years of experience, and approximately two thirds 64.8% of the studied nurses were married Al-Qubati, 2021 [10] depicted that the most of them had diploma. On other hand, this finding disagrees with a study by Esposito et al. 2017 [17] who found that, most of nurses were female.

Oure present study, majority of nurses were had moderate knowledge level toward central line catheters care, followed by (14.6%) poor knowledge. There are several factors that could explain the low percentage of nurses following EBP during CVC care. These include a lack of knowledge and awareness about risk and complications of CVC- RI as a result

A study by [22], reported that obesity (52.8%) and a lack of in-service training programs in the intended ICUs. In addition, nursing staff shortage, nursing work overload, and inadequate supervision by the nursing

supervisors could contribute to such a low percentage. This result was similar study by Daniel et al. 2013 [18] who reported that, knowledge level of staff nurses was moderate level (67%). Also, study by Shrestha, 2013 [19] who mentioned that, most of participants had moderate knowledge level regarding care of patient with central venous line. One the line, study by Vilete Barbosa et al., 2017 [20] 56% of the participants had less than 75%-50% of correct answers, characterizing deficient knowledge.

On other hand, these findings of the study were unaccepted with different studies, the study by Lourenço & Vieira 2010 [18]who reported the nurses had poor knowledge concerning the studied aspects, indicating the need for nurses to constantly update and improve their knowledge about PICC line insertion.so as to better the quality of care. On the line, study by El-Sol & Badawy 2017 [21] who reported that, poor knowledge level. Moreover, this finding was not supported with study to assess the knowledge of staff nurses regarding central line associated blood stream infection (CLABSI) with a view to develop information-booklet on prevention of CLABSI in a selected hospital of Delhi, was conducted by Kurian & John 2016 [22] who concluded that the majority (96%) of staff nurses had inadequate knowledge and only (4%) had adequate knowledge. On same line study by Aloush 2018 [15] who recorded that, ICU nurses' knowledge of central venous catheter-related infection prevention guidelines is poor, indicating that nurses had not receive proper education about these guidelines. Fathermore study by Elbilgahy et al. 2019 [23] who reported that, the majority of nurses (88.3%) had poor knowledge about prevention of CLABSI. Moreover, study by Mlinar and Malnaršić 2012 [6] who reported that the surveyed nursing students have insufficient knowledge of CVC. Correct and safe handling of the

CVC is not possible without good practical and theoretical knowledge.

The current study found that there was statistically significant association between level of nurses' knowledge toward central line catheters care and age. The result of the study disagreement with Deshmukh & Shinde 2014 [3] who funded that there `was no a significant association of age and sex of the staff nurses with knowledge score regarding venous access device care. Moreover, the result of the study not supported with Friedt 2011 [24] who reported that, no statistically significant differences was found between the participation for any of the demographic variables examined or the test scores on the knowledge of evidence-based guidelines for preventing central venous catheter bloodstream infections. Also, study by Arslan et al. 2014 [25]they mentioned that there was not a significant difference in the nurses' knowledge about PC according to these social characteristics (P>0.05). Furthermore, study by, Abbady et al. 2019 [12] they recorded that, there is not a significant association of age, sex, nursing qualification, years' experience of the ICU nurses with practice about bundle of care related

Conclusion

More than three quarters of ICU nurses were had level of knowledge toward central line catheters care had moderate knowledge, and (14.6%) who had poor knowledge. There was a statistically significant association between level of nurses' knowledge toward central line catheters care and age at (p-value =0.05).

Recommendations

The orientation of new staff members in ICU's should include education on recommended strategies for central line catheter care. Revision of unit protocols regularly as updates and new evidence for best practice are constantly emerging and staff should be educated on the updated protocols. Staff members should be motivated to develop their careers by studying further and gaining more knowledge and skills in the ICU field. The ICU training program should include evidence-based guidelines for central line catheter care.

Conflict of interest

No conflict of interest is associated with this work.

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الملخص العربي

الخلفية: غالبا ما تستخدم قسطرة الخط المركزي كأجهزة إلزامية عند رعاية المرضى المصابين بأمراض خطيرة لإعطاء الأدوية وكذلك المواد الغذائية والتقييم المستمر لنظام القلب والأوعية الدموية. كان الهدف من هذه الدراسة هو تقييم معارف التمريض في وحدة العناية المركزة تجاه العناية بالقسطرة المركزية .

المنهجية: أجريت دراسة وصفية مقطعية بين ممرضين وحدة العناية المركزة في المستشفيات العامة في صنعاء، اليمن. تم استخدام طريقة أخذ العينات الملائمة لاختيار عينة مكونة من ١٣٧ ممرض وممرضة في وحدة العناية المركزة. وتم استخدام استبيان مغلق لجمع البيانات .

النتائج: أظهرت هذه الدراسة ان معظم الممرضين بنسبة (٧٨,٨٪) مشاركاً لديهم مستوى معرفة متوسط تجاه رعاية القسطرة المركزية، يأتي فيما بعد نسبة (١٤,٦٪) مشاركاً كان مستوى معرفة ضعيف. كذلك أظهرت الدراسة انه توجد علاقة ذات دلالة إحصائية بين مستوى معرفة الممرضين تجاه رعاية القسطرة المركزية مع الفئة العمرية عند مستوى الدلالة الإحصائية (٠,٠٥)

الاستنتاجات والتوصيات: أكثر من ثلثي الممرضين في رعاية القسطرة المركزية كان لهن مستوى معرفة متوسط. كما توصي هذه الدراسة بزيادة المعرفة لدى الكادر التمريضي في وحدة العناية المركزة من خلال الدورات التدريبية وورش العمل والمناهج الدراسية. وينبغي إجراء المزيد من البحوث لاختبار مستويات المعرفة والممارسة للكادر التمريضي قبل وبعد البرنامج التعليمي بشأن المبادئ التوجيهية القائمة على الأدلة لرعاية القسطرة المركزية.

الكلمات المفتاحية: معارف، التمريض، رعاية القسطرة المركزية.