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Critical Care Nurses' Knowledge, Practices and Perceptions Regarding Mouth Care of Ventilated Patients in Palestine Hospital

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Thesis Approval

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Declaration

I declare that this study is the result of my own work research, except where otherwise indicated. It has been submitted for Master degree.

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Dedication

For my Family

Helen Maher Mohammad Rezqallah

Acknowledgement

First of all, I thank God very much for giving me the strength, direction and determination to complete this dissertation. This work would not have been possible without the constant support and encouragement from the people around me.

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I extend my deepest gratitude to my family, whose love, prayers, and sacrifices have been a constant source of strength throughout my academic journey. To my parents, thank you for instilling in me the values of perseverance and hard work, and for always believing in my potential. Your encouragement has been my biggest motivation.

Helen Maher Mohammad Rezqallah

Abstract

Background: Oral care is a fundamental aspect of nursing practice, particularly in intensive care units where mechanically ventilated patients are at increased risk of complications. Maintaining proper oral hygiene can significantly reduce the risk of infections, including ventilator-associated pneumonia (VAP), which is one of the most common and serious ICU complications. Despite its importance, oral care practices remain inconsistent, especially in resource-limited settings, leading to increased morbidity, prolonged hospital stays, and healthcare costs.

Aim: This study aims to assess critical care nurses' knowledge, practices, and perceptions regarding oral care for mechanically ventilated patients.

Method: This descriptive cross-sectional study included 304 critical care nurses from intensive care units in the West Bank. A structured self-administered questionnaire assessed their knowledge, practices, and perceptions of oral care for mechanically ventilated patients. Data were analyzed using descriptive and inferential statistics.

Results: Knowledge scores were categorized as poor (0–16), moderate (17–25), and good (26–34). Practices and attitudes were also categorized based on their total possible score Among 304 participants (52% private, 48% governmental ICUs), most were male (57.9%), married (62.8%), and had a bachelor’s degree (78.9%), with a mean age of 29.8 ± 6.0 years. Nurses had moderate knowledge (17.78 ± 3.26/34), suboptimal practices (34.5% followed protocols), and moderately positive attitudes (25.88 ± 3.41/40). Barriers included lack of time (60.7%) and supplies (44.3%). Higher education correlated with better knowledge, and private sector nurses had better practices. Attitudes correlated with knowledge ($r = 0.227$, $p < 0.001$), but no significant links were found between knowledge, practices, or attitudes.

Conclusion: The study founded a significant positive association between oral care perceptions and knowledge. Nurses with higher academic qualifications had better knowledge,

while married nurses, those trained in oral care, and those with more ICU experience performed care more frequently. Private ICU nurses and those in larger ICUs had better practices and perceptions. The study emphasizes the need for mouth care protocols and enhanced educational resources to improve oral care in Palestinian ICUs.

Keywords: Ventilator-associated pneumonia, oral care, critical care nurses, mechanical ventilation, ICU, knowledge, practices, perceptions, Palestine.

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List of Abbreviation

Abbreviation	Full form
ICU	Intensive Care Unit
OHC	Oral Hygiene Care
MV	Machine Ventilation
VAP	Ventilation Associated Pneumonia
ETT	Endotracheal Tube

Chapter One

Introduction

This chapter presents an overview of the study, focused on the knowledge, practices, and perceptions of critical care nurses regarding oral care for mechanically ventilated patients in Palestinian intensive care units (ICUs). It highlights the importance of oral hygiene in preventing ventilator-associated complications and addresses gaps in local research and practice. The chapter outlines the problem, significance, aim, research questions, and definitions of key variables.

1.1 Background of the Study

Oral care has been recognized as a fundamental component of nursing care for mechanically ventilated patients in ICUs. Its primary goal is to maintain a clean, moist, and infection-free oral cavity, ensuring patient comfort and minimizing complications such as ventilator-associated pneumonia (VAP). VAP is a major healthcare-associated infection that typically develops 48 to 72 hours after endotracheal intubation and is associated with increased morbidity, prolonged mechanical ventilation, extended ICU stays, rising healthcare costs, and elevated mortality rates. Incidence rates of VAP range from 23.8% to 36%, with reported mortality rates reaching up to 13% (Alharbi, 2024; Getahun et al., 2022).

Endotracheal intubation compromises oral defenses and predisposes patients to mechanical trauma, dryness, and colonization by pathogenic organisms—particularly Gram- negative bacteria. These factors increase the likelihood of developing VAP, underscoring the need for rigorous oral hygiene care (Zhang et al., 2020; Asadi &

Jahanimoghadam, 2024).

Effective oral care procedures—including the use of antiseptic solutions like chlorhexidine, sodium bicarbonate, hydrogen peroxide, mouth swabs, toothbrushes, and suction devices—have been shown to reduce oropharyngeal bacterial load and stimulate protective saliva flow (Rumagihwa & Bhengu, 2019; Park & Kim, 2023).

Critical care nurses are key providers of oral care. However, multiple studies have identified barriers that hinder optimal practices, such as insufficient staffing, lack of standardized protocols, inadequate training, patient non-cooperation, and fear of causing discomfort or complications (Ibrahim et al., 2015; Smith & Johnson, 2025). In many ICU settings, oral care is still perceived as a comfort measure rather than an essential clinical intervention, leading to inconsistencies in practice (Lee & Choi, 2023; Rumagihwa & Bhengu, 2019).

Moreover, studies suggest that nurses' knowledge and attitudes toward oral care remain variable and influenced by educational background, work experience, and access to training (Kim & Lee, 2022; El-Kass et al., 2024). Although international guidelines recommend evidence-based oral care protocols for VAP prevention (Mastrogianni et al., 2023), adherence remains inconsistent across settings.

In Palestine, there is a distinct gap in literature exploring ICU nurses' knowledge, practices, and perceptions of oral care for mechanically ventilated patients. Only a limited number of local studies have addressed adherence to VAP prevention guidelines (Al-Nawaja'a, 2022), and there is a lack of structured, evidence-based oral care policies. This study seeks to address this gap by providing current, region-specific data on nurses' oral care practices in ICUs.

1.2 Problem Statement

Oral care for mechanically ventilated patients is a vital yet often overlooked component of nursing care in ICUs. Inadequate oral hygiene has been directly linked to increased risk of ventilator-associated pneumonia (VAP), a leading cause of morbidity and mortality in critically ill patients (Getahun et al., 2022). Despite this, oral care practices remain inconsistent and are frequently deprioritized in ICU settings (Ibrahim et al., 2015; Rumagihwa & Bhengu, 2019).

In the Palestinian context, the situation is further complicated by limited resources, lack of standardized protocols, and insufficient training of nursing staff. Previous research in Palestine has shown suboptimal adherence to VAP prevention practices among ICU nurses (Al- Nawaja'a, 2022). However, little is known about nurses' specific knowledge, practices, and perceptions regarding oral care. This lack of data limits efforts to develop evidence-based interventions tailored to the local healthcare environment.

Furthermore, sociodemographic factors such as age, level of education, years of clinical experience, and participation in continuing education may influence oral care performance. Yet, their impact remains largely unexplored in Palestinian ICUs. Without this information, it is difficult to design effective training and policy reforms that target actual gaps in care.

This study addresses these issues by evaluating ICU nurses' knowledge, practices, and perceptions toward oral care for ventilated patients and examining the relationship between these factors and sociodemographic characteristics.

1.3 Significance of the Study

This study is significant as it addresses an underexplored yet clinically important aspect of ICU nursing in Palestine. VAP continues to be a major preventable complication in ICUs, and improving oral care practices has been shown to reduce its incidence significantly (Alharbi, 2024; Asadi & Jahanimoghadam, 2024). In the absence of standardized national guidelines, Palestinian nurses often rely on individual knowledge and informal routines, leading to inconsistent care and compromised patient outcomes.

By investigating the knowledge, practices, and perceptions of ICU nurses, this study provides a comprehensive assessment of current practices in Palestinian ICUs. The findings can support the development of targeted training programs, inform institutional policies, and promote the implementation of standardized oral care protocols that align with international best practices (Mastrogianni et al., 2023).

Furthermore, the study provided critical insight into the barriers to optimal oral care in low-resource settings and identifies key enablers that could improve patient outcomes. It contributes valuable data to the global literature and helps establish a foundation for future research and policy development in critical care nursing within Palestine and similar contexts.

1.4 Study Aim

This study aimed to assess the knowledge, practices, and perceptions of critical care nurses regarding oral care for mechanically ventilated patients in intensive care units in Palestinian hospitals. Additionally, the study sought to examine the relationship between these factors and nurses' sociodemographic characteristics, including age, level of education, clinical experience, and prior training in oral care.

1.5 Research Questions

The study attempts to answer the following research questions:

1. What is the level of critical care nurses' knowledge regarding oral care for mechanically ventilated patients?
2. What are the current practices of oral care for mechanically ventilated patients among critical care nurses?
3. What are the perseptions of critical care nurses towards providing oral care for mechanically ventilated patients?
4. Are there significant differences in critical care nurses' knowledge, practices, and attitudes regarding oral care for mechanically ventilated patients based on their sociodemographic characteristics?
5. Is there a significant relationship between critical care nurses' knowledge, practices, and perceptions regarding oral care for mechanically ventilated patients?

1.6 Definitions of the Study Variables

Conceptual and operational definitions of the study variables are listed in Table

Table 1.1 Conceptual and Operational Definitions of The Study Variables

Variable	Conceptual Definition	Operational Definition
Knowledge	The fact or condition of having information or of being learned (Merriam-webster, 2024a)	Level of knowledge regarding oral care for mechanically ventilated patients was measured by using Oral Care Questionnaire. The knowledge section comprised 7 multiple response questions with a total of 34 items statements, to be answered by

		selecting all that apply (Al-Zaru et al., 2020; Lin et al., 2011; Soh et al., 2012) Oral care practices for mechanically ventilated patients were assessed using the Oral Care Questionnaire, which included 13 questions with various response formats, including yes/no, multiple-choice, and select- all-that-apply options (Al-Zaru et al., 2020; Lin et al., 2011; Soh et al., 2012). Attitudes toward oral care were measured using the Oral Care Questionnaire, which included 12 questions focused on nurses' perceptions of oral care for mechanically ventilated patients. (Al-Zaru et al., 2020; Lin et al., 2011; Soh et al., 2012).
Practice	To perform or work at repeatedly so as to become proficient (Merriam-webster, 2024b).	
Attitude	A feeling or emotion toward a fact or state (Merriam-webster, 2024c).	

1.7 Summary

This chapter introduces the study focused on oral care for mechanically ventilated patients in ICUs, particularly examining the knowledge, practices, and perceptions of critical care nurses in Palestinian hospitals. It emphasizes the crucial role of oral care in preventing VAP, a common and serious hospital-acquired infection that significantly contributes to prolonged hospital stays, increased healthcare costs, and high mortality rates. The chapter outlines the complexities of providing effective oral care in ICUs, where compromised oral immunity due to endotracheal intubation increases the risk of VAP.

The chapter also highlights various barriers that nurses face in delivering optimal oral care, including insufficient training, lack of resources, competing clinical priorities, and the perception of oral care as a non-essential comfort measure rather than a life-saving intervention. These challenges are particularly pronounced in Palestinian ICUs, where limited research has been conducted to assess nurses' knowledge, practices, and attitudes regarding oral care for mechanically ventilated patients.

This study aims to fill this research gap by evaluating critical care nurses' understanding and implementation of oral care practices, as well as their perceptions toward its importance in preventing VAP. It also seeks to explore how sociodemographic factors, such as age, education, and clinical experience, impact the quality of oral care provided in Palestinian ICUs. By investigating these factors, the study aims to provide actionable insights into the current state of oral care practices, identify barriers to effective care, and contribute to the development of standardized, evidence-based guidelines that are suited to the resource limitations and unique challenges faced by Palestinian hospitals.

The findings of this research are expected to inform the development of targeted interventions, such as training programs, resource optimization strategies, and evidence-based protocols, that can enhance oral care practices, reduce the incidence of VAP, and improve patient outcomes. This study also holds significant implications for global healthcare, as it will contribute to the broader body of knowledge on critical care nursing, particularly in resource- limited settings, and serve as a model for future studies addressing similar issues in other regions.

Chapter Two

Literature Review

Oral care for mechanically ventilated patients in ICUs is a critical aspect of patient care that significantly impacts the prevention of VAP and other complications. Despite its importance, oral hygiene practices in ICUs are often inconsistent, leading to poor outcomes. Inadequate oral care practices contribute to increased microbial load, which can result in severe respiratory infections and longer ICU stays. This chapter aims to provide a comprehensive overview of the current literature on oral care in ICUs, specifically focusing on the knowledge, attitudes, and practices of ICU nurses, the effectiveness of various oral care solutions and tools, and the barriers to providing optimal oral care. The chapter will also discuss strategies for improving oral care practices in ICU settings to enhance patient outcomes.

2.1 Searching Strategies

A structured literature search was conducted using databases such as PubMed, CINAHL, ScienceDirect, and Google Scholar. Keywords included "oral care," "mechanically ventilated patients," "ICU nurses," "ventilator-associated pneumonia," and "oral hygiene practices." Boolean operators (AND, OR) were applied to refine the search. The search included peer- reviewed English-language articles published between 2017 and 2025. Reference lists of selected studies were reviewed for additional sources.

2.2 The Significance of Oral Care in Intensive Care Units

Oral care in ICU settings, particularly for mechanically ventilated patients, is critical in preventing complications such as ventilator-associated pneumonia. VAP remains one of the most common and serious infections in critically ill patients, leading to increased mortality, morbidity, and healthcare costs. Studies such as those by Zhang et al. (2020), Alharbi (2024), and Smith & Johnson (2025) have shown that mechanical ventilation significantly increases the risk of VAP, primarily due to the aspiration of contaminated oropharyngeal secretions into the lungs. Effective oral care, including regular cleaning of the oral cavity and teeth, has been demonstrated to reduce bacterial load, prevent aspiration, and improve overall patient outcomes (Torres et al., 2023; Garcia et al., 2022). Despite its importance, oral care is often deprioritized in ICU settings due to the high acuity of patient care needs and resource constraints (Rumagihwa & Bhengu, 2022).

Furthermore, oral hygiene is essential for patient comfort and well-being. Patients who are intubated and mechanically ventilated experience discomfort due to dry mouth, plaque accumulation, and bacterial overgrowth. Providing regular oral care enhances patient comfort, reduces the likelihood of secondary infections, and may even shorten ICU stays (Al-Zaru et al., 2023; Al-Nawaja'a, 2022). Nevertheless, inadequate oral care practices are frequently observed, often attributed to inconsistent adherence to protocols, inadequate training, and a lack of standardized care routines (Asadi & Jahanimoghadam, 2024).

2.3 Oral Cleaning Solutions

Several types of oral care solutions have been evaluated for their effectiveness in reducing oral bacterial load and maintaining oral mucosal integrity. Among the most studied solutions are chlorhexidine, sodium chloride, hydrogen peroxide, and sodium bicarbonate. These solutions vary in their antibacterial properties, mechanisms of action, and potential side effects, making their selection and application critical in the context of ICU care for mechanically ventilated patients. Recent studies have further explored their efficacy, safety, and optimal use in preventing VAP and improving patient outcomes (Alharbi, 2024; Asadi & Jahanimoghadam, 2024; Zhang et al., 2020).

2.3.1 Chlorhexidine

Chlorhexidine is widely recognized for its strong antibacterial properties and is one of the most frequently used oral care solutions in ICUs. It has been shown to reduce the incidence of VAP, decrease bacterial colonization, and improve overall oral hygiene (Zhang et al., 2020; Mastrogianni et al., 2023). Recent studies, including those by Alharbi (2024) and Asadi & Jahanimoghadam (2024), emphasized the importance of combining chlorhexidine with mechanical cleaning methods, such as toothbrushing, to maximize its effectiveness in reducing bacterial load and preventing VAP. However, side effects such as oral irritation and mucosal staining remain concerns.

2.3.2 Sodium Chloride

Sodium chloride, commonly known as saline solution, is primarily used to maintain moisture in the mouth and remove debris. While it is less potent as an antibacterial agent compared to chlorhexidine, it is widely used in conjunction with other

oral care solutions to ensure adequate oral moisture, especially in intubated patients. Recent research has highlighted its cost- effectiveness and accessibility in resource-limited settings, supporting its practical use (Garcia et al., 2022; Getahun et al., 2022).

2.3.3 Hydrogen Peroxide

Hydrogen peroxide is commonly used as an antiseptic solution to help cleanse the oral cavity and reduce microbial load. Recent studies have provided new insights into its safe and effective use. Torres et al. (2023) demonstrated that low concentrations (1–3%) were effective in reducing bacterial load without significant mucosal harm. The study highlighted its usefulness in patients with thick oral secretions but cautioned against prolonged use.

2.3.4 Sodium Bicarbonate

Sodium bicarbonate is used to neutralize acidity in the oral cavity, which helps prevent the growth of harmful bacteria. Recent studies, including Alotaibi et al. (2023), highlighted its effectiveness when combined with chlorhexidine, as well as its affordability and safety in low- resource settings (Cherian & Karkada, 2023).

2.4 Tools for Dental Plaque Removal

The effectiveness of oral care also depends on the tools used for plaque removal. Foam swabs, toothbrushes, and gauze pads are common. However, toothbrushes are more effective than foam swabs in removing plaque and bacteria. Recent studies have reinforced these findings. Al-Zaru et al. (2023) reported that toothbrushes significantly reduced plaque accumulation compared to foam swabs. Similarly, Ibrahim et al. (2023)

found that electric toothbrushes provided better outcomes but were underused due to cost and training barriers. Garcia et al. (2022) confirmed the benefits of suction toothbrushes in maintaining hygiene and reducing aspiration risk. Despite this evidence, many ICUs continue to rely on foam swabs due to cost and ease (Asadi & Jahanimoghadam, 2023).

2.5 Risk Factors for Ventilator-Associated Pneumonia

Several factors contribute to the development of VAP, including aspiration of contaminated secretions, contaminated respiratory equipment, poor hand hygiene, and preadmission colonization. Oral care is a key preventive measure. Zhang et al. (2020), Torres et al. (2023), and Al-Zaru et al. (2023) highlight its importance in lowering VAP incidence. Garcia et al. (2022) and Getahun et al. (2022) further emphasize how combining oral care with infection control strategies reduces aspiration and VAP risk.

2.6 Current Practices in Oral Care for Mechanically Ventilated Patients

Oral care practices in ICUs vary significantly. Studies like Al-Zaru et al. (2023) and Garcia et al. (2022) found that standardized protocols improve outcomes and adherence. Conversely, Asadi & Jahanimoghadam (2024) noted many nurses still lack confidence in oral care due to limited training. Ibrahim et al. (2023) showed that checklists and documentation tools improve adherence, while Getahun et al. (2022) emphasized the importance of resources and adequate staffing.

2.7 Knowledge and Attitudes of ICU Nurses

Nurses' knowledge and attitudes are crucial. Recent studies such as Asadi & Jahanimoghadam (2024), Al-Zaru et al. (2023), and Garcia et al. (2022) demonstrated

that structured education and ongoing training significantly improve knowledge and practice. Simulation-based programs (Ibrahim et al., 2023) have also enhanced confidence and competence.

2.8 Adherence to Protocols and Documentation

Adherence to protocols and proper documentation improves consistency in oral care. Ibrahim et al. (2023) found electronic documentation enhanced compliance and patient outcomes. Getahun et al. (2022) emphasized interdisciplinary collaboration in protocol design.

2.9 Frequency of Oral Care Practices

Recommended intervals for oral care are every 2–4 hours, but many ICUs fall short. Alotaibi et al. (2023) and Rumagihwa & Bhengu (2022) reported workload and staffing challenges affecting frequency. The use of checklists has been shown to improve compliance.

2.10 Tools and Equipment for Oral Care

Advanced tools such as suction and antimicrobial-coated toothbrushes are highly effective (Torres et al., 2023; Garcia et al., 2022). However, reliance on foam swabs persists due to ease and affordability (Asadi & Jahanimoghadam, 2023).

2.11 Barriers to Effective Oral Care

Barriers include staffing shortages, lack of training, and limited resources (Al-Zaru et al., 2023; Asadi & Jahanimoghadam, 2024). Garcia et al. (2022) also highlighted

supply shortages.

Cultural and institutional perceptions continue to deprioritize oral care.

2.12 Impact of Education and Training on Oral care Practice

Education remains key. Studies by Ibrahim et al. (2023), Getahun et al. (2022), and Asadi & Jahanimoghadam (2024) show that structured and interdisciplinary training improves compliance, confidence, and outcomes.

2.13 Comparative Insights and Knowledge Gaps

Knowledge gaps persist, especially in tailoring oral care to specific populations. Alotaibi et al. (2023) emphasized older and vulnerable patients need customized protocols. Garcia et al. (2022) and Torres et al. (2023) called for research into safer and innovative tools.

2.14 Perception of Oral Care in Mechanically Ventilated Patients

Nurses' perceptions influence prioritization. Zhang et al. (2020) and Al-Zaru et al. (2023) reported that positive attitudes lead to better practice. Asadi & Jahanimoghadam (2024)

highlighted challenges due to limited awareness and training. Institutional support, leadership, and champions improve perceptions (Rumagihwa & Bhengu, 2022).

2.15 Summary

This chapter reviewed recent literature (2017–2025) on oral care for mechanically ventilated ICU patients, underscoring its essential role in preventing VAP and improving outcomes. Despite advancements, oral care remains inconsistently practiced due to various systemic and institutional barriers. Effective oral hygiene requires standardized protocols, proper equipment, and trained personnel. Nurse perceptions, shaped by education and support, significantly affect care delivery. Further research, especially in underrepresented settings like Palestine, is crucial for developing context-specific interventions and improving care standards.

Chapter Three

Research Methodology

This chapter describes the research approach, including study design, settings, target population, sample size, sampling technique, inclusion criteria, data collection process, instruments, validity and reliability, ethical considerations, and data analysis methods.

3.1 Study Design

A cross-sectional study design was employed, selected for its alignment with the research objectives. This approach involves the collection of data at a single point in time, eliminating the need for follow-up. It offers several advantages, including the ability to access a broad and diverse participant population, enabling efficient data collection and analysis. Furthermore, this design is particularly suitable given the constrained time frame associated with this nursing master's thesis.

3.2 Study Setting

The study was conducted in 12 hospitals (5 governmental and 7 private) located in the West Bank region. Data were collected from critical care nurses providing care to mechanically ventilated patients in these settings. The study included all nurses working in the general ICUs (medical, surgical, and neurological) of the selected hospitals during the data collection period. This approach ensured a representative sample of critical care nurses actively involved in the delivery of oral care to ventilated patients across diverse healthcare facilities in the region.

3.3 Population and Sampling

3.3.1 Target Population

The target population for this study comprises all nurses working in adult Palestinian ICUs in the region of West Bank except Jerusalem in both governmental and private healthcare sectors. The total number of critical care nurses who work in different type of adult ICUs in this area was 723 nurses.

Table 3.1: Illustrates their Distribution According to Hospitals.

Table 3.1 Nurses' distribution in adult Palestinian ICUs, West Bank (N = 723).

Governmental sector			**Private sector**		
Hospital – City		**ICU Team**	**Hospital – City**		**ICU Team**
1	Jericho - Jerico	12	15	Ibn Sina – Jenin	53
2	Turkish – Tubas	14	16	Alrazi – Jenin	34
3	Al-Hussein - Beit Jala	24	17	Specialized Arab – Nablus	45
4	Dura – Dura	15	18	An-Najah – Nablus	40
5	Dr. Thabet Thabet – Tulkarm	20	19	Specialized Nablus – Nablus	36
6	Khalil Suleiman – Jenin	24	20	Specialized Alesraa – Tulkarm	11
7	Yasser Arafat Hospital - Salfeet	11	21	Al-Mezan – Hebron	22
8	Abu Al-Hasan Qassem - Yatta	7	22	Al-Ahli – Hebron	43
9	Palestine Medical Complex (PMC)- Ramallah	80	23	Arab Society for Rehabilitation (BASR) – Bethlehem	36
10	Darwish Nazzal – Qalqilya	15	24	Yamamah – Bethlehem	10
11	Al-Watani – Nablus	31	25	H clinic – Ramallah	16
12	Rafidia – Nablus	22	26	Istishari – Ramallah	50
13	Queen Alia – Hebron	40			
14	Mahmoud Abbas – Halhoul	12			
Total cohort		**327**	**Total cohort**		**396**

3.3.2 Recommended Sample Size

To determine the minimum required sample size, we adopted the single population proportion formula implemented in the online Statdisk software. The recommended sample size was 252 based on a 5% margin of error and with a 95% confidence interval. A 10% drop rate was added to account for incomplete responses or missing data. Hence, the estimated sample size was 278 nurses.

3.3.3 Sampling

To reach the recommended sample size, a convenience sampling technique was employed to recruit participants who met the inclusion criteria from 12 selected hospitals, representing both governmental and private healthcare sectors in the West Bank. These hospitals were located in the cities of Bethlehem, Ramallah, Tulkarm, Nablus, and Jenin. The total accessible population of critical care nurses working in these hospitals was 402. Accordingly, 402 questionnaires were distributed to this entire population. A total of 304 valid responses were received, yielding an overall response rate of 75.6%, which exceeded the minimum required sample size.

Table 3.2 summarizes nurses' response rate by hospital. This selection was made to achieve a balanced representation of the diverse geographical and demographic conditions in the region, offering a well-rounded perspective of the experiences of critical care nurses across different locales. Thus, provide a suitable environment for identifying the existing knowledge, practices, and attitudes of ICU nurses regarding oral care for orally intubated patients.

Table 3.2: Nurses' Response Rate by Hospital (N = 304).			
Hospital		**ICU Team**	**Response n (%)**
Governmental sector			
1	Al-Hussein - Bethlehem	24	16 (66.7)
2	Dr. Thabet Thabet – Tulkarm	20	19 (95.0)
3	Martyr Khalil - Jenin	24	12 (50.0)
4	Palestine Medical Complex (PMC) - Ramallah	80	70 (87.5)
5	Al-Watani – Nablus	31	29 (93.5)
Total cohort		**179**	**146 (81.5)**
Private sector			
6	Alrazi – Jenin	34	9 (26.5)
7	Istishari – Ramallah	50	45 (90.0)
8	An-Najah – Nablus	40	36 (90.0)
9	Specialized Nablus – Nablus	36	30 (83.3)
10	Specialized Alesraa – Tulkarm	11	10 (90.9)
11	Arab Society for Rehabilitation (BASR) – Bethlehem	36	12 (33.3)
12	H clinic – Ramallah	16	16 (100.0)
Total cohort		**223**	**158 (70.9)**
Overall		**402**	**304 (75.6)**

3.4 Eligibility Criteria

Inclusion criteria included any registered or practical nurse who were currently working at adult ICUs in the nominated hospitals. Pediatrics units were excluded. Participation in the study was completely voluntary. Nurses preferring not to participate in the study and those who did not meet the inclusion criteria were excluded.

3.5 Study Instruments

The assessment of ICU nurses' knowledge, practices, and attitudes regarding oral care for mechanically ventilated patients was obtained through a 4-section questionnaire developed based on the study of Al-Zaru et al. (2020). This instrument was a combination of two questionnaires used by Lin et al. (2011) and Soh et al., (2012).

3.5.1 Sociodemographic Section

The first section included 11 items capturing work-related sociodemographic information, adapted from prior literature. These items encompassed: hospital affiliation, gender, age, marital status, educational level, unit specialty, number of ICU beds, job title, years of ICU experience, training received on oral care for mechanically ventilated patients, and the primary source of knowledge regarding oral care for mechanically ventilated patients.

3.5.2 Knowledge Section

The second section had 7 multiple-choice questions with a total of 34 items to assess nurses' knowledge regarding oral care for for mechanically ventilated patients. These questions contained the characteristics of ideal care cleaning solutions, chlorhexidine, sodium chloride, hydrogen peroxide and sodium bicarbonate, oral care supplies and equipment that were effective for removing dental plaque, and the risk factors associated with VAP. Each question had one or more correct answers and the participants could choose multiple answers. For scoring, 1 point was given if the respondent correctly selected a correct option or not selected a wrong option and 0 otherwise. Hence, the total scores range from 0 - 34. Higher scores indicate higher levels

of knowledge.

3.5.3 Practices Section

The third section comprised 13 questions (yes/no and multiple-choice questions) concerning nurses' practices regarding oral care for for mechanically ventilated patients. These questions included the availability of oral care protocol and documentation form, current supplies and solutions readily available, difficulties associated with oral care for for mechanically ventilated patients. Moreover, this part also included four multiple-choice questions regarding the frequency of performing oral care practices (i.e., assisting patients in maintaining oral moistness, helping patients remove oral secretions toothbrushing, and using a cotton or foam swab). Nurses selected their own answers from the different frequency or duration options to each question. These four questions and the minimum standards recommended in the literature were used as a cut-off point for the frequency or duration of performance of oral care (Lin et al., 2011; Soh et al., 2012).

For scoring, one point was given when the frequency of "assisting patients in maintaining oral moistness" as well as "helping patients remove oral secretions" was "once every 2 - 4 hours" or more often. One point was also given when the frequency of performing "oral care using a toothbrush" was "once every 8 - 12 hours" or more often. Moreover, one point was given when the frequency of "oral care using a cotton swab or foam swab" was "once every 6 - 8 hours" or more often. On the other hand, zero points were given for less frequent care or no answer given. The scores were added together to form an ideal practices scale, ranging from 0 - 4, where a higher score reflected a higher frequency of performing oral care practices.

3.5.4 Perceptions Section

The fourth section comprised 12 questions concerning nurses' perceptions towards oral care for mechanically ventilated patients. This section consisted of 3 parts. The first part contained 2 questions, where nurses asked to rank the 7 physical care activities (i.e., activities nurses can perform independently to promote patients' comfort, for e.g., bed baths and chest physiotherapy) and the 8 nursing treatment activities (i.e., activities with greater survival impact on the patient that nurses could perform them as physicians' orders, for e.g., administering medication and catheter care) based on their priority as perceived by each nurse.

The second part comprised of 2 questions regarding the importance of oral care as perceived by each nurse as a physical care activity and a nursing treatment activity, respectively. Responses were in the form of a 10-point scale. Hence, total scores for both questions ranged from 2-20, where a higher score reflected a more positive perception toward oral care.

The third part included 8 items: (1) Oral care is a high priority for mechanically ventilated patients, (2) I have enough supplies and equipment to provide oral care, (3) I have adequate time to provide oral care, (4) cleaning the oral cavity is unpleasant task, (5) the oral cavity is difficult to clean, (6) I need enough training to provide oral care, (7) the mouth of patients gets worse no matter I do, and (8) when I perform tooth brushing in patient, I also use the suction. Each item was answered on a 5-point Likert-type scale ranging from 1 = Strongly disagree to 5 = Strongly agree. The responses for the negatively worded questions were reversed, where the reverse-scoring obtained by subtracting the respondent's answer from 6. So, the total perceptions scale ranged from 8-40, where higher scores indicate higher levels of favorable perceptions. This scale was also

extensively adopted in earlier studies. For example, it was used to explore the perceptions of ICU nurses towards oral care practices for mechanically ventilated patients in southern Jordan (Alja'afreh et al., 2018). Furthermore, Dagnew et al., (2020) employed this scale to assess nurses' perceptions towards oral care and their practicing level for hospitalized patients in Eritrea.

To facilitate comparisons, the mean score of the knowledge, practices, and perceptions was converted to a percentage by dividing the mean score by the maximum protentional score and then multiplied it by 100 %. Furthermore, nurses who scored 75% and above were considered to have good knowledge, practices and perceptions. Those who scored between 50- 74% were considered to have moderate or average knowledge, practices, and perceptions and those who scored less than 50% were considered to have poor knowledge, practices and perceptions (Elbokhary et al., 2015).

3.6 Questionnaire Assessment

The validity of the questionnaire was assessed through content validity. The instrument was reviewed by a panel of four experts in critical care nursing and mechanical ventilation, including one faculty member from Arab American University (AAUP) and three highly experienced critical care nurses. The panel evaluated the suitability, clarity, and contextual appropriateness of the wording. Consensus was reached on the survey items, with minor modifications made to improve wording. Additionally, the panel recommended adding two items to the perceptions scale: "When I perform tooth brushing for a patient, I also use suction" and "I have sufficient supplies and equipment to provide oral care." They also advised replacing the Yes/No format used in Al-Zaru et al. (2020) with a 5-point Likert-type scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

3.6.1 Pilot Testing

The final version of the questionnaire was pilot-tested with 30 ICU nurses who were not part of the main study to further assess question clarity and estimate the time required for completion. Based on feedback from the pilot, minor wording adjustments were made. The internal consistency of the attitudes scale was evaluated using Cronbach's Alpha, which yielded a value of 0.781, exceeding the recommended threshold of 0.70 (Hair et al., 2020), indicating good internal consistency.

3.7 Data Collection

After receiving approval from the Ethics Committee at Arab American University and securing permission to conduct the study from selected hospitals, an initial meeting was coordinated with the nursing managers of each participating hospitals. The purpose of this meeting was to discuss data collection procedures and agree upon suitable dates for data collection, the data collection period was between October and December 2024.

Following the agreement on scheduled appointments, researchers attended regular meetings held for each ward. During these sessions, participants were provided with the questionnaires to complete, with the survey requiring approximately 15–20 minutes to finish. Prior to data collection, the study's objectives and procedures were thoroughly explained to the participants, and written informed consent was obtained to safeguard their rights.

To ensure the integrity of responses, separate printed consent forms were provided for participants to sign, and completed questionnaires were securely sealed in return envelopes for submission. All collected data were anonymized and coded, with participants assured that their data would be securely disposed of at the conclusion of the

study. Additionally, participants were informed that the collected data would solely be utilized for research purposes and would not be utilized for any other intention.

3.8 Data Analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS) software, version 29. Categorical variables were summarized as frequencies and percentages, while continuous variables were expressed as means and standard deviations. Internal consistency was evaluated using Cronbach's Alpha coefficient. Differences in knowledge, practices, and attitudes scores regarding oral care for mechanically ventilated patients, based on nurses' general characteristics, were examined using independent t-tests and analysis of variance (ANOVA), with the Scheffé post-hoc test applied for multiple comparisons. Linear relationships between key study variables were assessed using Pearson's correlation coefficient. A significance level of 5% ($p \leq 0.05$) was applied for all statistical tests, with p-values ≤ 0.05 considered statistically significant.

3.9 Ethical Consideration

The study adhered to established ethical guidelines and secured all necessary approvals and permissions. Ethical approval was granted by the Institutional Review Board (IRB) of Arab American University (approval code: R-2024/A/91/N). Additionally, permissions were obtained from the Palestinian Ministry of Health and the administrations of the participating hospitals.

Formal permission letters were secured from both private hospitals and Palestinian Ministry of Health hospitals to facilitate the study's implementation. Participants were

informed about the voluntary nature of their participation and assured that all personal information would remain confidential, safeguarded by the researcher, and inaccessible to the public. The study's main findings, conclusions, and recommendations will be shared with relevant stakeholders, including critical care departments and hospital administrations, to ensure dissemination and potential implementation of the results.

3.10 Summary

This chapter has provided a description of the design and methods that were used in this study. The study questionnaire consisting of four parts was explained. A convenience sample of 304 Palestinian ICU nurses working in 12 hospitals in the region of Westbank completed the questionnaire with an overall response rate of 75.6%. Results of the study are presented in the following chapter.

Chapter Four

Results

This chapter presents the study's findings, addressing the research questions and hypotheses. It begins with an overview of participants' sociodemographic characteristics, followed by an assessment of nurses' knowledge, practices, and attitudes toward oral care for mechanically ventilated patients. The chapter also explores how sociodemographic factors influence these elements and examines the associations between knowledge, practices, and perceptions.

4.1 General Characteristics of the Participants

The general characteristics of the participants are presented in Table 4.1. The healthcare sector of the participants was approximately equal, where 52.0% of them from private ICUs, whereas 48.0% from governmental ICUs. More than half (57.9%) were men. The majority were married (62.8%), registered nurses (88.5%), and with bachelor degree (78.9%). The mean age was 29.8 ± 6.0 years, ranged from 22 to 54 years old. More than half (58.2%) were young adults (i.e., age < 30 years). Only (13.2%) of the participants had 10 years or more of ICU experience, where the mean of ICU experience was 5.7 ± 4.1 years, ranged from 1 to 27 years. Nearly three- quarters (72.0%) had received training regarding oral care for intubated patients. The main source of learning regarding oral care for intubated patient was a nursing school (75.8%) followed by the senior nurses in their units (61.4%). Furthermore, more than half (55.9%) were general ICUs. Nearly one-third (33.6%) of the ICUs were equipped with 10 beds or more, where the mean number of ICU beds was 7.8 ± 2.8, ranged from 4 to 14.

The general characteristics of the participants are presented in Table 4.1.

Table 4.1: General Characteristics of the Participants (N = 304)		
Characteristic	**Categories**	**n (%)**
Healthcare sector	Governmental	146 (48.0)
	Private	158 (52.0)
Gender	Male	176 (57.9)
	Female	128 (42.1)
Age (years)	< 30	177 (58.2)
	30 - 39	108 (35.5)
	≥ 40	19 (6.3)
	Mean ± SD (min - max)	29.8 ± 6.0 (22 - 54)
Social status	Single	113 (37.2)
	Married	191 (62.8)
Education	Diploma	23 (7.6)
	Bachelor	240 (78.9)
	Master/PhD	41 (13.5)
Unit specialty	General	170 (55.9)
	Medical	66 (21.7)
	Surgical	20 (6.6)
	Coronary	48 (15.8)
ICU no. of beds	< 10	202 (66.4)
	≥ 10	102 (33.6)
	Mean ± SD (min - max)	7.8 ± 2.8 (4 – 14)
Job title	Registered nurse	269 (88.5)
	Head nurse	19 (6.3)

	Practical nurse	16 (5.3)
ICU experience (y)	< 5	125 (41.1)
	5 - 9	139 (45.7)
	10 - 14	26 (8.6)
	≥ 15	14 (4.6)
	Mean ± SD (min - max)	5.7 ± 4.1 (1 – 27)
Training regarding oral care for intubated patients	Yes	219 (72.0)
	No	85 (28.0)
Source(s) of learning regarding oral care for intubated patient[a]	Instruction from senior ICU nurses	137 (61.4)
	Nursing school	169 (75.8)
	In-service education at ICU	112 (50.2)
	Participating in an in-service course outside the hospital	55 (24.7)
	Reading related studies and materials of my own accord	55 (24.7)
	Participating in an in-service course within the hospital	36 (16.1)

[a] Multiple responses were possible

4.2 Nurses' Knowledge Regarding Oral Care for Intubated Patients

Table 4.2 summarizes our findings about nurses' knowledge regarding oral care for orally intubated patients. Overall, the participants had a moderate level of knowledge regarding oral care for intubated patients, where the mean knowledge score was (17.78 ± 3.26) out of 34, and ranged from 8.0 to 25.0 points (or equivalently, 52.28 ± 9.58%). Participants were categorized according to their level of knowledge, see Figure 4.1. Approximately, two thirds (66.1%) had a moderate knowledge level (those who scored 50% to less than 75.0%).

Surprisingly, none had a good knowledge level (i.e., score ≥ 75.0%). Furthermore, the percentages of participants who responded correctly/incorrectly to each question are illustrated

4.3. Concerning the Characteristics of Various Cleaning Solution

we found that more than three- quarters (76.3%) of participants recognized that "anti-bacterial or inhibits bacteria" as the main characteristic for ideal cleaning solution. Moreover, the least often selected five correct options were:

1) "Causes oral pain" as a characteristic of chlorhexidine (12.5%),
2) "Promotes wound healing" as a characteristic of sodium chloride (31.9%),
3) "Tends to encourage bacterial growth" as a characteristics of sodium bicarbonate (37.5%),
4) "Neutralizes excessive oral acidity" as of sodium bicarbonate (41.8%), and
5) "Irritating to oral mucus" as a characteristic of hydrogen peroxide (42.4%).

On the other hand, the most often selected five wrong options were:

1) "Eliminates debris attached to oral mucous" as a characteristic of sodium chloride

(66.8%),

2) “Maintains oral moisture” as a characteristic of sodium chloride (54.6%),

3) “Decreases viscosity of oral mucus” as a characteristic of hydrogen peroxide (48.0%),

4) “Cotton swab” as characteristics of effective equipment for removing dental plaque (47.7%), and

5) “Removes dental plaque” as a characteristic of sodium chloride (44.7%).

Concerning the most common risk factors of VAP, the participants indicated that aspiration from contaminated secretions from the oropharynx as the most common risk factor (70.7%), followed by contaminated respiratory equipment (58.6%).

Table 4.2: Mean Knowledge Regarding Oral Care for Intubated Patients (N = 304)

Overall knowledge score	**Out of 34**	**Out of 100%**
Mean ± SD (min - max)	17.78 ± 3.26 (8.0 – 25.0)	52.28 ± 9.58 (23.53 – 73.53)

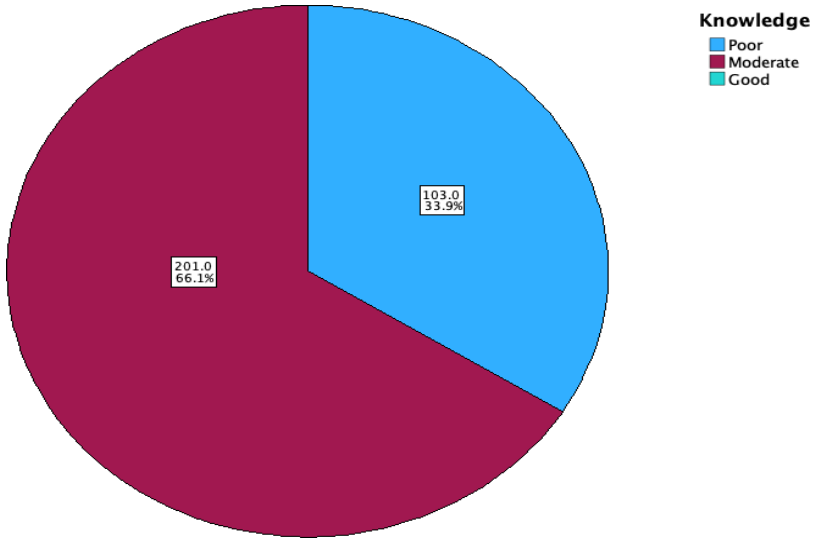

Figure 4.1: ICU Nurses’ Knowledge Levels of Oral Care for Intubated Patients (N = 304).

Table 4.3: ICU Nurses' Knowledge of Oral Care for Intubated Patients (N = 304)		
Questions/Items	**n (%)[a]**	**n (%)[b]**
Characteristics of the ideal cleaning solution		
contains alcohol	195 (64.1)	109 (35.9)
antibacterial or inhibits bacteria*	232 (76.3)	72 (23.7)
maintains oral moisture*	186 (61.2)	118 (38.8)
increases viscosity of oral mucus	199 (65.5)	105 (34.5)
promotes wound healing*	104 (34.2)	200 (65.8)
Characteristics of chlorhexidine as oral cleaning solution cleaning solution		
antibacterial*	206 (67.8)	98 (32.2)
appropriate concentration is 0.1- 0.12%*	166 (54.6)	138 (45.4)
decreases viscosity of oral mucus	172 (56.6)	132 (43.4)
treats oral infections*	156 (51.3)	148 (48.7)
causes oral pain*	38 (12.5)	266 (87.5)
Characteristics of sodium chloride as oral cleaning solution cleaning solution		
eliminates debris attached to oral mucus	101 (33.2)	203 (66.8)
maintains oral moisture	138 (45.4)	166 (54.6)
tends to cause mouth dryness*	139 (45.7)	165 (54.3)
removes dental plaque	168 (55.3)	136 (44.7)
promotes wound healing*	97 (31.9)	207 (68.1)
Characteristics of hydrogen peroxide as oral cleaning solution cleaning solution		
antibacterial*	169 (55.6)	135 (44.4)
removes bad odors*	188 (61.8)	116 (38.2)
decreases viscosity of oral mucus	158 (52.0)	146 (48.0)

irritating to oral mucus*	129 (42.4)	175 (57.6)
promotes wound healing	223 (73.4)	81 (26.6)
Characteristics of sodium bicarbonate as oral cleaning solution		
Antibacterial	188 (61.8)	116 (38.2)
tends to encourage bacterial growth*	114 (37.5)	190 (62.5)
increases viscosity of oral mucus	170 (55.9)	134 (44.1)
removes cell debris from inside mouth*	172 (56.6)	132 (43.4)
neutralizes excessive oral acidity*	127 (41.8)	177 (58.2)
Oral care supplies and equipment effective for removing dental plaque		
cotton swab	159 (52.3)	145 (47.7)
foam swab	189 (62.2)	115 (37.8)
toothbrush*	158 (52.0)	146 (48.0)
gauze pad	174 (57.2)	130 (42.8)
The most common risk factors of VAP on ventilated patients is		
from other patients*	146 (48.0)	158 (52.0)
aspiration of contaminated secretions from the oropharynx*	215 (70.7)	89 (29.3)
from health care workers' hand*	178 (55.9)	126 (41.4)
from contaminated respiratory equipment*	170 (58.6)	134 (44.1)
preadmission colonization*	80 (26.3)	224 (73.7)

*Correct answer

[a] Frequencies and percentages of correct options

[b] Frequencies and percentages of wrong options

4.3 Nurses' Practices Regarding Oral Care for Intubated Patients

Table 4.4 summarizes nurses' practices regarding oral care for intubated patients.

Approximately, one-third of the participants (34.5%) reported following a mouth care protocol. About half of the participants (51.3%) reported that oral care performed based on a physician order. More than half of the participants (58.2%) indicated that they did not document their patient's oral care. Only 45.1% of participants reported they frequently performing oral care for intubated patients during daily practice.

Cotton and gauze were indicated as the most available supplies for oral care (72.3%), followed by toothbrushes (55.1%). On the other hand, chlolahixidine was reported as the most available solution for oral care (75.4%), followed by sodium chloride (49.5%). Moreover, just over half of the participants (54.3%) reported using lip balm/Vaseline. Furthermore, the lack of time was considered as the major factor influencing the provision of oral care (60.7%), followed by the lack of supplies and equipment (44.3%). However, the most important barrier of providing oral care to patients who were orally intubated was suction difficulties (57.6%), followed by patient agitation/aggression (56.6%).

The practices scale consisted of four multiple-choice questions regarding the frequency of performing oral care practices (i.e., assisting patients in maintaining oral moistness, helping patients remove oral secretions, toothbrushing, and using a cotton or foam swab). Nurses selected their own answers from the different frequency or duration options to each question. These four questions and the minimum standards recommended in the literature were used as a cut-off point for the frequency or duration of performance of oral care (Al-Zaru et al., 2020; Lin et al., 2011; Soh et al., 2012).

Table 4.5 demonstrates participants' ideal performance frequency for mechanically ventilated patients. We found that just over three-quarters (75.7%) of participants reported they were removing patients' oral secretion once every 2-4 hours or more often. Nearly two-thirds (64.5%) of nurses were performed oral care with a cotton swab or foam once every 6-8 hours or more often. On the other hand, only (23.7%) indicated they were maintaining patients' oral moistness once every 2-4 hours or more often. Furthermore, nearly one-third (35.2%) reported they were performing oral care with a toothbrush once every 8-12 hours or more often.

Generally, the participants had a moderate level of practice, where the mean practice score was 1.99 ± 1.19 out of 4, and ranged from 0 to 4 points (i.e., the percentage of mean practice scores was 49.75 ± 29.75%), see Table 4.6. Moreover, participants were categorized according to their level of practice, see Figure 4.2. Only 28.9% had a good practice level (i.e., score ≥ 75.0%).

Table 4.4: ICU Nurses' Practices Regarding Oral Care for Intubated Patients (N = 304)

Variable	**Categories**	**n (%)**
Follow a mouth care protocol/policy	Yes	105 (34.5)
	No	199 (65.5)
Patient oral care performed based on a physician order	Yes	156 (51.3)
	No	148 (48.7)
Have a documentation form for patient oral care	Yes	127 (41.8)
	No	177 (58.2)
Frequency of oral care for intubated patients during daily practice	Always	137 (45.1)
	Often	93 (30.6)
	Sometimes	64 (21.1)

	Rarely	10 (3.3)
Current supplies readily available for oral care[a]	Gauze or cotton	219 (72.3)
	Toothbrush	167 (55.1)
	Toothpaste	109 (36.0)
Current solutions readily available for oral care[a]	Chlolahixidine	227 (75.4)
	Sodium bicarbonate	116 (38.5)
	Hydrogen peroxide	81 (26.9)
	Sodium chloride	149 (49.5)
	Lemon & glycerol	35 (11.6)
Routine use lip balms (e.g., Vaseline)	Yes	165 (54.3)
	No	139 (45.7)
	Not foreseen in the unit protocol	96 (32.0)

Factors affecting the provision of oral care[a]	Lack of time	182 (60.7)
	Lack of skills	130 (43.3)
	Lack of supplies and equipment	133 (44.3)
	Lack of nurses during the shift	116 (38.7)
	It causes patient discomfort	77 (25.7)
Barriers of providing oral care to patients who are intubated[a]	Lack of time	141 (48.6)
	Suction difficulties	167 (57.6)
	Patient agitation/aggression	164 (56.6)
	Inadequate equipment	115 (39.7)
	Coordination with other medical	58 (20.0)

	team members	
[a]Multiple responses were possible		

Table 4.5: ICU Nurses' Practices for Oral Care Practices for Intubated Patients (N = 304)	
Variable	**n (%)**
Removing patients' oral secretions once every 2-4 hours or more often	230 (75.7)
Maintaining patients' oral moistness once every 2-4 hours or more often	72 (23.7)
Performing oral care with a toothbrush once every 8-12 hours or more often	107 (35.2)
Performing oral care with a cotton swab or foam once every 6-8 hours or more often	196 (64.5)

Table 4.6: Mean Ideal Practice Regarding Oral Care for Intubated Patients (N = 304)		
Overall ideal practice score	**Out of 4**	**Out of 100%**
Mean ± SD (min - max)	1.99 ± 1.19 (0 – 4)	49.75 ± 29.75 (0 – 100)

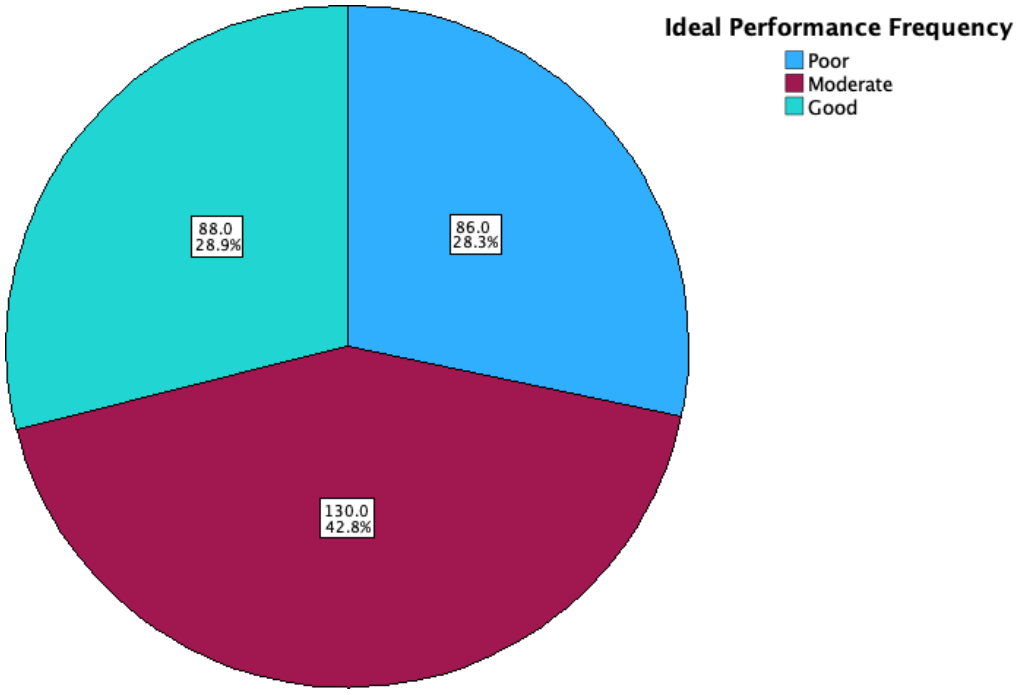

Figure 4.2: ICU Nurses' Ideal Practices Levels of Oral Care for Intubated Patients (N = 304).

4.4 Nurses' Perceptions/Attitudes Regarding Oral Care for Intubated Patients

Table 4.7 summarizes participants ranking of priority of oral care. The participants believed that oral care was relatively moderate important as a physical care activity. Therefore, they ranked oral care third in the order of priority of physical activities next to physical assessment, and chest physiotherapy. However, when oral care competing with other nursing treatment activities that have greater survival effects on the patient like oxygen therapy, suctioning sputum, and observing patient status, participants considered oral care the least important. So, they ranked oral care eighth in order (the last) of priority of nursing treatment activities.

Nurses had also asked to rank the importance of oral care as they perceived as a physical care activity and a nursing treatment activity, respectively. Our findings are summarized in Table

4.8. The mean perception scores regarding the importance of oral care of intubated patients was 14.40 ± 3.26) out of 20, and ranged from 3 to 20. Equivalently, the percentage of mean perception scores was 72.0 ± 16.3%.

Table 4.7: Critical Care Nurses' Ranking of Priority of Oral Care (N = 304)

Physical care activities	**Mean ± SD**	**Rank**	**Nursing treatment activities**	**Mean ± SD**	**Rank**
Physical assessment	2.76 ± 2.11	1	Processing patients' entrance ICU	4.08 ± 2.53	3
Bowel & bladder care	4.28 ± 1.72	6	Oxygen therapy	2.79 ± 2.01	1
Oral care	3.96 ± 2.02	3	Suctioning sputum	3.88 ± 1.96	2
Bed path	4.04 ± 1.92	4	Observing patient status	4.53 ± 2.08	4
Chest physiotherapy	3.51 ± 1.65	2	Assisting physician with procedures	4.56 ± 2.05	5

Changing position	4.10 ± 1.84	5	Administering medication	5.11 ± 1.94	6
Gastrointestinal care	5.37 ± 1.79	7	Catheter care	5.47 ± 2.43	7
			Oral care	5.53 ± 1.99	8

Table 4.8: Mean Perception Towards the Importance of Oral Care in Physical Care and Nursing Treatment Activities (N = 304)

	Mean ± SD (Min – Max)	
Question	**Out of 10/20**	**%**
Importance of oral care in physical care activities	7.73 ± 1.94 (1 – 10)	77.3 ± 19.4 (10 – 100)
Importance of oral care in nursing treatment activities	6.67 ± 2.44 (1 – 10)	66.7 ± 24.4 (10 – 100)
Total perception score	**14.40 ± 3.26 (3 – 20)**	**72.0 ± 16.3 (15 – 100)**

Furthermore, the nurses' overall attitude towards oral care scores were totaled from eight questions on the 5-point Likert scale (five positively worded and three negatively worded) giving an ideal minimum and maximum scores of 8 and 40 respectively. The responses for the negatively worded questions were reversed while computing the overall attitude scores. With increase in score, the level of favorable attitude increases. Table 4.9 summarizes our findings.

Table 4.9: Mean Perceptions Scores Regarding Oral Care for Intubated Patients (N = 304)		
Overall attitude score	**Out of 40**	**Out of 100%**
Mean ± SD (min - max)	25.88 ± 3.41 (13 – 37)	64.69 ± 8.53 (32.5 – 92.5)

Overall, the participants had a moderate level of perceptions towards oral care for for orally intubated patients, where the mean attitude score was (25.88 ± 3.41) out of 40, and ranged from 3 to 37 (or equivalently, 64.69 ± 8.53%). Participants were also categorized according to their level of perceptions , see Figure 4.3. The majority (82.9%) had a moderate attitude level (i.e., those who scored from 50% to less than 75.0%).

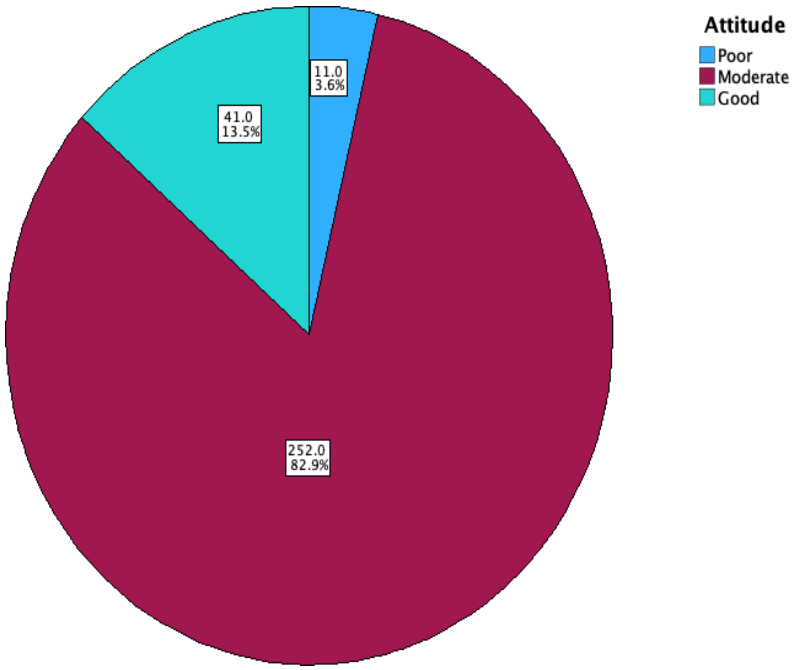

Figure 4.3: ICU Nurses' Attitude Levels of Oral Care for Intubated Patients (N = 304).

Furthermore, the percentages of participants who agreed or disagreed with each question are illustrated in Figure 4.10. It was also found that almost three-quarters (74.3%) of nurses considered oral care a high priority for mechanically ventilated patients, and more than half (58.6% and 52.6%, respectively) agreed that they had

sufficient supplies and equipment for oral care, as well as adequate time to provide it. Nevertheless, almost half of the nurses (i.e., 49.7% and 46.1%, respectively) agreed that oral care was an unpleasant task and reported that cleaning the oral cavity was difficult. In addition, only 43.8% of participants agreed on the need for sufficient training and oral care guidelines. Moreover, 39.1% agreed that the patients' oral condition worsened regardless of the care they provided.

Table 4.10: ICU Nurses' Attitudes Regarding Oral Care for Intubated Patients (N = 304)

Attitude		**Strongly agree/agree**	**Neutral**	**Strongly disagree/disagree**
		n (%)	**n (%)**	**n (%)**
1.	Oral care is a high priority for MV patients	226 (74.3)	29 (9.5)	49 (16.1)
2.	I have enough supplies and equipment to provide oral care	178 (58.6)	77 (25.3)	49 (16.1)
3.	I have adequate time to provide oral care	160 (52.6)	87 (28.6)	57 (18.8)
4.	Cleaning the oral cavity is unpleasant task[R]	151 (49.7)	83 (27.3)	70 (23.0)
5.	The oral cavity is difficult to clean[R]	140 (46.1)	78 (25.7)	86 (28.3)
6.	I need enough training to provide oral care	133 (43.8)	81 (26.6)	90 (29.6)
7.	The mouth of patients gets worse no matter I do[R]	119 (39.1)	82 (27.0)	103 (33.9)
8.	When I perform tooth brushing in patient, I also use the suction	179 (58.9)	71 (23.4)	54 (17.8)

[R] Negatively worded questions

4.5 Nurses' Knowledge, practices, and perceptions Regarding Oral Care for Intubated Patients According to Sociodemographic Characteristics

In this section, we presented our findings about the differences in ICU nurses' mean knowledge, practices, and perceptions according to their sociodemographic characteristics.

4.5.1 Nurses' Knowledge Regarding Oral Care for Intubated Patients According to Sociodemographic Characteristics

The differences in the mean knowledge scores regarding oral care for intubated patients according to nurses' sociodemographic characteristics were shown in Table 4.11. Significant differences in knowledge levels were found according to nurses' education level, where higher education levels were associated with higher knowledge levels (p-value = 0.007). On the other hand, no significant relationships were found between the knowledge levels regarding oral care for intubated patients and other sociodemographic variables (i.e., healthcare sector, gender, age, social status, unit specialty, ICU no. of beds, job title, ICU experience, and oral care training).

Table 4.11: Relationship Between Nurses' Knowledge Regarding Oral Care and their Sociodemographic Characteristics (N = 304)

Characteristic	**Categories**	**Mean ± SD**	**P-value (t or F)**
Healthcare sector	Governmental	17.94 ± 3.23	0.405
	Private	17.63 ± 3.29	
Gender	Male	17.84 ± 3.29	0.712
	Female	17.69 ± 3.22	
Age (years)	< 30	17.93 ± 2.90	0.283
	30 - 39	17.41 ± 3.51	

	≥ 40	18.42 ± 4.65	
Social status	Single	17.50 ± 3.11	0.264
	Married	17.94 ± 3.34	
Education level	Diploma[a]	16.26 ± 3.06	0.007*
	Bachelor[b]	17.73 ± 3.08	
	Master/PhD[c]	18.90 ± 4.01	
Unit specialty	General	17.89 ± 3.03	0.483
	Medical	17.47 ± 3.67	
	Surgical	17.00 ± 3.32	
	Coronary	18.13 ± 3.44	
ICU no. of beds	< 10	17.83 ± 3.20	0.677
	≥ 10	17.67 ± 3.38	
Job title	Registered nurse	17.83 ± 3.19	0.216
	Head nurse	16.58 ± 4.48	
	Practical nurse	18.31 ± 2.62	
ICU experience (y)	< 5	17.85 ± 2.85	0.119
	5 - 9	17.53 ± 3.33	
	10 - 14	17.73 ± 3.97	
	≥ 15	19.71 ± 4.08	
Oral care training	Yes	17.68 ± 3.21	0.389
	No	18.04 ± 3.38	
*The difference was significant (i.e., p-value ≤ 0.05).			

4.5.2 Nurses' Practices Regarding Oral Care based on Sociodemographic Characteristics

Table 4.12 illustrates the differences in the mean scores of the ideal practices regarding oral care for intubated patients according to nurses' sociodemographic characteristics. It was found that nurses in private hospitals had significantly higher practices scores than their counterparts in governmental hospitals (p-value < 0.001). Furthermore, married participants had considerably higher scores than single participants (p-value = 0.047). Nurses in ICUs equipped with higher no. of beds had higher scores (p-value < 0.001). Generally, higher ICU years of experience was also associated with higher scores (p-value = 0.011). Furthermore, nurses who had oral care training had higher scores (p-value = 0.005). On the other hand, no significant associations were found between the practice levels regarding oral care for intubated patients and other sociodemographic variables (i.e., gender, age, education, unit specialty, and job title).

Characteristic	**Categories**	**Mean ± SD**	**P-value (t or F)**
Healthcare sector	Governmental	1.75 ± 1.20	< 0.001*
	Private	2.21 ± 1.14	
Gender	Male	1.95 ± 1.22	0.479
	Female	2.05 ± 1.15	
Age (years)	< 30	1.90 ± 1.21	0.109
	30 - 39	2.18 ± 1.13	
	≥ 40	1.74 ± 1.24	
Social status	Single	1.81 ± 1.24	0.047*
	Married	2.09 ± 1.15	

Education level	Diploma	1.83 ± 1.47	0.226
	Bachelor	2.05 ± 1.14	
	Master/PhD	1.73 ± 1.27	
Unit specialty	General	1.98 ± 1.23	1.000
	Medical	2.00 ± 1.11	
	Surgical	2.00 ± 0.97	
	Coronary	1.98 ± 1.27	
ICU no. of beds	< 10	1.85 ± 1.28	< 0.001*
	≥ 10	2.27 ± 0.92	
Job title	Registered nurse	1.99 ± 1.21	0.604
	Head nurse	2.21 ± 1.08	
	Practical nurse	1.81 ± 1.05	
ICU experience (y)	< 5	1.78 ± 1.15	0.011*
	≥ 5	2.13 ± 1.20	
Oral care training	Yes	2.11 ± 1.14	0.005*
	No	1.68 ± 1.26	

4.5.3 Nurses' perceptions towards Oral Care According to Sociodemographic Characteristics

Table 4.13 presents the differences in the mean scores of perceptions towards oral care for intubated patients according to nurses' sociodemographic characteristics. It was observed that nurses in private hospitals had considerably higher attitudes scores than their counterparts in governmental hospitals (p-value = 0.035). Besides, nurses in ICUs equipped with higher no. of beds had higher scores (p-value = 0.043). On the other hand,

no significant relationships were found between the nurses' attitudes levels regarding oral care for intubated patients and other sociodemographic variables (i.e., gender, age, education, social status, unit specialty, job title, ICU experience, and oral care training).

Table 4.13: Nurses' Attitudes Towards Oral Care According to Sociodemographic Characteristics (N = 304)

Characteristic	**Categories**	**Mean ± SD**	**P-value (t or F)**
Healthcare sector	Governmental	25.44 ± 3.62	0.035*
	Private	26.27 ± 3.16	
Gender	Male	25.89 ± 3.37	0.054
	Female	25.84 ± 3.48	
Age (years)	< 30	25.99 ± 3.46	0.119
	30 - 39	25.46 ± 3.12	
	≥ 40	27.11 ± 4.21	
Social status	Single	25.69 ± 3.62	0.490
	Married	25.98 ± 3.29	
Education	Diploma	25.48 ± 2.63	0.375
	Bachelor	25.80 ± 3.44	
	Master/PhD	26.54 ± 3.61	
Unit specialty	General	25.82 ± 3.30	0.783
	Medical	25.71 ± 3.62	
	Surgical	25.75 ± 4.42	
	Coronary	26.33 ± 3.09	
ICU no. of beds	< 10	25.59 ± 3.40	0.043*

	≥ 10	26.43 ± 3.37	
Job title	Registered nurse	25.84 ± 3.43	0.579
	Head nurse	26.63 ± 3.32	
	Practical nurse	25.56 ± 3.20	
ICU experience (y)	< 5	26.04 ± 3.65	0.090
	5 - 9	25.53 ± 3.09	
	10 - 14	25.88 ± 3.23	
	≥ 15	27.86 ± 4.04	
Oral care training	Yes	26.02 ± 3.25	0.241
	No	25.51 ± 3.80	
*The difference was significant (i.e., p-value ≤ 0.05).			

4.6 Associations between Knowledge, Attitudes and perceptions Regarding Oral Care

The relationships between oral care knowledge, perceptions and practices were investigated using Pearson's correlation coefficient (r), see Table 4.14. There was a significant small positive association between the oral care perceptions and knowledge [r = 0.227, and p- value < 0.001]. Moreover, linear regression analysis revealed that attitude score tends to increase by 0.24 per 1 point increase in total knowledge score (95% CI: 0.12 – 0.35). The value of the determination coefficient (r^2 = 5%) indicated that knowledge scores explained approximately 5% of the total variation in the perceptions scores, see Table 4.15. However, there were no significant correlations between the oral care knowledge and practice [r = - 0.110, and p-value = 0.056] and oral care practices and perceptions [r = 0.031, and p-value = 0.595].

Table 4.14: Correlation Between Nurses' Knowledge, Perceptions and Practices of Oral Care For Intubated Patients (N = 304)			
Variables	**Knowledge**	**Attitudes**	**Ideal practices**
Knowledge	—	—	—
perceptions	0.227* (< 0.001)		
practices	- 0.110 (0.056)	0.031* (0.595)	
* Linear association was significant at 5% level of significant.			

Table 4.15: Linear Regression Between Oral Care Knowledge and Perceptions of VAP (N = 304)				
Independent variable	**B ± standard error**	**95% CI**	**p-value**	**r^2**
Knowledge	0.24 ± 0.06	0.12 – 0.35	< 0.001	0.05
B: Regression coefficient; r^2: Determination coefficient; CI: Confidence interval				

4.7 Summary

This chapter displayed our findings regarding the research questions and hypotheses. The results showed that the knowledge of the ICU nurses regarding oral care was relatively moderate with a mean of 52.3%. Nurses didn't have adequate knowledge and clear perception about the properties of various oral cleaning solutions as well as the effective equipment that is used to remove dental plaque.

In terms of practices regarding oral care, the study showed that nurses have a relatively moderate level of ideal performance with a mean of 49.8%. The study found that mouth care protocol was relatively uncommon in Palestinian ICUs (34.5%). The study revealed that nurses have moderate positive perceptions level with a mean of 64.7%. The study also indicated when the greater importance activities were to stabilize the condition of critically ill patients, oral care was occupied the least priority.

Finally, the study supported positive significant association between oral care attitudes and knowledge. Moreover, the study provided evidence that master/PhD degree nurses tend to have greater knowledge regarding oral care for orally intubated patients than those with a bachelor's/diploma degree. Also married nurses, those who had oral care training, and those with higher ICU experience tend to perform oral care more frequently for intubated patients.

Moreover, nurses in private ICUs and also those working in ICUs equipped with higher no. of beds tend to perform oral care more frequently as well as have more positive attitudes than their counterparts in governmental ICUs and those working in ICUs equipped with fewer no. of beds, respectively.

Chapter Five

Discussion

This chapter finalizes the thesis by providing discussions and conclusions of the research, as well as recommendations to the healthcare centers and institutions practitioners. Limitations and some suggestions for future research were also mentioned.

In this study, we employed quantitative cross-sectional study design to explore the Palestinian ICU nurses' knowledge, practices and perceptions regarding oral care for mechanically ventilated patients. The study questionnaire was developed based on research that evaluated Jordanian ICU nurses' knowledge, practices and perceptions regarding oral care for mechanically ventilated patients (Al-Zaru et al., 2020). A total of 304 questionnaires from 12 hospitals were analyzed with an overall response rate of 75.6%. To the best of our knowledge, this was the first study in Palestine that explored ICU nurses’ knowledge, practices, practices regarding oral care specific to mechanically ventilated patients. The main results of this study were that the mean percentage of ICU nurses' knowledge, practices, and perceptions of oral care were 52.3%, 49.8%, and 64.7% respectively. These findings were consistent with the Jordanian study conducted by Al-Zaru et al., (2020), see Figure 5.1. Moreover, these findings were also agreed with a study done in Taiwan, see Lin et al., (2011).

5.1 Nurses Knowledge Regarding Oral Care for Intubated Patients

The ICU nurses’ knowledge regarding oral care for mechanically ventilated was inadequate with a mean of 52.3%, where our findings showed that the nurses did not have adequate knowledge and a clear perception regarding the properties of various oral

cleaning solutions as well as the effective equipment that can be used to remove dental plaque. These findings were consistent with the results of Al-Zaru et al., (2020) and Lin et al., (2011) in which the mean percentage knowledge score was 53.6%, and 58.8%, respectively. Moreover, a similar conclusion was also obtained from the former study of Labeau et al., (2008), in which they found that the nurses had low knowledge regarding the risk factors of developing VAP with a mean percentage knowledge score of 45.1%. Labeau et al., (2008) also reported that the lack of knowledge as a barrier for evidence-based practice adherence. This may due to many reasons, for instance, the absence of oral care protocols or policies, the lack of adopting updated evidence concerning oral care, and the lack of in-service continuing education regarding oral care as an important preventable measure for developing VAP.

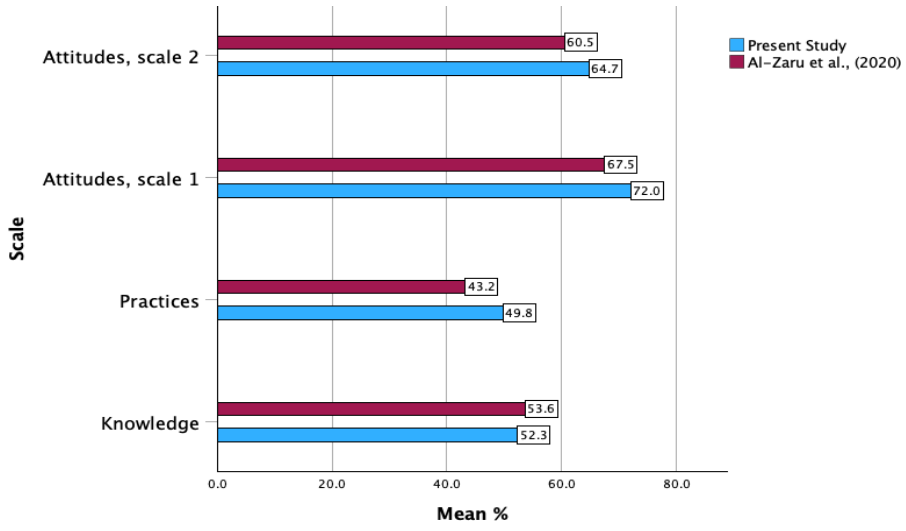

Figure **5**.1: Mean % of ICU Nurses' Knowledge, Practices, and Perceptions Regarding Oral Care for Mechanically Ventilated Patients.

Additionally, chlolahixidine was the most available solution for oral care (75.4%). Nevertheless, few participants (12.5%) recognized that it causes oral pain. Moreover, almost half (48.7%) did not know that it treats the oral infection as well as 45.4% of the participants did not know it’s appropriate concentration. Generally, these

findings were consistent with Al-Zaru et al., (2020). However, we found more than three-quarters (76.3%) of the nurses recognized that ideal cleaning solutions should have an antibacterial or bacterial inhibiting effect. This was agreed to what was found by Al-Zaru et al., (2020) and Lin et al., (2011), where 89.6% and 92.7% of the nurses selected "anti-bacterial or inhibits bacteria" as the main characteristic for ideal cleaning solution, respectively.

Toothbrushes were emphasized as an effective tool in removing dental plaque for orally intubated patients in the literature (Garcia, 2005; Garcia et al., 2009; Soh et al., 2012), where pediatric toothbrushes were found to be more suitable than adult ones due to their small heads. Nevertheless, our findings suggested that nurses did not have a clear perception about the effective cleaning tools for removing dental plaque. It was found that almost half (52.0%) of the nurses selected toothbrushes as an effective tool in removing dental plaque, whereas, 62.2 % and 57.2% selected foam swab and gauze pad, respectively. These findings were consistent with Al- Zaru et al., (2020). Similarly, Rumagihwa and Bhengu, (2019) reported that 53.2% of nurses never used a toothbrush.

Oral care is critical care in VAP prevention where the risk of VAP increases 1.3 times with each day on mechanical ventilator (Chacko et al., 2017; Getahun et. al, 2022). However, an Iranian study indicated only 21% of ICU nurses knew the reason for oral care was to prevent VAP (Adib-Hajbaghery et al., 2013). This was in contrast with a Jordanian study which showed that 73.5% agreed that VAP can be prevented if oral care is provided (Alja'afreh et al., 2018).

Our findings showed that nurses had a good idea about the main risk factors for developing VAP. It was found that nurses indicated that aspiration from contaminated secretions from the oropharynx as the most common risk factor of VAP (70.7%), followed by

contaminated respiratory equipment (58.6%). This was similar to Al-Zaru et al., (2020) and Soh et al., (2011).

5.2 Nurses Practices Regarding Oral Care for Intubated Patients

Oral care protocol along with good oral care practices (like the use of toothbrush, foam swabs, chlorhexidine, lip moisturizer and subglottic suctioning) have a positive influence on reducing the incidence of VAP, (Cherian & Karkada, 2015; Getahun et al., 2022). However, mouth care protocol/policy was relatively uncommon in Palestinian ICUs, where nearly two- thirds (65.5%) did not follow a mouth care protocol. This finding was similar to Ibrahim et al. (2015) and Rumagihwa and Bhengu, (2019). This may be likely linked to the poor oral care performance, where only 45.1% of participants reported they frequently performing oral care for intubated patients during daily practice. On the other hand, this was in contrast with a Jordanian study which revealed that 65% nurses followed a specific oral care protocol (Alja'afreh et al., 2018).

Generally, nurses had a moderate level of ideal practice, where the mean ideal practice score was 1.99 ± 1.19 out of 4, and ranged from 0 to 4 points (i.e., the percentage of mean ideal practice scores was 49.75%). It was found that the majority (42.8%) had a moderate level of ideal practices (i.e., score 50% to less than 75.0%), whereas, only 28.9% had a good ideal practice level (i.e., score ≥ 75.0%). This finding was relatively higher than the mean practices score of 43.2% in Al-Zaru et al., (2020). We also found that just over three-quarters (75.7%) of participants reported they were removing patients' oral secretion once every 2-4 hours or more often as ideal oral care. This finding was relatively lower than the results found by Lin et al., (2011) and Al-Zaru et al., (2020). However, nearly two-thirds (64.5%) of nurses performed ideal oral care with a cotton swab or foam

once every 6-8 hours or more often. This finding was relatively higher than the results of Lin et al., (2011) and Al-Zaru et al., (2020). On the other hand, less than half of nurses in this study performed ideal oral care with a toothbrush once every 8-12 hours or more often and maintaining patients' oral moistness once every 2-4 hours or more often. These findings were consistent with Lin et al., (2011) and Al-Zaru et al., (2020), whereas they were significantly less frequent than the findings of Ganz et al., (2009). This may due to many reasons that contribute to the less frequent performance of ideal oral care practices, for example, cleaning the oral cavity was found to an unpleasant task (49.7%) and difficult to clean (46.1%). Also, the lack of standardized oral care protocol/policy (65.5%) and the lack of knowledge about effective supplies and equipment (44.3%).

We also found that cotton and gauze were indicated as the most available supplies for oral care (72.3%), followed by toothbrushes (55.1%). Just over half of the participants (54.3%) reported using lip balm/Vaseline. On the other hand, chlolahixidine was reported as the most available solution for oral care (75.4%), followed by sodium chloride (49.5%). Generally, these findings were similar to Al-Zaru et al., (2020). However, despite many studies showed that chlorhexidine can be effective for mouth care procedure as it decreases the occurrence of VAP and there were some evidences suggest that it is preferred for cardiac surgery patients (Cuccio et al., 2012; Hillier et al., 2013), chlorhexidine was never used by 89.4% nurses in Rumagihwa and Bhengu, (2019).

The participants gave conflicting responses, such as over half (52.6%) agreed or strongly agreed they had adequate time to provide oral care, and yet the results showed that (60.7%) considered the lack of time as the major factor influencing the provision of oral care (60.7%), followed by the lack of supplies and equipment (44.3%). However, the most important barrier of providing oral care to patients who were intubated was suction

difficulties (57.6%), followed by patient agitation/aggression (56.6%). This finding was inconsistent with Rumagihwa and Bhengu, (2019), where nurses gave conflicting responses as over half (59.6%) nurses said that they did not have any difficulty to perform oral care to ventilated patients, and yet their findings showed that over three quarters (78.7%) had a low level of practice. In fact, the lack of supplies and equipment would hinder regular oral patient care.

5.3 Nurses Attitudes/Perceptions towards Oral Care for Intubated Patients

We adopted two different scales to measure nurses' attitudes/perceptions regarding oral care for mechanically ventilated patients. The first scale measures nurses' perceptions regarding the importance of providing oral care in physical care and nursing treatment activities. This scale comprised of two questions in the form of a 10-point scale. The total score ranged from 2-20, where a higher score reflected a more positive perception toward oral care. Accordingly, the mean of perception scores towards oral care of intubated patients was (14.40 ± 3.26) out of 20, and ranged from 3 to 20. Equivalently, the percentage of mean perception scores was 72.0%.

This finding agreed with the scores of (Ganz et al., 2009, Feider et al., 2010, and Lin et al., 2011). Moreover, our finding was a little higher than the perception score of 67.5% in Al-Zaru et al., (2020). On the other hand, the second scale measures nurses' overall perceptions towards oral care through eight questions which was answered on a 5-point Likert-type scale ranging from 1 = Strongly disagree to 5 = Strongly agree. So, the total attitudes score ranged from 8-40, where higher scores indicate higher levels of favorable attitudes. It was found mean attitude score was (25.88 ± 3.41) out of 40 (or equivalently, 64.7 %). Although the comparison with results of Al-Zaru et al., (2020) was

not straightforward, where nurses' attitudes was assessed using only six questions in the form of Yes/No questions. Our finding was relatively higher than the attitude score score of 60.5% in Al-Zaru et al., (2020).

Our findings also showed that when the greater importance activities were to stabilize the condition of critically ill patients, oral care was occupied the least priority. The results revealed that nurses believed that oral care was relatively moderate important as a physical care activity. Therefore, they ranked oral care third in the order of priority of physical activities next to physical assessment, and chest physiotherap. However, when oral care competing with other nursing treatment activities that have greater survival effects on the patient like oxygen therapy, suctioning sputum, and observing patient status, participants considered oral care the least important. Accordingly, they ranked oral care eighth in order (the last) of priority of nursing treatment activities. These findings were also agreed with Yeung and Chui, (2010), Lin et al., (2011), and Al-Zaru et al., (2020).

Despite earlier studies showed nurses ranking oral care as a high priority, many of these studies found that it was perceived as a difficult procedure and an unpleasant task in which they lacked sufficient knowledge, see e.g., (Soh et al., 2011, Alotaibi et al., 2016, Hassan et. al, 2017, Alja'afreh et., al, 2018, and Al-Zaru et al., 2020). Similarly, this study found that almost three- quarters (74.3%) nurses considered oral care was a high priority for mechanically ventilated patients and more than one half (58.6% and 52.6%, respectively) agreed they had enough supplies and equipment for oral care and adequate time to provide oral care. Nevertheless, almost half nurses (49.7% and 46.1%, respectively) agreed that oral care was unpleasant task and they felt that the oral cavity was difficult to clean. Besides, only 43.8% of the participants were positive about the need

for sufficient training and oral care guideline. Moreover, 39.1% agreed that the patients' oral condition worsened regardless of the care they provided.

5.4 Nurses' Knowledge, practices, and perceptions Regarding Oral Care for Intubated Patients According to Sociodemographic Characteristics

The study provided evidence that master/PhD degree nurses tend to more knowledgeable regarding oral care for orally intubated patients than those with a bachelor's/diploma degree (p- value = 0.007). This may be explained as that nurses with Master/PhD degrees usually had more condensed materials and tasks to do. Also nurses who had oral care training as well as those with higher ICU years of experience tend to perform oral care more frequently for intubated patients (p-value 0.005, and 0.011, respectively). This may due to the accumulation of clinical experience that could enhance their performance. Also, married nurses tend to perform oral care practices more frequently (p-value = 0.047). This may due to the confounding effect of ICU experience, where the analysis showed that married nurses had significantly higher ICU years of experience than single nurses (p-value < 0.001).

Moreover, nurses in private ICUs and those working in ICUs equipped with higher no. of beds tend to perform oral care more frequently for intubated patients than their counterparts in governmental hospitals and those working in ICUs equipped with fewer no. of beds, respectively (p-values < 0.001). This may due to adopting appropriate nurse-to-patient ratio which reduce the workload in these ICUs and enable performing oral care frequently. Additionally, nurses in private ICUs as well as those working in ICUs equipped with higher no. of beds tend to be with more positive attitudes towards oral care for intubated patients than their counterparts in governmental hospitals and those working

in ICUs equipped with fewer no. of beds, respectively (p-value = 0.035 and 0.043, respectively).

The study findings also supported positive significant association between oral care attitudes and knowledge (r = 0.227, and p-value < 0.001), where knowledge scores explained approximately 5% of the total variation in the attitudes scores. Generally, these findings intersect to what was found by Labeau et al (2008), Lin et al (2011), and Al-Zaru et al., (2020). However, the findings of Al-Zaru et al., (2020) revealed a mild significant positive correlation between attitudes and practices scores. Additionally, the results of Rumagihwa, (2017) did not show any correlation neither between knowledge and practices nor perceptions and practices.

5.5 Study Limitations and Strengths

There were several limitations to this study. First, the use of the convenience sampling approach instead the randomized sampling, would increase the probability of systemic sampling error, and reduce the power of the study by limiting its generalizability. Second, the adoption of long self-report questionnaire as a data collection approach would have influenced the process of sample recruitment, and thus decreases the response rate among staff nurses; furthermore, “self- reporting” is an inherent limitation where the reliability of individual responses cannot be ensured. Third, long questionnaire would cause nurses’ answers vary due to time constraints, or unwillingness to read each question before responding. Fourth, the study was limited to the hospitals who agreed to participate. Additionally, it was also limited to the nurses who agreed to participate voluntarily as well as the time period available to conduct the study. Lastly, there was no consensus on the definitions of the knowledge, practices, and perceptions regarding oral

care and there was also an argue about how these concepts should be measured. Accordingly, making decision with this type of research was difficult.

Despite these limitations, the study had some strengths. To the best of our knowledge, it was the first study in Palestine that attempts to assess ICU nurses' knowledge, practices, and attitudes specific to mechanically ventilated patients. It also tried to incorporate most of the relevant components of oral care. In addition, our survey participants covered a broad range of age groups, geographical location (north, middle, south) of West Bank, ICU experience, and types of ICUs, including both governmental and private hospitals of various sizes. Consequently, our data reflect the broad spectrum of oral care knowledge, practices and perceptions

5.6 Study Conclusion

To the best of our knowledge, this study was the first that attempts to assess Palestinian ICU nurses' knowledge, practices, and perceptions regarding oral care specific to intubated patients. A total of 304 questionnaires were analyzed and showed that the mean percentages of critical care unit nurses' knowledge, practices, and attitudes regarding oral care were 52.3%, 49.8%, and 64.7% respectively. The study showed that the nurses didn't have adequate knowledge and clear perception about the properties of various oral cleaning solutions (i.e., chlorhexidine, sodium chloride, and sodium bicarbonate) as well as the effective equipment that is used to remove dental plaque. The study found that mouth care protocol was relatively uncommon in Palestinian ICUs. The study also indicated when the greater importance activities were to stabilize the condition of critically ill patients, oral care was occupied the least priority.

The study findings supported positive significant association between oral care

attitudes and knowledge. Furthermore, the study provided evidence that master/PhD degree nurses tend to have greater knowledge regarding oral care for orally intubated patients than those with a bachelor's/diploma degree. Also married nurses, those who had oral care training, and those with higher ICU years of experience tend to perform oral care more frequently for intubated patients. Nurses in private ICUs as well as those working in ICUs equipped with higher no. of beds had considerably higher practices and perceptions scores than their counterparts in governmental hospitals and those working in ICUs equipped with fewer no. of beds, respectively.

Lastly, the study findings provide insight into oral care in Palestinian ICU nurses' and the need for mouth protocol development, implementation, and evaluation. Additionally, enhancing nurses to get knowledge about oral care from different educational sources to improve their oral care practices.

5.7 Study Recommendations

The inadequate knowledge, suboptimal practices, and perceptions of ICU nurses toward oral care for mechanically ventilated patients highlight an urgent need for clinical managers' attention. Ensuring ICU nurses receive proper education and training in oral care is critical for delivering high-quality patient care. Evidence-based oral care guidelines are scarce in Palestine, underscoring the importance of training and motivating all healthcare workers involved in oral care for intubated patients. Therefore, we recommend the following:

- The need for developing a standardized mouth care protocol for mechanically ventilated patients. Written guidelines or standards available in nurses' hands throughout their daily practices would improve the care of such patients.

- The need of regular in-service education and training programs. Improving nurses' knowledge would give nurses confidence in making the correct decisions, increases optimal delivery of patient care, and also reduces the length of their hospital stay.
- The need to involve the interdisciplinary team members when performing oral care for intubated patients such as the respiratory experts.
- Nursing curricula need to include core knowledge on nursing care of mechanically ventilated patients, including oral care.
- Nursing managers need to follow up their nurses to evaluate that all nurses perform oral care accurately.
- Hospital managers need to reduce nurses' workloads such as adopting a suitable nurse-to- patient ratio. The lack of time was considered as the major factor influencing the provision of oral care.
- The need to use chlorhexidine, sodium chloride, and sodium bicarbonate as oral cleaning solutions and pediatric toothbrushes as effective tool for removing dental plaque.
- Hospital managers need to encourage their ICU nurses to participate in workshops/conferences regarding new evidence and updates in nursing care related VAP and especially oral care.
- The need for future longitudinal research to explore ICU nurses' knowledge, practices, and perceptions regarding oral care for intubated patients over a number of years.
- The need for future research to assess the impact of nurses' knowledge, practices and perceptions on the development of VAP for intubated patients.

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Appendices

Appendix (1): Study Questionnaire

Study Questionnaire

Subject:

Critical care nurses' knowledge, practices and perceptions regarding oral care for mechanically ventilated patients in Palestine

Dear ICU nurse,

I kindly invite you to participate in my research project on the assessment of knowledge, practices and precipitations regarding oral care for mechanically ventilated patients in Palestine. Your participation is valuable. It will provide us with insights on how we can improve patient care in the future. The survey consists of four parts: general information (11 questions), oral care knowledge (7 questions), oral care practices (13 questions), and oral care perceptions (5 questions). It should take no more than (10 – 15) minutes to complete the survey.

If you agree to participate, please complete this questionnaire honestly. Your responses are completely confidential and will not be shared with anyone else. The data collected will be used for research purposes only and any published results will be anonymous and will not contain any identifying information. Please do not leave any questions unanswered. If you do not understand a question, please do not hesitate to contact the researcher for clarification.

Thank you in advance for your cooperation and your valuable contribution to this important research.

Best Regards,

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Supervisor: Dr. Bahaaeddin M. Hammad
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A. General information		
1.	Hospital	----------
2.	Gender	○ Male ○ Female
3.	Age (years)	----------
4.	Marital status	○ Single ○ Married ○ Widowed ○ Divorced
5.	Level of nursing education	○ Diploma ○ Bachelor ○ Master/PhD
6.	Unit specialty	○ General ○ Medical ○ Surgical ○ Coronary ○ Intermediate ○ Other ----------
7.	No. of ICU beds in your unit	----------
8.	Job title	○ Registered nurse ○ Head nurse ○ Practical
9.	Years of ICU experience	----------
10.	Did you receive training/instruction in providing oral care for intubated patients?	○ Yes ○ No
11.	***If yes to the previous question***, please select the source(s) of learning about oral care for intubated patients. *** Please choose ***all*** the answers that fit.	☐ Instruction from senior ICU nurses ☐ Nursing school(كلية التمريض) ☐ In-service education at ICU ☐ Participating in an in-service course outside of the hospital ☐ Reading related studies and materials of my own accord (اختياري) ☐ Participating in an in-service course within the hospital ☐ Others ----------

B. Oral care knowledge: This section consisted of **7 multiple-choice questions** about characteristics of oral care cleaning solutions and tools. *** Please choose ***all*** the answers that fit.		
1.	What is/are the characteristics of ideal oral cleaning solution? *** Please choose ***all*** the answers that fit.	☐ Contains alcohol ☐ Anti-bacterial or inhibits bacteria ☐ Maintains oral moistness ☐ Increases viscosity (اللزوجة)of oral mucus ☐ Promotes wound healing
2.	What is/are the characteristics of chlorhexidine (mouth wash) as oral cleaning solution? *** Please choose ***all*** the answers that fit.	☐ Anti-bacterial ☐ Appropriate concentration is 0.1-0.12% ☐ Decreases viscosity (اللزوجة) of oral mucus ☐ Treats oral infections ☐ Causes oral pain
3.	What is/are the characteristics of sodium chloride as oral cleaning solution? *** Please choose ***all*** the answers that fit.	☐ Eliminates debris (الاوساخ) attached (الملتصقة) to oral mucus ☐ Maintains oral moistness (رطوبة) ☐ Tends (تساعد) to cause mouth dryness ☐ Removes dental plaque ☐ Promotes(تحسن) wound healing
4.	What is/are the characteristics of hydrogen peroxide as oral cleaning solution? *** Please choose ***all*** the answers that fit.	☐ Anti-bacterial ☐ Remove bad odors (الروائح السيئة) ☐ Decreases viscosity of oral mucus ☐ Irritating(تهيج) to oral mucus ☐ Promotes wound healing
5.	What is/are the characteristics of sodium bicarbonate as oral cleaning solution? *** Please choose ***all*** the answers that fit.	☐ Anti-bacterial ☐ Tends to encourage bacterial growth ☐ Increases viscosity of oral mucus ☐ Remove cell debris(البقايا الخلوية) from inside mouth ☐ Neutralizes (تعادل) excessive oral acidity
6.	Which oral care supplies and equipment are effective for removing dental plaque? *** Please choose ***all*** the answers that fit.	☐ Cotton swab ☐ Foam swab (رغوة التنظيف) ☐ Toothbrush ☐ Gauze pad
7.	The most common risk factors of ventilator-associated pneumonia to ventilated patients is *** Please choose ***all*** the answers that fit.	☐ From other patients ☐ Aspiration of contaminated secretions from the oropharynx ☐ From health care workers' hands ☐ From contaminated respiratory equipment ☐ Preadmission colonization

C. Oral care practices: Please choose your own answer for providing oral care in your practice.		
1.	Do you follow a mouth care protocol/policy in your unit?	○ Yes ○ No
2.	Does patient oral care performed based on a physician order?	○ Yes ○ No
3.	Does your unit have a documentation form (نموذج توثيق) for patient oral care?	○ Yes ○ No
4.	How frequently do you provide oral care to your patients who are intubated in your daily practice?	○ Always ○ Often ○ Sometimes ○ Rarely
5.	How often do you remove oral secretions to your patients who are intubated?	○ Once every 2-4 hours ○ Once every 4-6 hours ○ Once every 6-8 hours ○ Once every 8-12 ○ Once a day ○ None a day
6.	How often do you assist patients in maintaining oral moistness?	○ Once every 2-4 hours ○ Once every 4-6 hours ○ Once every 6-8 hours ○ Once every 8-12 hours ○ Once a day ○ None a day
7.	How often do you perform oral care for patients using a toothbrush?	○ Once every 2-4 hours ○ Once every 4-6 hours ○ Once every 6-8 hours ○ Once every 8-12 hours ○ Once a day ○ None a day
8.	How often do you perform oral care for patients using a cotton swab or foam swab?	○ Once every 2-4 hours ○ Once every 4-6 hours ○ Once every 6-8 hours ○ Once every 8-12 hours ○ Once a day ○ None a day
9.	What are the current supplies readily available in your unit for oral care?	☐ Gauze or cotton ☐ Toothbrush ☐ Toothpaste

	*** Please choose ***all*** the answers that fit.	☐ Others ----------
10.	What are the current solutions readily available in your unit used for oral care? *** Please choose ***all*** the answers that fit.	☐ Chlolahixidine ☐ Sodium bicarbonate ☐ Hydrogen peroxide ☐ Sodium chloride ☐ Lemon & glycerol ☐ Others ----------
11.	Do you routinely use lip balms (e.g., Vaseline) for your patients?	○ Yes ○ No
12.	What are the factors affecting the provision of oral care in your unit? *** Please choose ***all*** the answers that fit.	☐ Not foreseen in the unit protocol ☐ Lack of time ☐ Lack of skills ☐ Lack of supplies and equipment ☐ Lack of nurses during the shift ☐ It causes patient discomfort ☐ Others ----------
13.	What are the difficulties/ barriers do you encounter when providing oral care to patients who are intubated? *** Please choose ***all*** the answers that fit.	☐ Lack of time ☐ Suction difficulties ☐ Patient agitation/aggression ☐ Inadequate equipment ☐ Coordination with other medical team members ☐ Others ----------

D. Oral Care Perceptions/Attitudes

1. Physical care activities "activities nurses can perform independently to promote patients' comfort"

***Please read all items first, then rank the seven physical care activities in order of their priority with only one ranking. **أرتب حسب الأولوية بوضع الرقم من 1 إلى 7 في ( ) حيث 1 (الأكثر أهمية)، 7 (الأقل أهمية)**

( ) Physical assessment
( ) Bowel & bladder care
( ) Oral care
( ) Bed path
( ) Chest physiotherapy
( ) Changing position
( ) Gastrointestinal care

2. Nursing treatment activities "activities with greater survival impact on the patient that nurses can perform them under physicians' orders"

***Please read all items first, then rank the eight nursing treatment activities in order of their priority with only one ranking. **أرتب حسب الأولوية بوضع الرقم من 1 إلى 8 في ( ) حيث 1 (الأكثر أهمية)، 8 (الأقل أهمية)**

( ) Processing patients' entrance ICU
( ) Oxygen therapy
( ) Suctioning sputum
( ) Observing and recording status of patients
( ) Assisting physician with invasive procedures
( ) Administering medication
( ) Catheter care
( ) Oral care

3. Please circle the number that corresponds with the importance of oral care in relation to physical care activities.

1 2 3 4 5 6 7 8 9 10

Not importance at all Very importance

4. Please circle the number that corresponds with the importance of oral care in relation to nursing treatment activities.

1 2 3 4 5 6 7 8 9 10

Not importance at all Very importance

5. ***Please indicate whether you: strongly agree, agree, uncertain, disagree or strongly disagree to the following statements by ticking (√) under the column that best describes your point of view***

	Statement/item	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree
a.	Oral care is a high priority for MV patients					
b.	I have enough supplies and equipment to provide oral care					
c.	I have adequate time to provide oral care					
d.	Cleaning the oral cavity is unpleasant task					
e.	The oral cavity is difficult to clean					
f.	I need enough training to provide oral care					
g.	The mouth of patients gets worse no matter I do					
h.	When I perform tooth brushing in patient, I also use the suction					

Appendix (2) Ethical Approval Letter

Arab American University
Institutional Review Board - Ramallah

الجامعـــة العربيـــة الأمريكيـــة
مجلس اخلاقيات البحث العلمي – رام الله

IRB Approval Letter

Study Title: "Critical Care Nurses' Knowledge, Practices, and Perceptions Regarding Mouth Care of Ventilated Patients in Palestine Hospital".

Submitted by: Helen Maher Mohammad Rezqallah

Date received: 3th June 2024

Date reviewed: 4th June 2024

Date approved: 4th June 2024

Your Study titled **"Critical Care Nurses' Knowledge, Practices, and Perceptions Regarding Mouth Care of Ventilated Patients in Palestine Hospital"** with the code number **"R-2024/A/91/N"** was reviewed by the Arab American University Institutional Review Board - Ramallah and it was approved on the 4th of June 2024.

Sajed Ghawadra, PhD
IRB-R Chairman
Arab American University of Palestine

الجامعة العربية الأمريكية - فلسطين
مجلس اخلاقيات البحث العلمي - رام الله
IRB-R
ARAB AMERICAN UNIVERSITY-PALESTINE
INSTITUTIONAL REVIEW BOARD - RAMALLAH

General Conditions:

1. Valid for 6 months from the date of approval.
2. It is important to inform the IRB-R with any modification of the approved study protocol.
3. The Bord appreciates a copy of the research when accomplished.

الملخص

الخلفية: تعتبر الالتهاب الرئوي المرتبط بجهاز التنفس الصـــناعي من المضـــاعفات الخطيرة في وحدات العناية المركزة، حيث يزيد من معدلات المرض، وفترات الإقامة في المســـتشـــفى، والتكاليف.

يُعتبر العنـاة الفمويـة الفعّـالـة أمراً حيويـاً للوقـابـة من الالتهـاب الرئوي المرتبط بجهـاز التنفس الصناعس، لكنها غالباً ما تكون غير منتظمة، خاصة في البيئات ذات الموارد المحدودة.

الهدف: تهدف هذه الدراسة إلى تقييم معرفة وممارسات وتصورات ممرضي العناية المركزة حول العناية الفموية للمرضى الموضوعين على أجهزة التنفس الصناعي.

الطرق: تضـمنت هذه الدراسـة الوصـفية المقطعية 304 ممرضـاً من وحدات العناية المركزة في الضـفة الغربية. تم اسـتخدام اسـتبيان منظم ذاتي الإدخال لتقييم معرفتهم وممارسـاتهم وتصـوراتهم حول العناية الفموية للمرضـــى الموضـــوعين على أجهزة التنفس الصـــناعي. تم تحليل البيانات باستخدام الإحصائيات الوصفية والاستدلالية.

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النتائج: من بين 304 مشاركين (52% من وحدات العناية الكزية الخاصة، 48% من الحكومية)، كـان معظمهم من الـذكور (57.9%)، متزوجين (62.8%)، ويحملون درجـة البكـالوريوس (78.9%)، بمتوســـط عمر 29.8 ± 6.0 عاماً. أظهرت النتائج أن الممرضـــين لديهم معرفة متوســـطة (17.78 ± 34/3.26)، وممارســـات دون المســـتوى الأمثل (34.5% فقط اتبعوا البروتوكولات)، ومواقف إيجابية بشـكل معتدل (25.88 ± 40/3.41). تضـمنت العوائق نقص الوقت (60.7%) ونقص الموارد (44.3%). ارتبط التعليم العابي بمعرفة أفضل، وكان موضوع القطاع الخاض يتمتعون بممارسـات أفضـل، وكان ممرضـو القطاع الخاص يتمتعون بممارسـات أفضـل. كما ارتبطت المواقف بالمعرفة ($p < 0.001$، $r = 0.227$)، لكن لم توجد روابط ذات دلالة إحصـئية بين المعرفة والممارسات أو المواقف.

الاســـتنتاج: وجدت الدراســـة ارتباطاً إيجابياً كبيراً بين مواقف العناية الفموية والمعرفة. أظهر الممرضـــون الحاصـــلون على مؤهلات أكاديمية أعلى معرفة أفضـــل، في حين قام الممرضـــون

المتزوجون، والمُدربون على العناية الفموية، والذين لديهم خبرة أكبر في وحدات العناية المركزة بتقديم الرعية بشكل أكثر تكراراً. كان ممرضوا وحدات العناية المركزة الخاصة والكبرى.
يتمتعون بممارسات ومواقف أفضل. تؤكد الدراسة على الحاجة إلى بروتوكولات العناية الفموية وموارد تعليمية معززة لتحسين العناية الفموية في وحدات العناية المركز الفلسطينية.
الكلمات المفتاحية: الالتهاب الرئوي المرتبط بجهاز التنفس الصناعي، العناية الفموية، ممرضو العناية المركزة، التهوية الميكانيكية، وحدة العناية المركزة، المعرفة، الممارسات، التصورات، فلسطين