

## Critical Care Nurses' Knowledge of Tracheostomy Care

### Abstract

**Background:** Tracheostomy care is a standard procedure that nurses perform in Critical Care Units (CCUs) to reduce complications from tracheostomy. The literature indicates a clear variety of care and practice in managing tracheostomy patients within the healthcare system. This study was conducted to assess the knowledge level of tracheostomy care among nurses in CCUs in Jordanian hospitals. **Materials and Methods:** A cross-sectional descriptive design was used for this study. A convenience sample of 260 nurses working in the CCUs of four government hospitals completed a self-reported structured questionnaire. Data were collected from January 2021 to March 2021. A t-test and one-way Analysis of Variance (ANOVA) were used to assess the differences among socio-demographic variables in terms of knowledge score. **Results:** The result revealed that the level of knowledge was suboptimal. There was a statistically significant difference in the mean level of knowledge regarding tracheostomy care (in all dimensions) by age ( $F = 22.595, p < 0.001$ ), educational level ( $F = 355.30, p < 0.001$ ), and work experience ( $F = 13.63, p < 0.001$ ). For gender, there was a statistically significant difference in knowledge of the tracheostomy suctioning dimension ( $p = 0.001$ ). **Conclusions:** The level of knowledge among nurses regarding tracheostomy care was moderate, indicating an urgent need for education.

**Keywords:** Cross-sectional studies, Jordan, nurses, tracheostomy

### Introduction

Tracheostomy tube placement is a procedure that may be applied in Critical Care Units (CCUs) for different reasons, including clearing or removing secretions from the airways, bypassing upper airway obstruction, providing oxygen to the lungs, and establishing long-term mechanical ventilation.<sup>[1]</sup> Safe practice in tracheostomy care increases comfort for patients, decreases the incidence of laryngeal injury, reduces the need for sedation, expedites weaning from the ventilator, and shortens the hospital length of stay.<sup>[2,3]</sup> However, poor practice of tracheostomy care may increase the hospital length of stay<sup>[4]</sup> and increase both short-duration complications (tube obstruction, infection, accidental decannulation, and hemorrhage) and long-duration complications (failure of weaning, upper airway obstruction, and scarring).<sup>[5]</sup> Improving nurses' knowledge and skills regarding tracheostomy care may prevent complications, reduce the mortality rate, and lower financial costs.<sup>[5]</sup>

In Jordan, nurses are not obliged to take formal education on the application of tracheostomy care. They typically provide such care based on the knowledge they received during the process of obtaining their nursing degree or from their senior nurse, charge nurse, and preceptors when they start their nursing career.<sup>[4]</sup> There are variations in the management of tracheostomy patients within healthcare settings,<sup>[6-10]</sup> because about 80% of nurses do not follow guidelines or recommendations.<sup>[3,11]</sup> Consequently, to provide safe and effective tracheostomy care, nurses need adequate skills and knowledge.<sup>[6]</sup>

Recent studies have shown that between 35% and 65% of CCU nurses had a low-to-moderate level of knowledge,<sup>[7,12,13]</sup> which can lead to the aforementioned short- and long-term complications related to poor tracheostomy care and poor practices.<sup>[14]</sup> Preventing these complications requires adequate knowledge and skills. Implementation of standardized tracheostomy care protocols such as those

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of the American Association of Critical-Care Nurses or the guidelines of the United Kingdom helps to reduce complications, improve communication, and reduce variations in practice.<sup>[15]</sup> Several studies found a significant association between the nurse's level of knowledge regarding tracheostomy care and demographic variables, for example, gender,<sup>[13,16]</sup> work experience,<sup>[3,13,17]</sup> and the ward in which nurses work affected their level of knowledge.<sup>[17]</sup> All prior studies were conducted in developed countries, with none conducted in developing or Arab countries such as Jordan.

In Jordan, the CCUs nurses' practice regarding care for patients with a tracheostomy is associated with a dearth of knowledge and a lack of formal educational programs.<sup>[11]</sup> Consequently, they tend not to follow the evidence-based practice guidelines. Moreover, the high rate of infection in patients with tracheostomy raises a red flag regarding the status of knowledge and compliance among nurses.

This study aimed to assess the level of knowledge of tracheostomy care application among critical care nurses in Jordan. It is expected to provide data on the needs of these nurses. Furthermore, that data will activate changes in the healthcare system to add evidence-based education, training, and standardized protocols for nurses providing tracheostomy care in CCU units in Jordan.

## Materials and Methods

A cross-sectional descriptive design was used to assess the level of knowledge about tracheostomy care of CCU nurses, from September to December 2021.

This study was conducted in the CCUs of four government hospitals in Amman, Irbid, Al-Mafraq, and Al-Zarqa, administered by the Jordan Ministry of Health (JMOH).

The target population was all nurses in CCUs in hospitals. The accessible population was all available nurses who matched the inclusion criteria in the four hospitals selected to participate in this study. A convenience sample was selected to assess the level of knowledge about tracheostomy care among 260 nurses who (a) had a diploma, bachelor's degree, or postgraduate degree, who were delegated to perform tracheostomy care, (b) were currently working in CCU units, (c) had Jordanian nationality, (d) agreed to participate, and (e) were not engaged in any recent training program about tracheostomy care. The sample size was calculated using the Raosoft sample size calculator. Based on a margin of error of 5%, a confidence level of 95%, a population size of 800, a response distribution at 50%, and the estimated measurement, the appropriate sample size was 250. To overcome missing or insufficient data, an additional 10 participants were added so that the final sample size was 260. The nurses were evaluated in the main CCU units (cardiac, thoracic, surgical, medical, general, and long-term critical care) in the four government hospitals that were selected (Al-Bashir Hospital 118, Zarqa

Hospital 51, Princess Basma Hospital 61, and Mafraq Hospital 30). Nurses were asked to complete the informed consent form and survey at the closest administration department in each hospital before the start of each shift or at its conclusion, depending on the workload conditions in each unit and the presence of the data collector.

A structured questionnaire was used to collect the required data, consisting of two parts: the socio-demographic data form: This consists of four variables (gender, age, years of experience, and educational level). Knowledge about tracheostomy care: The knowledge questionnaire sheet developed by Onoha (2019) was used to measure knowledge about tracheostomy care among staff nurses working in CCUs. It consists of 38 multiple-choice questions with four options for each question and is divided into six dimensions: "General information regarding trachea," five questions; "Knowledge regarding tracheostomy," five questions; "Knowledge regarding tracheostomy tube," five questions; "Knowledge regarding tracheostomy care," 10 questions; "Knowledge regarding tracheostomy suctioning," four questions; and "Nursing responsibility in tracheostomy care," nine questions. A score of less than 60% (<23/38) is considered low; 60% to 80% (23/38 to 31/38), moderate; and above 80% (>31/38), high. Evidence of reliability and validity was reported. Internal consistency reliability as measured by Cronbach's alpha coefficients for all items exceeded 0.73. Furthermore, the questionnaire scale was assessed for face and content validity by five experts in the context of tracheostomy care in critical care patients of interest who were employed as faculty members at Al al-Bayt University and other Jordanian hospitals. The overall impression was that all items were clear and easy to understand by the critical care nurses. The author conducted a pilot study in two selected public hospitals on a convenience sample of 20 CCU nurses before conducting the study. The pilot was intended to identify anticipated problems or obstacles to the data collection procedure and the suitability of the items in the questionnaire. This step helped the author to evaluate and ensure the clarity and familiarity of the questionnaire's words and phrases from the participants' perspective. Their comments revealed that the items were clear, comprehensive, suitable, and easy to complete.

Data were analyzed using the Statistical Package for Social Sciences version 20 (SPSS Inc., Chicago, IL, USA). Descriptive statistics, that is, means, standard deviations, frequencies, percentages, and ranges, were used to describe the sample and knowledge regarding tracheostomy care procedures. The *t*-test, one-way analysis of variance (ANOVA), and Scheffe's test were used to assess the differences between socio-demographic variables in terms of the level of knowledge.

**Ethical considerations**

Permission to conduct the study was obtained from the Institutional Review Board (IRB) of the university (ethical code: 23/140/2021, 22.3.2021) and the Ministry of Health (MOH). Written informed consent was obtained from all CCU staff nurses who agreed to participate in the study. The participants were informed that their participation was voluntary, and they could withdraw from the study at any time. Participants were also assured that their responses were confidential.

**Results**

The results include a description of participants' demographics and knowledge regarding tracheostomy care. The study survey was sent to 371 CCU nurses, with 260 nurses completing the survey and a response rate of 70%.

It is evident from Table 1 that the overall level of knowledge was moderate, with mean/total score standard Deviation (SD) of 26.05/38 (8.82). In detail, nurses had moderate levels of knowledge regarding tracheostomy care in five of the dimensions (general information regarding trachea, knowledge regarding tracheostomy, knowledge regarding tracheostomy tube, knowledge regarding tracheostomy suctioning, and knowledge regarding nursing responsibility in tracheostomy). In the dimension of knowledge regarding tracheostomy care, they had a high level of knowledge.

Table 2 presents these demographic factors associated with the nurses' knowledge of tracheostomy care. Three factors were significantly associated with knowledge age ( $F = 22.60, p < 0.001$ ), educational level ( $F = 355.30, p < 0.001$ ), and work experience ( $F = 13.63, p < 0.001$ ).

**Discussion**

Currently, tracheostomy care is a major health concern worldwide as the number of patients undergoing tracheostomy increases. Several deaths have occurred as a result of nurses' insufficient knowledge.<sup>[12]</sup> Although the significance of nurses' knowledge levels regarding particular care tools is prominent,<sup>[3,18]</sup> in the current study, the level of knowledge was moderate, which was lower than expectations. These findings indicate that CCU nurses need more knowledge regarding tracheostomy care if they are to prevent and manage complications (such as infection and bleeding), in addition to dressing care or suctioning.<sup>[19]</sup> Hence, continuous nursing professional development for CCU nurses is recommended.

In a prior quasi-experimental study among fifty Intensive Care Unit (ICU) nurses, they claimed that they had a good level of knowledge regarding tracheostomy care.<sup>[12]</sup> In the current study, the level of knowledge regarding the tracheostomy care dimension was high, although the other five dimensions were moderate. A similar result in a previous study indicated that nurses had a moderate-to-low

**Table 1: Level of knowledge about tracheostomy care among nurses (n=260) in the six dimensions**

Dimension	Mean (SD)	Knowledge level
General information regarding a trachea	3.27 (1.42)	Moderate
Knowledge regarding tracheostomy	2.70 (1.75)	Moderate
Knowledge regarding tracheostomy tube	3.16 (1.24)	Moderate
Knowledge regarding tracheostomy care	8.87 (2.43)	High
Knowledge regarding tracheostomy suctioning	2.49 (1.25)	Moderate
Knowledge regarding nursing responsibility in tracheostomy	5.56 (2.41)	Moderate
Overall	26.05 (8.82)	Moderate

**Table 2: Variables regarding the participants' characteristics (n=260) and correlations with the total level of knowledge regarding tracheostomy care**

Variable	n (%)	Total level of knowledge regarding tracheostomy care	p*
		Mean (SD)	
Age groups			
21-30	126 (48.40)	24.56 (8.11)	0.001
31-40	120 (46.10)	25.70 (7.40)	
41-60	14 (5.30)	5.43 (1.81)	
Gender			
Male	122 (46.90)	23.21 (8.81)	0.306
Female	138 (53.07)	24.80 (8.74)	
Educational level			
Diploma	44 (16.90)	34.82 (3.00)	0.001
Bachelors	180 (69.23)	25.01 (3.76)	
Postgraduate nursing	36 (13.8)	6.11 (1.88)	
Work experience			
Less than 5 years	98 (37.60)	27.37 (5.79)	0.001
5-10 years	136 (52.40)	23.50 (8.42)	
More than 10 years	26 (10.00)	14.46 (12.29)	

p\* was calculated by either t-test or one-way ANOVA test

level of knowledge,<sup>[20]</sup> while others found substantial levels of insufficiency.<sup>[7,13,21]</sup> Implementing educational materials on tracheostomy care has been shown in prior research to improve knowledge.<sup>[16]</sup> Thus, it is necessary to mandate and implement ongoing training for CCU nurses in tracheostomy care. Future studies need to assess further the major related factors that may lead to inadequate knowledge regarding tracheostomy care among nurses.

Tracheostomy care education frequently depends on anecdotal evidence rather than standardized tracheostomy care education programs. As such, a standardized program will help nurses acquire sufficient knowledge to avoid injury, disease, or even death among their patients.<sup>[3,22]</sup>

Although a previous study<sup>[23]</sup> conducted among 94 healthcare providers (50 physicians, 37 nurses, and seven fourth-year medical students) found that the level of knowledge regarding tracheostomy care is not necessarily

associated with nurses' age, working experience, or educational level, this is incompatible with the present study's findings. A statistically significant difference was found in all dimensions of care according to age, educational level, and work experience. Regarding gender, there was a statistically significant difference in knowledge regarding the tracheostomy-suctioning dimension. The gender showed that females has better knowledge level than males, and this result may be because females are naturally more careful and caring with patience, tenderness, emotions, and more accurate than other males, which makes them more interested in providing nursing care at the highest level.<sup>[24]</sup> In particular, according to the age variable, the knowledge level was highest in the age group of 30–40 years, followed by 20–30 years. Similarly, a previous descriptive study specified a significant association between the level of knowledge and age.<sup>[24]</sup> However, in the present study, experience was not constantly positively associated with knowledge about tracheostomy care. The results showed that the nurses with work experience of less than 5 years had the highest level of knowledge, which may result in variation in practice among nurses. It also revealed the need for clear written policies and an educational and training program for tracheostomy care. The previous studies found a positive relationship between work experience and the level of knowledge.<sup>[13,20]</sup>

On the topic of education level, nurses who have a diploma certificate have a high knowledge level. Similarly, a previous study emphasized a significant association between nurses' education level and level of knowledge,<sup>[4]</sup> although another revealed no significant demographic factors associated with the level of knowledge.<sup>[25,26]</sup>

The present study has a few limitations. This study was limited to four government hospitals and 260 nurses working in CCUs. Thus, the study findings may be generalized only to those government hospitals that have the same organizational policies, conditions, and procedures. Also, the current study used a self-reporting questionnaire, which is subject to self-report bias. Finally, this study focused on levels of knowledge regarding six dimensions of tracheostomy care, so future studies may focus on further common procedures such as stoma care and tape changes.

It is important to recognize nurses' training requirements regarding tracheostomy care and to design educational programs that can improve their level of knowledge. It is therefore recommended to develop and improve standardized tracheostomy care guidelines in clinical practice, to introduce training, workshops, educational programs, and clearly written protocols and policies for the application of safe tracheostomy care in hospitals, and to repeat the present study using a larger sample size and different health settings.

## Conclusion

Increasing complication rates among tracheostomy patients points to the significance of care and well-prepared educational programs. The level of knowledge among nurses regarding tracheostomy care was moderate, which was below our expectations. It was significantly associated with age, educational level, and work experience.

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## Conflicts of interest

Nothing to declare.

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