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Original Article

Critical Care Nurses' Practice of Oral Care for Critically Ill Patients with a Tracheostomy Tube

Asmaa Ahmed El-Assay 1, Hala Ahmed Abd El Rahman 2, Nahed Kandeel 3

1Demonstrator of Critical Care and Emergency Nursing, Faculty of Nursing, Mansoura University, Egypt. e.mail: dr_asmaa7320@yahoo.com

2 Lecturer of Critical Care and Emergency Nursing, Faculty of Nursing, Mansoura University, Egypt. e.mail: halaabdelrahma@yahoo.com

3 Professor of Critical Care and Emergency Nursing, Faculty of Nursing, Mansoura University, Egypt. e.mail: NahedKandeel2000@yahoo.com

1.ABSTRACT

Background: Oral care is an essential intervention for patients with a tracheostomy tube. Critical care nurses (CCNs) play a crucial role in providing proper oral care to maintain oral health and prevent infection, particularly ventilator-associated pneumonia. **Aim**: This study aimed to assess CCNs' practice of oral care for critically ill patients who have a tracheostomy tube. Method: A descriptive observational research design was used to conduct this study with a convenience sample of 60 CCNs working in three intensive care units affiliated with Mansoura Emergency Hospital in Egypt. One tool was used to collect data for this study: critical care nurses' practice of oral care assessment tool. **Results**: Most oral care interventions, such as gentle brushing the teeth and gum with chlorhexidine, suctioning oropharyngeal secretions, washing the mouth with antiseptic oral rinses, and using oral swabs with 1.5 % hydrogen peroxide in the event of infection, were not performed by all participant nurses. **Conclusion and Recommendations**: Overall, CCNs demonstrated poor oral care practice. These findings may have a negative effect on patients' outcomes. This emphasizes the importance of organizing oral care refresher training sessions regularly to improve nurses' practice. More research is needed to investigate the effectiveness of oral care training programs on CCNs' practice and the clinical outcomes of critically ill patients.

Keywords: Critical Care Nurses, Critically Ill Patients, Oral Care, Tracheostomy Tube.

2.Introduction:

Critically ill patients (CIPs) often require ventilatory support that is typically provided through the insertion of an endotracheal tube or the creation of a tracheostomy **(Woodrow, 2019)**. Prolonged endotracheal intubation is considered the first warning indication for tracheostomy **(Wahba, Basiony, Elsamanody, & Nour, 2020)**. However, tracheostomy is rarely the first procedure performed on a patient and is usually performed in response to clinical deterioration **(Billington & Luckett, 2019)**.

Tracheostomy is defined as "the procedure which involves an incision on the trachea followed by insertion of a tracheostomy tube with the maintenance of patency of the opening on trachea either permanently or temporarily" **(Swain, Behera, & Sahu, 2017, P. 50-51)**. Tracheostomy can be done either by a percutaneous or a surgical technique **(Intensive Care Society [ICS], 2014; Mishra, Khasne, & Dandnaik, 2020)**. The percutaneous dilatational technique is a bedside procedure that requires only a minor surgical incision and does not necessitate an operating room. While, the surgical technique is best performed in an operating room with proper lighting, suction, instruments, and assistance **(Fagan et al., 2017)**.

Swain et al. (2017) reported that tracheostomy is one of the most common surgical procedures performed in intensive care units (ICUs). In the United Kingdom, the **ICS (2014)** reported that around 15,000 tracheostomy insertion procedures are performed each year in ICUs. In Egypt, a recent study carried out by **Wahba et al. (2020)** found that tracheostomy was performed for 12.6% of CIPs. The authors also added that 83.3% of the studied patients were males, and 75% were cigarette smokers. The **National Confidential Enquiry into Patient Outcome and Death (2014)** reported that tracheostomy was inserted percutaneously in almost two-thirds of cases, and surgically in one-third of them.

A tracheostomy provides a secure airway, facilitates secretion clearance and weaning from mechanical ventilation (MV), reduces the direct laryngeal injury caused by the endotracheal tube,

and enhances patient comfort (**El-Anwar, Nofal, El Shawadfy, Maaty, & Khazbak, 2017**). Despite the numerous advantages of tracheostomy, its presence is associated with health complications and a decrease in patient quality of life **(Kutsukutsa, Mashamba-Thompson, & Saman, 2017)**. Oral feeding is one of the most unpleasant aspects for many patients with a tracheostomy tube as there may be a delay or absence of oral intake in these patients **(ICS, 2020)**.

Moreover, normal oral airflow is interrupted, resulting in less evaporation of oral secretions which subsequently accumulate in the oral cavity. This interruption results in the occurrence of ventilator-associated pneumonia (VAP). To overcome this problem, oral hygiene is critical for the patient with a tracheostomy tube **(National Tracheostomy Safety Project, 2013)**. In Brazil, **Miranda (2016)** found that a lack of preventative measures, and poor oral and clinical care in ICUs, are risk factors for the development of systemic disorders, particularly those affecting the respiratory and cardiovascular systems.

Oral care is a disease preventive and cost□effective procedure for patients, especially CIPs **(Emery & Guido- Sanz, 2019)**. Proper oral care prevents dental biofilm, tongue coating accumulation, and the accumulation of gram-negative bacteria which results in VAP, nosocomial pneumonia, and bacterial endocarditis **(Miranda, 2017)**. Critical care nurses (CCNs) play a vital role in performing oral care to preserve oral health and reduce the risk of infection **(Anggraeni, Hayati, & Nur'aeni, 2020)**. In Egypt, **Moustafa, Tantawey, El-Soussi, and Ramadan (2016)** advocated for the adoption of an oral assessment instrument for the prompt diagnosis of oral abnormalities in all patients.

In France, a study conducted by **Ory et al. (2016)** showed that an oral care protocol including tooth brushing, chlorhexidine use, and suctioning oral cavity significantly improved oral health scores compared with chlorhexidine cleaning alone. Additionally, an oral swab with a 1.5% hydrogen peroxide (HP) solution was recommended to clean the oral cavity every 2– 4 hours **(Sreenivasan, Ganganna, & Rajashekaraiah, 2018)**. A recent study emphasized the importance of using moisture of the mucosal membrane to improve oral health **(Anggraeni et al., 2020)**. Consequently, these interventions have a positive impact on decreasing the incidence of VAP **(Cherian & Karkada, 2015)**.

In this regard, a study carried out by **Ayşe, Karahan, and Cömert (2019**) recommended using soft toothbrushes to remove dental plaques and improve oral health status for the patients on MV. Also, a recent study reported that a combination of antiseptics and toothbrushing may reduce the incidence of VAP and length of ICU stay **(Zhao et al., 2020)**.

In Egypt, a recent study conducted by **Abdelhafez and Tolba (2021)** reported factors affecting the quality of oral care as perceived by the nurses, including inadequate nurse-patient ratio, inconsistent competency evaluation, and unavailability of oral care guidelines. Moreover, **Odgaard and Kothari (2019)** attributed poor oral care practices to limited nurses' time, unavailability of supplies, and the need for training courses on oral care as mentioned by the nurses. Furthermore, oral hygiene methods are frequently focused on patient comfort rather than germ elimination **(Sreenivasan et al., 2018)**. Hence, it is critical to overcome these obstacles and increase nurses' compliance with evidence-based oral care practices.

Significance of the Study

According to the **World Health Organization (2021)**, oral health is an important predictor of general health, well-being, and quality of life. To promote oral health in CIPs, it is vital to educate ICU staff about the link between dental plaque and patients' systemic conditions, improve ICU professional training, and implement oral care protocols **(Miranda, de Paula, de Castro Piau, Costa, & Bezerra, 2016)**.

Internationally, several studies assessed the nursing practice of oral care and reported CCNs' poor practice level **(Al-Bdairy & Hassan, 2021; da Silva Junior et al., 2020; Rumagihwa & Bhengu, 2019; Tanguay et al., 2018).** In Egypt, a recent study conducted by **Abd Alraheem, Mohamed, and Gendy (2020)** to assess the effect of oral care for patients on MV in ICU reported that most of CCNs had an unsatisfactory practice level of oral care. The same researchers also found that oral care in ICUs may be inadequate in eliminating dental plaque and respiratory infections from patients' oropharynx, contributing to a decline in oral health and increasing the risk of VAP.

A study conducted by **Collins et al. (2020)** reported that an effective oral care program decreases the incidence of VAP and improves patient comfort. Furthermore, a previous study that examined the effectiveness of oral care education in the prevention of VAP in ICUs found that increased education and adherence to oral care procedures with 0.12 % chlorhexidine solution

resulted in significant reductions in VAP rates by 62.5 % **(Zurmehly, 2013).** These findings indicate the need for more investigations to assess CCNs' practice of oral care for CIPs who have a tracheostomy tube in Egypt and identify areas that need improvement.

Aim of the Study

This study aimed to assess CCNs' practice of oral care for CIPs who have a tracheostomy tube.

Research question

To fulfill the aim of the study, the following research question is formulated:

Q: What is the level of CCNs' practice of oral care for CIPs who have a tracheostomy tube?

3. Method

Design

A descriptive observational research design was used to conduct this study. This design is used to observe, describe, and document a phenomenon occurring in its natural setting without any intervention or control **(Sharma, 2018)**. The collected data are used to assess conditions and practices or develop plans for improving health care practices **(Wood & Haber, 2018)**.

Setting

This study was carried out in three ICUs affiliated with Mansoura Emergency Hospital (surgical ICU 1, surgical ICU 2, and surgical ICU 3). Each unit has a capacity of 10 beds and is well equipped with supplies, advanced technology, as well as the manpower needed for CIPs' care. Surgical ICU 1 receives mostly patients with neurological impairment, poisoning, and shock. Surgical ICU 2 receives mostly poly traumatic patients. Surgical ICU 3 receives critically ill patients with different diagnoses. The nurse-patient ratio in these units is nearly 1: 2.

Participants

The current study involved a convenience sample of 60 nurses working in the aforementioned ICUs who were involved in direct patient care. Nurses with at least one year of work experience in the ICU and who agreed to participate were included in this investigation.

Data Collection Tools

One tool was developed to collect data for the current study

Critical Care Nurses' Practice of Oral Care Assessment Tool

It was developed by the primary investigator (PI) based upon reviewing the relevant literature **(Dale et al., 2019; National Tracheostomy Safety Project, 2013; Ory et al., 2016)**. This tool was used to assess CCNs' practice of oral care for CIPs who have a tracheostomy tube. It consisted of two main parts:

Part I: Critical Care Nurses' Demographic Characteristics

This part was used to collect data about participant nurses' age, gender, education level, years of work experience in the ICU, and attended training programs related to oral care.

Part II: Oral Care Observation Checklist

This part was used to observe and evaluate CCNs' practice of oral care. It involved 6 interventions including:

- Applying oral care every 4 hours a day with a soft toothbrush.
- Gently brushing the patient's teeth, gum, tongue, and hard palate using 2% chlorhexidine.
- Suctioning oropharyngeal secretions after brushing.
- Rinsing patient's mouth with antiseptic oral rinses.
- Applying a mouth moisturizer to the oral mucosa and lips.
- Using oral swabs with 1.5 % HP solution every 2-4 hours, if the infection is detected.

The scoring system was distributed as follows: "Done correctly" was given 2 marks, "Done incorrectly" was given 1 mark, and "Not done" was given 0. The total scoring system was classified into three categories; "Good practice" was >75%, "Fair practice" was from 50%-75%, and "Poor practice" was <50% **(Elbokhary, Osama, & El-khader, 2015)**.

Validity and Reliability

The tool was tested for its content validity by a panel of five experts from the Critical Care and Emergency Nursing and Medicine fields. Suggested modifications were made before data collection. The reliability of the tool (part II) was assessed by using the Cronbach's alpha test that was 0.89 which indicates a reliable tool.

Pilot Study

A pilot study was conducted in May 2019 on 7 nurses (10% of the total sample) to assess the objectivity, clarity, feasibility, and applicability of the data collection tool. The participants in the pilot study were excluded from the main study group.

Ethical Considerations

Ethical approval was obtained from the Research Ethics Committee of the Faculty of Nursing- Mansoura University. Eligible nurses were informed about the details of the study including the aim, benefits, and risks. They were also informed that participation in this investigation was voluntary and that they had the right to accept or refuse to take part in the study. Additionally, they were notified that they had the right to withdraw from the study at any time without penalty. They were also assured that the obtained data would not be a part of their annual appraisal. Anonymity and confidentiality of the personal data were assured through using codes on nurses' sheets instead of using names. Written informed consent was obtained from participant nurses who accepted to participate in the study.

Data Collection process

- Data were collected by the PI over a six-month period (between June and November 2019).
- Before commencing data collection, official permission to conduct the study was obtained from the director of the Mansoura Emergency Hospital after explaining the nature of this study.
- The PI set up a meeting with available nurses working in the selected study setting, explaining the study's aim and nature, and inviting them to participate in this research.
- The PI collected participant nurses' demographic data using part I of the tool. Completing this part lasted about 10 minutes for each nurse.
- Each nurse was given a code number to be used as an identifier during data entry and to ensure confidentiality.
- Participant nurses were observed three times during oral care of patients with a tracheostomy tube in different shifts according to nurses' predetermined schedules.
- The PI evaluated nurses' practice of oral care using the observation checklist (part II of the tool). Each observation lasted about 3 hours.
- The mean of the three observations was calculated. The practice level was determined according to the predetermined scoring system.

Data Analysis

The Statistical Package for Social Sciences (SPSS) Program version 25 was utilized for data analysis. Qualitative data were described as numbers and percentages. However, quantitative data were expressed as mean ± standard deviation (SD) or median if normally distributed and interquartile range (IQR) if not.

Limitations of the study

This study involved a small size convenience sample and it was only conducted in three ICUs in one hospital (Mansoura Emergency Hospital). These factors limit the generalizability of the research findings.

4. Results

Table 1 reveals the demographic characteristics of participant nurses. The results showed that 55% of the participant nurses were in the age group between 20 and 30 years with a mean age of 29.7 ± 5.3, and most of them (80%) were females. Additionally, 43.3% of the nurses had completed secondary nursing school and had more than 10 years of work experience in the ICU with a mean of 9.1± 5.6 years of experience. Furthermore, all participant nurses (100%) reported that they did not attend any training courses related to oral care.

Table 2 depicts participant nurses' total oral care practice level. The findings revealed that all participant nurses (100%) demonstrated poor oral care practice level, with practice scores < 50%.

Table 3 illustrates participant nurses' oral care practices. The results revealed that most oral care interventions, including gentle brushing the teeth and gum with chlorhexidine, suctioning oropharyngeal secretions, rinsing the mouth with antiseptic rinses, and using oral swabs with 1.5 % HP in case of infection, were not performed by all participant nurses (100%). Only 33.3% of the nurses correctly applied a moisturizer to oral mucosa and lips after each cleansing using water-soluble jell.

Table 1 Demographic Characteristics of Participant Nurses

Variables	n = 60	
	n	%
Age		
• 20-30 years	33	**55**
• 41- 50 years	27	45
Mean ± SD (29.7± 5.3)		
Gender		
• Male	12	20
• Female	48	**80**
Education Level		
• Secondary nursing school	26	**43.3**
• Technical diploma	10	16.7
• Bachelor	22	36.7
• Postgraduate	2	3.3
Years of Work Experience in ICUs		
• ≤ 5 years	21	35
• 6-10 years	13	21.7
• > 10 years	26	**43.3**
Mean ± SD (9.1± 5.6)		
Attended Training Courses		
• No	60	**100**

Data are expressed as number (n) & percentage (%), SD: Standard Deviation, ICUs: Intensive Care Units.

Table 2 Participant Nurses' Total Oral Care Practice Level

Item	Nurses' Practice (n= 60)					
	Good Level >75 %		Fair Level 50- 75 %		Poor Level < 50 %	
	n	%	n	%	n	%
Oral Care	0	0.0	0	0.0	60	**100**

#Data are expressed as number (n) & percentage (%).

Table 3 Participant Nurses' Oral Care Practices

Steps of Oral Care	Nurses' Practice (n= 60)					
	Done Correctly		Done Incorrectly		Not Done	
	n	%	n	%	n	%
1. Apply oral care every 4 hours a day with a soft toothbrush.	0	0.0	38	63.3	22	**36.7**
2. Gently brush the patient's teeth, gum, tongue, and hard palate using 2% chlorhexidine.	0	0.0	0	0.0	60	**100**
3. Suction oropharyngeal secretions after brushing.	0	0.0	0	0.0	60	**100**
4. Rinse patient's mouth with antiseptic oral rinses	0	0.0	0	0.0	60	**100**
5. Apply a mouth moisturizer to the oral mucosa and lips after each cleansing using a water-soluble jell.	20	**33.3**	19	31.7	21	35
6. Use oral swabs with 1.5 % HP solution every 2-4 hours, if infection is detected.	0	0.0	0	0.0	60	**100**
	Mean ± SD (4.9 ± 3.2)					

#Data are expressed as number (n) & percentage (%), SD: Standard Deviation, HP: Hydrogen Peroxide.

5. Discussion

Oral care provided regularly according to a standard protocol has a positive effect on oral mucosa health **(Özveren & Uçar, 2017)**. Unfortunately, oral care is sometimes overlooked in favor of the urgent needs of CIPs. Furthermore, it appears that nursing staff gives a low priority to oral hygiene **(Sreenivasan et al., 2018)**. Hence, we conducted this study to assess the CCNs' practice of oral care for CIPs in ICUs who have a tracheostomy.

The findings of the current study showed that more than half of the participant nurses were in the age group between 20 and 30 years. This may be attributed to the national trend in Egypt of employing newly graduating CCNs in ICUs to enhance patient care quality **(Mohamed, Kandeel, Abosaeda, & Ali, 2020**). This finding is supported by the results of other previous studies **(Aithal, Jagmohan & Niveditha, 2017; Maraş, Güler, Eşer, & Köse, 2016; Mohamed et al., 2020)**. However**, Madhuvu, Endacott, Plummer, and Morphet (2020)** reported that the biggest proportion of the enrolled nurses was in the age group between 31 and 40 years. This discrepancy could be due to the large sample size as the researchers involved 294 CCNs in their study.

Concerning gender, the current study illustrated that most of the participant nurses were females. This was expected as the nursing profession was previously known as a female profession in Egypt, yet males continue to be underrepresented in the nursing field (**Mohamed et al., 2020)**. This observation is consistent with the findings of similar investigations **(Maraş et al., 2016; Mwakanyanga, Masika, & Tarimo, 2018)**.

The current study revealed that the biggest proportion of the participant nurses had completed secondary nursing school and had more than 10 years of work experience in ICUs. This could be because nurses with a Bachelor's degree in Nursing Science were assigned administrative responsibilities within a few years after appointment rather than working as staff nurses. These findings are consistent with the findings of **Mohamed, Ismail, Sultan, and Abdel-kader (2016)** who reported that most of the studied samples in ICUs were graduated from secondary nursing school and had ≥ 10 years of work experience in ICUs. This is also supported by the results of another Egyptian study **(Zanaty, Morsy, Elshamy, & Ali, 2016)**.

On the contrary, **Abd- Elfatah, Khalil, and Abd El Rahman (2018**) reported that the biggest proportion of the studied nurses were graduates of the technical nursing institute and had less than 10 years of work experience in ICUs. Also, **Mohamed et al. (2020)** found that nearly half of the participant nurses had a Bachelor's degree in nursing and most of them had from 1 to less than 5 years of work experience. These discrepancies are due to the availability of different educational nursing programs that are currently running in Egypt including secondary nursing school, technical nursing institute, bridging program, Bachelor's of nursing program, and postgraduate programs.

The **American Association of Critical Care Nurses (2015)** emphasized the necessity of continuous skill training to maintain the qualifications required to operate equipment, carry out protocols, adhere to policies and procedures, and offer age-appropriate care. However, the current study revealed that all participant nurses did not attend any training courses on oral care for tracheostomized patients. This finding can be explained by a lack of in-service training programs in the study setting, limited training funds, and a nursing staff shortage that prevents nurses from attending training programs outside of the hospital. Consequently, this may negatively affect oral care for tracheostomized patients.

These findings are in harmony with the results of other studies **(Dhaliwal, Choudhary, & Sharma, 2018; Mohamed et al., 2016)**. On the other hand, **Odgaard and Kothari (2019)** reported that most of the studied nurses attended oral care training. This discrepancy could be related to the fact that the majority of the nurses in their study believed that oral care education, workshops, or programs would assist them to learn more about the best oral care techniques **(Odgaard & Kothari, 2019)**.

A previous study reported that HP mouthwash was more effective than normal saline mouthwash in reducing VAP **(Nobahar, Razavi, Malek, & Ghorbani, 2016)**. Therefore, this study recommended using HP mouthwash in routine nursing care. However, the current study's findings revealed that oral care practices were poor. Most steps of oral care procedure, such as gently brushing the patient's teeth and gums with chlorhexidine, suctioning oropharyngeal secretions, washing the mouth with antiseptic oral rinses, and utilizing oral swabs in the event of infection, were not performed by all of the participants.

These findings may be attributed to the nurses' perception of oral care as a comfort measure for the patient rather than an essential intervention. Nurses' perception of oral care as an unpleasant task may be a major barrier to their ability to do it **(Ibrahim, Mudawi, & Omer, 2015)**. Unavailability of oral care supplies, inadequate staff, and limited time available for each patient are additional barriers to performing good oral hygiene **(Abd Alraheem et al., 2020; Ibrahim et al., 2015)**. In this respect, an American study conducted by **Rumagihwa and Bhengu (2019)** emphasized the importance of developing an oral hygiene protocol for ventilated patients as well as providing ongoing in-service training for CCNs on oral care.

Our findings are congruent with **Mukhtar, Afzal, Sarwar, Waqas, and Gillani (2017)** who found that participant nurses' oral care practices were inadequate. Additionally, these findings are consistent with the findings of **Aziz et al. (2020)** who revealed that the majority of the enrolled CCNs provided inadequate oral hygiene, such as swabbing the mouth with chlorhexidine solution. Furthermore, comparable findings were reported in other investigations (**Aboalizm & Kasemy**, **2016; Rumagihwa & Bhengu, 2019)**.

On the other hand, according to a recent national survey in Australia, nearly two thirds of nurses gave MV patients daily oral care using chlorhexidine solution **(Madhuvu et al., 2020).** Our results also contradict the findings of a previous research investigation **(Aotaibi, Alshayiqi & Ramalingam, 2014)**. This discrepancy may be explained by the fact that most of the nurses in the cited studies had a Bachelor's degree in Nursing Science or higher. This is to be expected because nursing students receive advanced clinical training on nursing procedures in Bachelor or postgraduate nursing programs.

6. Conclusion and Recommendations

Based on the findings of the current study, it can be concluded that participant nurses' total oral care practice score was poor. These findings may have a negative impact on patients' outcomes. This highlights the need for conducting ongoing refresher training sessions for CCNs to improve their oral care practice. In addition, oral care written guidelines and bundle posters should be available in ICUs. Consequently, CCNs will be familiar with the current evidence-based practice. Further studies are needed to determine the impact of oral care training programs on CCNs nurses' practice and the clinical outcomes of CIPs.

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8.Declaration of Conflicting Interests

The authors declared no potential conflicts of interest regarding the research or publication of the article.

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