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The Nurses' Knowledge Regarding Endotracheal Suctioning at Critical Care Unit of Kirkuk Teaching Hospital, Iraq

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ABSTRACT

Background: Endotracheal suctioning is one of the most frequently performed invasive procedures by intensive care nurses. Nurses should have adequate knowledge and skills to perform endotracheal suctioning based on the best evidence. The purpose of this study was to investigate critical care nurses' knowledge regarding endotracheal suctioning. **Methods:** A descriptive cross-sectional research design was adopted for this study, which was conducted in Kirkuk Teaching Hospital. The study extended from October 2023 to March 2024. The study population consisted of all the nurses working in the critical care unit of the hospital. A non-probability purposive sampling technique was used to select 46 nurses. A structured self-administered questionnaire was used to collect data. The collected data were entered, coded, and edited into the Statistical Package for Social Science (SPSS) version 26. Data were analysed by employing both descriptive and inferential statistical methods. **Results:** Among this group, 84.8% had attained a college education. It is worth noting that a significant portion of the sample (82.6%) had not undergone any training courses in endotracheal suctioning. The knowledge levels of 82.6% of nurses regarding endotracheal suctioning were inadequate, while 17.4% were adequate. There was a relationship between nurses' knowledge regarding endotracheal suctioning and both nurses' experience in the critical care unit at a *p*-value of 0.049 and nurses participating in training courses about endotracheal suctioning at a *p*-value of 0.022. **Conclusion:** The study concludes that only a few nurses had adequate knowledge and that the majority of them had inadequate knowledge of endotracheal suctioning. Therefore, it is necessary to upgrade nurses' knowledge on endotracheal suctioning through in-service education programs.

Keywords: Critical Care Unit; Endotracheal Suctioning; Nurses' Knowledge

INTRODUCTION

Endotracheal suctioning (ETS) is a common procedure that manually eliminates accumulated pulmonary secretions to ensure the patency of the patient's airways while they are intubated with an endotracheal tube. The responsibilities of nurses in the ICU include careful patient observation, intervention to maintain ventilation and oxygenation, and ensuring that patients' requirements are addressed. As a result, they should be knowledgeable about the suctioning method (Ntelele, 2023). Tracheal secretions in mechanically ventilated patients are removed using a catheter via the endotracheal tube. The suction catheter can be introduced by disconnecting the patient from the ventilator (open suction system) or by introducing the catheter into the ventilator circuit (closed suction system) (Yılmaz & Özden, 2024; Afandi & Ludin, 2020).

If ETS is not performed with correct techniques, the following side effects and hazards are associated with this procedure: bleeding, tracheal mucosa lesions, infections, atelectasis, cardiovascular disease, hypoxemia, and increased intracranial pressure (Singh, Bhalotra & Sharma, 2024). ETS side effects can be reduced by knowledgeable healthcare providers using the best available evidence to minimize its effects. Therefore,

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healthcare professionals need to be knowledgeable about the most recent evidence-based ETS practices in order to carry out the procedures in a scientific manner and lower the risks and complications that may arise for their patients (Süha & Karagözoğlu, 2024).

Based on the assessment of the patient's clinical condition, the requirement for suctioning should be determined. As a normal component of the patient assessment, qualified clinicians should determine whether ETT suctioning is necessary. The following are indications of endotracheal suctioning: auscultated coarse crackles over the trachea, deterioration in oxygen saturation, and apparent secretions in the airway (Blakeman *et al.*, 2022).

The reason for conducting this study, despite the availability of scientific proof supporting the successful and safe completion of endotracheal suctioning, is that in clinical settings, many of these recommendations have not been put into practice, probably as a result of a lack of understanding of this process. Nurses frequently carry out conventional or traditional procedures despite established evidence-based guidelines, which suggests that there are gaps between what is known scientifically and what is commonly done (Abo Eldahab *et al*., 2022).

Chen *et al*. (2021) observed nurses performing ETS and assessed their adherence to the aseptic method. They discovered that nurses routinely neglected to wash their hands both before and after the procedure. Only a few areas of ETS practices, such as catheter size, insertion depth, humidification, aseptic approach, suction pressure, and adverse effects, were included in those studies due to the small number of survey items. Despite the existence of three main hospitals in Kirkuk city that all contain critical care units, there has been no study conducted about critical care unit nurses' knowledge regarding endotracheal suctioning. So, the present study was under taken to investigate the above.

Objective

The objective of the research is to investigate the nurses` knowledge regarding endotracheal suctioning at critical care unit of Kirkuk teaching hospital.

METHODOLOGY

Design of the Study

A quantitative/descriptive/cross-sectional design was carried out from October 2023 to March 2024 in order to fulfill the current study's objectives. Sample selection technique: Non-probability sampling/a purposive sample of all nurses meeting the eligibility criteria and employed in the critical care unit of Kirkuk Teaching Hospital (Alkubati *et al*., 2022).

Criteria of Inclusion

Nurses with more than one year experience at critical care unit.

Criteria of Exclusion

The exclusion criteria for this study include nurses with less than one year of experience in the critical care unit, those holding administrative positions within the critical care unit, and individuals who participated in the pilot study.

Data Collection Instrument: Structured Interview Questionnaire

The researcher developed this tool after reviewing the relevant literature related to nurses' knowledge regarding endotracheal suctioning. The instrument comprised the following two components:

Part 1: Sociodemographic Characteristics of Nurses

It consists of information about nurses' gender, age, years of experience as a nurse, level of education,

years of experience in the critical care unit, and participation in an endotracheal suctioning training program.

Part 2: Nurses' Knowledge Regarding Endotracheal Suctioning

The researchers' instrument consists of 20 items to assess the nurses' knowledge regarding endotracheal suctioning.

Validity of Instrument

The content validity of the self-administered questionnaire was assessed by a panel of experts, who verified the clarity, applicability, and suitability of the nurses' knowledge assessment questionnaire regarding endotracheal suctioning to meet the study's objectives. The tool was developed by the investigators after studying the relevant literature and was delivered to eleven experts. After review and evaluation by the experts, it was revealed that the instrument had adequate content, and changes were made to the items according to their suggestions. In addition, a few items were removed, and other items were added to create the final version, making it measurable as a tool for conducting the study and achieving its purpose.

Pilot Study

Five nurses working in the critical care unit were randomly chosen to participate in a pilot study (meeting the same criteria as the original study sample). The pilot study was conducted to determine the reliability of the instrument. The five nurses were excluded from the studied sample. The participants were assessed according to the knowledge test, which was considered a pre-test.

Result of Pilot Study

The pilot study demonstrated that the study instrument was reliable at an excellent level. The questionnaire content was clear and easily understood by the participants, ensuring effective data collection. The time required to complete the questionnaire ranged from 20 to 30 minutes, indicating its feasibility for use in the main study.

Reliability of Instrument

The reliability of the questionnaire concerning the knowledge test was determined through the use of the test-retest approach, evaluating five nurses. Cronbach's alpha was used to establish the reliability of the questionnaire and was found to be $r = 0.949$.

Methods of Data Collection

The researcher distributed the questionnaire to the nurses in each group at the critical care unit of Kirkuk Teaching Hospital who agreed to participate in the study, and then clarified the objective of the study to the participants. The usual time taken to complete the questionnaire was around 20 to 30 minutes. After the questionnaire was completed, the investigator gathered it and ensured that the questionnaire sheets were fully completed.

Statistical Analyses

After the collection of data, it was coded and analyzed using statistical procedures. The following statistical data analysis approaches were used to analyze and assess the results of the study using the statistical package SPSS version 26. The items were rated and scored according to the following patterns: Each question had two responses, and for data analysis, the respondents answered as follows:

1. A correct answer was given a score of 1.
2. An incorrect answer was given a score of 0.

The nurses' responses were calculated and recorded. The total score of the nurses' knowledge ranged from

a minimum score of 6 to a maximum score of 20 and was categorized as follows:

1. A score of 6 - 10 (< 50%) denoted inadequate results.
2. A score of 11 - 15 (50% < 75%) indicated adequate results
3. A score between 16 and 20 (> 75%) showed good results.

Methods Used in Data Analysis

The data analysis methods used in this study included the presentation of tables with frequencies and percentages for descriptive statistics. The reliability of the pilot study was assessed using Cronbach's Alpha Correlation Coefficient, indicating the consistency of the instrument. The Fisher's Exact Test, a non-parametric test, was employed to investigate associations between two categorical binary variables. A *P*-value of 0.05 was used to determine statistical significance, with *P*-values greater than 0.05 considered statistically insignificant, *P*-values of 0.05 or less considered statistically significant, and *P*-values of 0.01 or less deemed highly statistically significant.

Ethical Consideration

The present study received ethical clearance from the Research Ethics Committee of College of Nursing, University of Kirkuk, Iraq with reference number 754 on 13th November 2023 to ensure the confidentiality and anonymity of the participants.

RESULTS

Table 1: Sociodemographic Characteristics of Participants (N=46)

Variables	Groups	F	%
Age in years	20-24	16	34.8
	25-29	28	60.9
	>30	2	4.3
	Mean ± SD	25.48 ± 2.76	
Gender	Male	23	50
	Female	23	50
Education level	Diploma	7	15.2
	Bachelors	39	84.8
Nursing experience	1-3 years	41	89.1
	3-5 years	5	10.9
Experience in critical care unit	1-2 years	40	87.0
	2-3 years	6	13.0
Participating of nurses in training course about ETS	No	38	82.6
	Yes	8	17.4

ETS: Endotracheal Suctioning, f: Frequency, %: Percentage

According to Table 1, 60.9 percent of the sample belonged to the age group between 25 and 29 years, while 34.8 percent of the sample was in the age group between 20 and 24 years. Of the nurses, 4.3 percent were older than 30 years, with a mean age of 25.48 years and a standard deviation of 2.76 years. Regarding gender, the participating nurses in the study had an equal percentage. Among the participants, the highest percentage had attained a college-level education (84.8%). Considering years of experience in the nursing field, 89.1 percent had 1-3 years of experience, and 10.9 percent had 3-5 years. The nurses' experience in critical care units was 87 percent for 1-2 years and 13 percent for 2-3 years. Most of the studied sample had not received training courses on endotracheal suctioning, accounting for 47 (82.6%).

Table 2: Nurses' Knowledge Regarding Endotracheal Suctioning at Critical Care Unit of Kirkuk Teaching Hospital

Questions	Answers	*F*	%	Mean
ETS frequency	Incorrect	14	30.4	0.70
	Correct	32	69.6	
Best method for suctioning	Incorrect	29	63.0	0.37
	Correct	17	37.0	
Endotracheal / tracheal suctioning repetition	Incorrect	17	37.0	0.63
	Correct	29	63.0	
The following is true about ETS	Incorrect	26	56.5	0.43
	Correct	20	43.5	
Recommended time duration for ETS 10-15 second	Incorrect	25	54.3	0.46
	Correct	21	45.7	
Appropriate position to perform ETS	Incorrect	21	45.7	0.54
	Correct	25	54.3	
Successful ETS is verified by	Incorrect	35	76.1	0.24
	Correct	11	23.9	
Nerve is stimulated during ETS	Incorrect	36	78.3	0.22
	Correct	10	21.7	
Complication of suctioning due to irritation of trachea	Incorrect	39	84.8	0.15
	Correct	7	15.2	
ETS source pressure	Incorrect	26	56.5	0.43
	Correct	20	43.5	
ETS catheter changed	Incorrect	29	63.0	0.37
	Correct	17	37.0	
Complication can arise due to absence of hyperventilation before ETS	Incorrect	21	45.7	0.54
	Correct	25	54.3	
Don't instilled sodium bicarbonate through the ET tube	Incorrect	30	65.2	0.35
	Correct	16	34.8	
Size of ETS catheter	Incorrect	38	82.6	0.17
	Correct	8	17.4	
Prevention of nosocomial infections	Incorrect	35	76.1	0.24
	Correct	11	23.9	
Effect of Pre-oxygenation in ETS	Incorrect	31	67.4	0.33
	Correct	15	32.6	
Contraindications for FTS	Incorrect	30	65.2	0.35
	Correct	16	34.8	
Normal Saline instillation during ETS	Incorrect	39	84.8	0.15
	Correct	7	15.2	
The reason behind discontinuation of procedure	Incorrect	25	54.3	0.46
	Correct	21	45.7	
Effect of ETS frequency	Incorrect	42	91.3	0.09
	Correct	4	8.7	
Total correct answers	Total incorrect answers			
332 (36.1 %)	588 (63.9 %)			

n: Sample size, f: Frequency, %: Percentage

Table 2 demonstrates that the nurses' knowledge regarding endotracheal suctioning in the critical care unit of Kirkuk Teaching Hospital was at inadequate levels.

Table 3: Relationship between Nurses' Knowledge Regarding Endotracheal Suctioning and their Sociodemographic Characteristics (N= 46)

Variables	Inadequate Knowledge	Adequate Knowledge	*P*- value	Sig.
	n = 38 (82.6%)	*n* = 8 (17.4%)		
Age (years)				
20-24	14 (30.4%)	2 (4.3%)	0.473	NS
25-29	23 (50%)	5 (10.9)		
>30	1 (2.2%)	1 (2.2%)		
Gender				
Female	20 (43.5%)	3 (6.5%)	0.699	NS
Male	18 (39.1%)	5 (10.9%)		
Educational Level				
Diploma	6 (13.0%)	1 (2.2%)	1.000	NS
Bachelors	32 (69.6%)	7 (15.2%)		
Nurses Experience as a Nurse				
1-3 years	34 (73.9%)	7 (15.2%)	1.000	NS
3-5 years	4 (8.7%)	1 (2.2%)		
Nurses Experience at Critical Care Unit				
1-2 years	35 (76.1%)	5 (10.9%)	0.049	S
2-3 years	3 (6.5%)	3 (6.5%)		
Participating of Nurses in Training Course about Endotracheal Suctioning				
No	34 (73.9%)	4 (8.7%)	0.022	S
Yes	4 (8.7%)	4 (8.7%)		

n: sample size, S: significant, NS: non-significant

Table 3 shows that there is a relationship between nurses' knowledge regarding endotracheal suctioning and both nurses' experience in the critical care unit (p-value = 0.049) and nurses' participation in a training course on endotracheal suctioning (p-value = 0.022). A p-value of equal to or less than 0.05 is considered significant. There was no relationship between nurses' knowledge regarding endotracheal suctioning and their age, gender, educational degree, or years of experience as a nurse.

DISCUSSION

Regarding the nurses' age, the current study discovered that over half of the participants belonged to the age range of 25 to 29 years, with a mean and SD of (25.48 ± 2.76). This result is lower than that obtained by Ali, Salem and Amin (2023), who reported that the mean and SD of nurses' age was (29.58 ± 4.46). The result of the present study agrees with studies conducted in Syria, which found that the age group between 20-30 years was the most frequent percentage among the different age groups participating in the study(Mohamed, Elaasar & Diab, 2022). According to the gender of nurses, half were male, and the other half were female. This result disagrees with a study conducted by Schults *et a*l. (2024), who reported that most nurses were female.

Concerning the level of education, the majority of nurses employed in the critical care unit held a bachelor's degree, and less than one-fifth had a diploma. This result disagrees with a quasi-experimental study (pre- and post-test) conducted in the Medical Intensive Care Units (MCU) and Intensive Care Units (ICU) at the Liver Hospital and Minia Emergency Hospital in Minia City, Egypt, by Ezzat Badawey, *et al*. (2024), who found that most nurses held a diploma.

The current study's findings indicate that the majority of nurses had fewer than three years of experience, with less than one-fifth having more than three years. This result does not match a cross-sectional comparative research design conducted by Mohamed Elmansy (2023) in Ismailia City, Egypt, who reported that more than half of the studied samples had more than four years of experience.

The study's findings indicate that the majority of nurses had fewer than two years of experience working in critical care units, likely due to the challenging work pressures within critical care units. As a result, nurses transfer themselves to departments and units with easier work environments (inadequate hospital management). These experiences reflect on nurses' knowledge. This result agrees with a cross-sectional study conducted in Al-Najaf City to assess nurses' practices toward endotracheal suctioning, which stated that the majority of nurses with less than three years of experience worked in critical care units (Abdelazeem, Fashafsheh & Fadllalah, 2019). It disagrees with the quasi-experimental pre-posttest research design employed in Egypt by Aboalizm and Elhy (2019) to assess the impact of educational intervention on nurses' endotracheal tube suctioning knowledge and practices, which revealed that over half of the nurses had more than six years of experience in critical care units.

According to the current study, the majority of the sample did not participate in training courses on endotracheal suctioning. This finding is the main cause leading to the inadequate knowledge level of nurses. This finding agrees with a study conducted by Abdelazeem, Fashafsheh and Fadllalah (2019), who reported that very few nurses had received training on endotracheal suctioning.

Concerning the nurses' knowledge, the study's results showed that about two-thirds of the nurses knew that endotracheal suctioning frequency and repetition should be done when required, not routinely, and not more than four times. Less than half of the nurses answered correctly regarding the recommended time duration for ETS (10-15 seconds). More than two-thirds of the nurses didn't have knowledge of how to verify the success of the endotracheal suctioning procedure. The majority of them didn't know the correct size of the catheter used for suctioning, and they were installing normal saline into the endotracheal tube before the suctioning procedure to dissolve secretions, which is not recommended by the American Association of Respiratory Care for endotracheal suctioning.

Regarding the nurses' knowledge level, the current study revealed that a few nurses had an adequate level of knowledge, while the majority had inadequate knowledge about endotracheal suctioning. This finding is related to the lack of training courses on endotracheal suctioning for critical care unit nurses, as well as the absence of endotracheal suctioning guidelines in the critical care unit of Kirkuk Teaching Hospital. The implications of this finding are that the low level of knowledge among nurses will affect their clinical practices and increase the occurrence of complications related to endotracheal suctioning procedures. The Ministry of Health in Iraq should engage nursing practices with science-based evidence (guidelines of evidence-based practices).

This result is in line with research conducted by Elsaman (2017), who stated that most nurses' knowledge was inadequate but improved after using the guidelines for endotracheal suctioning, which had a positive impact on the respiratory conditions of patients and decreased complications. The result of the current study does not match with a cross-sectional/observational study carried out at a teaching hospital in western Turkey (Maraş *et al*., 2017), which assessed the endotracheal suctioning knowledge and practices of critical care nurses, showing that the majority of nurses possessed a high level of expertise. Nurses' duties in critical care units have been impacted by the challenging security conditions in our nation in recent years. Their lack of education and training programs has resulted in a lack of expertise (Sameen, Hasan & Muhe-aldeen, 2019).

The study found that there was a relationship between nurses' knowledge about endotracheal suctioning and both nurses' experience in the critical care unit and their participation in training courses related to endotracheal suctioning. Nurses who did not participate in previous training courses and had less than two years of experience in the critical care unit showed inadequate levels of knowledge. The hospital administration must organize training courses on a regular basis, pay attention to critical care units, and avoid frequently changing the positions of critical care staff. A nurse in the critical care unit deals with critical cases and requires significant experience. This finding is consistent with a quasi-experimental study of Elshahat and Kafl (2023), which revealed a significant correlation between the total knowledge and practices of the studied nurses and their personal characteristics (age, educational level, years of experience, and previous training).

Limitations

Some participants (nurses) refused to participate in the study, and nurses with a master's degree or Ph.D.

were not available in the critical care unit. Additionally, all nurses had less than three years of experience in the critical care unit.

CONCLUSION

Endotracheal suctioning is an invasive procedure that can lead to significant complications; the lack of up-to-date knowledge identified by this study may increase the risk of such issues. This research could serve as the foundation for action-research projects aimed at initiating and implementing methods for improving hospital practices to enhance clinical outcomes. The key factors influencing the level of knowledge on ETS were found to be nurses' experience in critical care units and their participation in training courses related to endotracheal suctioning. Consequently, it is necessary to enhance nurses' knowledge of ETS through in-service education programs. Future research should focus on identifying barriers to and facilitators of implementing evidence-based endotracheal suctioning practices and developing context-appropriate interventions for guideline implementation. The study recommends systematic training on ETS guidelines, along with innovative strategies from implementation science, to promote changes in ETS practices.

Recommendation

The Ministry of Health in Iraq can and must shift nursing practices from tradition-based to science (evidence)-based. Developing evidence-based practice guidelines and encouraging hospital administration to adopt clinical guidelines for endotracheal suctioning in critical care units for nurses to follow is essential. The most important advice is to conduct regular training sessions (workshops and lectures) grounded in empirical studies to raise nurses' proficiency regarding endotracheal suctioning. Further research is needed with a larger sample of critical care nurses and other hospitals in Kirkuk city to determine the barriers preventing nurses from updating their expertise and skills.

Conflict of Interest

The authors declare that they have no competing interests.

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