

# Nurses' perception and attitudes towards oral care practices for mechanically ventilated patients

Mahmoud A. Alja'afreh, MSN, PhD, Sultan M. Mosleh, MSN, PhD, Sakhaa S. Habashneh, BSN MSN.

## ABSTRACT

**الهدف:** استكشاف تصور ومواقف تمريض العناية المركزة تجاه ممارسة الرعاية عن طريق الفم لمرضى أجهزة التنفس الاصطناعي.

**الطريقة:** تم استخدام تصميم وصفي مقطعي في هذه الدراسة. عينة الدراسة كانت 96 من تمريض العناية المركزة الذين قاموا بتعبئة استبيان معرفتهم واتجاهاتهم نحو الرعاية عن طريق الفم لمرضى أجهزة التنفس الاصطناعي. كان مكان الدراسة في في ثلاثة مستشفيات أردنية ممثلة في الكرك والعاصمة عمان على مدى ستة أشهر بين شهري شباط / فبراير وأيلول / سبتمبر 2016.

**النتائج:** ستة وتسعون ممرضة شاركو في هذه الدراسة، وكان معدل الاستجابة 76.8%. وكشفت النتائج أن 65% فقط من الممرضين لديهم بروتوكول خاص للرعاية عن طريق الفم. كان موقف الممرضات تجاه العناية بالفم إيجابياً للغاية؛ ولكن 68% منهم ينظرون إليها على أنها مهمة غير سارة و 29% من الممرضين وافقوا على أنه ليس لديهم ما يكفي من التدريب. 78% وافقوا على تعلم الطريقة المثلى للعناية بالفم. وقد حسبت الإحصاءات الوصفية المعيارية لجميع المعلومات الأساسية (الخصائص الاجتماعية - الديموغرافية). تم التعبير عن المتغيرات الثنائية كنسب، وتوزع عادة المتغيرات المستمرة كوسيلة والانحرافات المعيارية.

**الاستنتاج:** مواقف واتجاهات تمريض العناية المركزة السلبية في الرعاية عن طريق الفم لمرضى أجهزة التنفس الاصطناعي، يتطلب اهتماماً عاجلاً من المسؤولين الإداريين. وهكذا فإن التدريب داخل المستشفى فيما يتعلق ببروتوكول الرعاية الفموية في الاستخدام اليومي يمكن أن يحسن تصور الممرضات ومواقفهن. الكلمات الرئيسية: العناية بالفم؛ التنفس الاصطناعي؛ وحدات العناية المركزة؛ ممارسات التمريض

**Objectives:** To explore the perception and attitudes of intensive care unit (ICU) nurses towards oral care practice for mechanically ventilated (MV) patients.

**Method:** A descriptive cross-sectional design was used in this study. A convenience sample of 96 ICU nurses completed a questionnaire on their perception and

attitudes towards oral care. The study setting was 3 representative Jordanian hospitals in Al-Karak and the capital, Amman, over a 6-month period between February and September 2016.

**Results:** Ninety-six nurses participated in the study. The response rate was 76.8%. The results revealed that 65% only follow a specific oral care protocol. Nurses did not adhere to minimal standards. Although nurses' attitude towards oral care was strongly positive, 68% of them perceived it as an unpleasant task and 29% agreed that they had insufficient training; 78% agreed to learn more about the best way to perform oral care. Standard descriptive statistics were calculated for all baseline information (sociodemographic characteristics). Binary variables were expressed as proportions, and normally distributed continuous variables as means and standard deviations.

**Conclusion:** The poor perception and attitudes of ICU nurses regarding oral care for MV patients require the urgent attention of clinical administrators. In-hospital training regarding oral care protocol could improve nurses' perception and attitudes.

*Saudi Med J* 2018; Vol. 39 (4): 379-385  
doi: 10.15537/smj.2018.4.21749

From the Department of Adult Health Nursing, Faculty of Nursing, Mutah University, Alkarak, Jordan.

Received 4th December 2017. Accepted 28th February 2018.

Address correspondence and reprint request to: Dr. Mahmoud A. Alja'afreh, Department of Adult Health Nursing, Faculty of Nursing, Mutah University, Alkarak, Jordan. E-mail: mahd1967@mutah.edu.jo / mahmoudjaafreh@gmail.com  
ORCID ID: orcid.org/0000-0002-9272-2208

**Disclosure.** Authors have no conflict of interests, and the work was not supported or funded by any drug company. This study was funded by the Scientific Research Committee of Mutah University, Alkarak, Jordan (Grant No. 77/14/120).

Oral care is an important component of intensive care nursing for mechanically ventilated (MV) patients.<sup>1</sup> Oral care aims to maintain their oral condition in a comfortable, clean and moist manner, free of infection.<sup>2</sup> Patients in intensive care units (ICUs) may require oral intubation to maintain a clear airway. The endotracheal tube (ETT) can induce potential complications such as ventilator-associated pneumonia (VAP), one of the most common hospital-acquired infections among patients receiving mechanical ventilation in ICUs.<sup>3,4</sup> The VAP rate in developing countries ranges from 1.5 to 41.7 per 1000 ventilator-days.<sup>5-7</sup> Although the relationship between oral care and VAP prevention is difficult to measure, oral hygiene in combination with a range of other activities such as the VAP bundle care programme is important in decreasing the number of patients with VAP.<sup>1,7,8</sup> The effectiveness of oral care has been found to be associated with many factors, such as the unavailability of clear guidelines, the level of knowledge among the healthcare team, and the nurse to patient ratio.<sup>9</sup> Some studies have highlighted the importance of nurses' knowledge and attitudes regarding patients' oral care.<sup>9-12</sup> In a large European survey, 88.1% of ICU nurses reported oral care for their patients as their top priority.<sup>13</sup> In another study in Malaysia, 84.7% of ICU nurses reported they needed better methods and updated knowledge for practising oral care.<sup>14</sup> Despite 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.<sup>9,11,15-17</sup> Therefore, nurses need to be aware of both the problem and evidence-based preventive strategies, adhering to such practices and integrating them into their nursing care.<sup>8,18</sup> Oral care practice varies widely between different healthcare settings.<sup>9,19</sup> One of the most effective oral care practices is brushing the patient's mouth using chlorhexadine plus use of a broad-spectrum antibiotic agent.<sup>1,9,20-22</sup> The recommended frequency of performing oral care also varies: every 2 hours, 4 hours, 8 hours or 12 hours.<sup>9,13,19,23-25</sup> The literature did not confirm which was better for reducing the risk of VAP. Various surveys of ICUs found in the literature from the USA, Europe and the UK concluded that evidence-based oral care practices could reduce the incidence of VAP in patients.<sup>8</sup> In Arab countries, a study by Al-Sayaghi examined nurses' knowledge in a sample of 37 ICUs in Yemen, and found their knowledge of evidence-based strategies for VAP prevention was low. However, more than 60% of the nurses were most frequently correct regarding regular oral care.<sup>26</sup> Oral care is an important nursing care role for MV patients. Nursing

studies have identified appropriate tools for providing effective oral hygiene, including, chemical agents, and frequency; however, nursing practice based on clinical evidence and standardized oral care guidelines for VAP prevention are rarely employed.<sup>10</sup> Therefore, ICU nurses need a standardized best practice protocol to guide their important work on VAP rates, disseminated through in-service educational programmes.<sup>8,26</sup> Improving their knowledge would give nurses confidence in making the correct decisions, increasing optimal delivery of patient care, and reducing the length of their stay in the hospital.<sup>10,27</sup> The risk of VAP increases 1.3 times with each day on MV, and thus adds to treatment costs.<sup>6,28</sup> The inadequate provision of oral care may be because nurses view it as contributing less to patients' health and well-being than other procedures for critically ill patients. Evidence-based recommendations for oral care are not available in Jordan, and training and motivation of all healthcare workers involved in the care of intubated patients is essential. Currently, few studies in Jordanian hospitals have examined this issue. This study aimed to explore the perception and attitudes of ICU nurses towards oral care practice for MV patients to meet this need.

**Methods.** Related studies were identified from various scientific sources including Google Scholar, Cochrane Library, PubMed, CINAHL and MEDLINE. The search terms used included oral care, intensive care units, critical care nursing, and mechanically ventilated patients, in different combinations. The publications retrieved were assessed and reviewed.

A descriptive cross-sectional survey design was used in this study, which was conducted in southern Jordan, in the area served by the Al-Karak Government and Prince Ali Hospitals, and the King Hussein Medical Centre in Amman. These hospitals are among the biggest government and military hospitals in Jordan and are teaching hospitals for nursing and medical students for all universities and colleges. They receive all types of patients in critical care units (CCUs) which have beds for coronary care and for general intensive care. These units receive the patients at acute and critical stages of illness.

This study is part of a large project about effective intervention to reduce the risk of VAP. The size of the study sample was based on previous research reported in the literature. The target population was based on the number of ICU nurses (n=125) at the target settings: 25 in the Al-Karak Government Hospital, 22 in the Prince Ali Hospital and 78 in the King Hussein Medical Centre. A poster regarding the study's aim and

the proposal was distributed in all target hospital units. Research assistants then approached the 96 nurses who showed interest in participating in the study.

The inclusion criteria were critical care nurses working in the nominated ICUs of the 3 Jordanian hospitals, with ICU experience of at least 6 months. 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.

Assessment of nurses' perception and attitude towards oral care in CCUs was obtained through a questionnaire developed specifically for this study. The data were collected through a 3-part questionnaire prepared by the researchers, based on previous studies reported in the literature.<sup>9,29</sup> The first section comprised 7 demographic and work-related questions: age, gender, education, experience, nurse-patient ratio, working area, and ICU capacity. The items in sections 2 and 3 were developed based on these studies. The second section had 15 items to assess oral care, ETT suctioning and infection control practices (for details about this section, see Table 2, 3 items). The third section comprised 13 statements concerning nurses' attitudes towards oral care for MV patients, with responses measured on a 5-point Likert scale ranging from strongly agree to strongly disagree.

The content of the questionnaire was reviewed by a research panel (3 academic staff and 2 clinical ICU nurses), who checked the suitability, clarity and understandable wording in the context. To ensure content clarity, cultural sensitivity and internal reliability of the questionnaire, it was tested in a pilot study with 10 ICU nurses; the results were not included in the main study. Feedback and discrepancies in the questions were discussed among the researchers and the required changes made to the final version of the questionnaire. The test-retest reliability of the tool was verified as 0.92. The average scale content validity index for the items ranged from 0.77 to 0.90 with positive internal consistency; Cronbach's alpha coefficients ranged from 0.74 to 0.83. In relation to section 3, the content validity index for total attitude score was 0.77; internal consistency, measured by Cronbach's alpha coefficient, was 0.88. All sections of the questionnaire showed good reliability and validity properties. The questionnaire was practical and useful to assess the perception and attitudes of ICU nurses in Jordan.

The study was carried out over a 6-month period between February and September 2016. After ethical approval had been granted by the research ethics committee of the Faculty of Nursing of Mutah

University, the Jordanian Royal Medical Service and the Ministry of Health, data were collected to explore nurses' perception of oral care. The primary researcher met the matron of each participating hospital to explain the purpose of the study, the clinical implications and the data collection process. At these visits, 2 staff nurses were identified to act as research assistants in each hospital. They could not be involved in providing direct care for any of the patients in the study population. To ensure accuracy and consistency between all nominated research assistants across the different settings, a workshop was held to explain the purpose of the research, go through the data collection processes and answer any questions.

The questionnaires were distributed by research assistants to all nurses working in ICUs in the 3 nominated hospitals. Any nurse who was willing to take part was told about the study, and given an information sheet, consent form and a return envelope. Each participant was asked to complete the questionnaire in their break time and to return it to the research assistant or drop it in a designated box in their working area.

**Ethical considerations.** The study was approved by the Mutah University Ethics Committee. Researchers ensured application of necessary interventions during data collection from the CCUs of the assigned hospitals. Subjects were assured that their data would be anonymous. All research data were kept in a safe locked place. To ensure safety and confidentiality the computerized data could be accessed by the researchers only through a password.

**Statistical analysis.** Standard descriptive statistics were calculated for all baseline information (sociodemographic characteristics). Binary variables were expressed as proportions, and normally distributed continuous variables as means and standard deviations. Study data tests was analyzed using the Statistical Package for the Social Sciences (SPSS) version 21 (IBM Corp., Armonk, NY, USA) and the results reported as mean, frequency and percentage.<sup>30</sup>

**Results.** One hundred and twenty-five nurses were approached, of whom 96 participated in the study, a rate of 76.8%. The average age was 27.97±4.88; 53.1% were women; 78.9% had Bachelor degrees and only 10.4% had less than one year of ICU experience, with 46.9% 1-5 years and 43.8% more than 6 years of ICU experience. More than 50% of nurses were from surgical ICUs. The nurse-patient ratio was 1:2 for most of the participating ICUs (Table 1).

The results of assessing nurses' perceptions toward oral care revealed that only 65% follow a specific oral care

**Table 1** - Participants by demographic characteristics (n=96).

Demographic factors of participants	n (%)	
Mean age (SD); range*	27.97	4.88
<b>Gender</b>		
Male	45	(46.9)
Female	51	(53.1)
<b>Education</b>		
Associate degree	1	(1.1)
Diploma	19	(20.0)
Bachelor	75	(78.9)
Master	1	(1.1)
<b>Experience (years)</b>		
Less than 1 year	10	(10.4)
1-5 years	45	(46.9)
More than 5 years	41	(42.7)
<b>Nurse patients ratio</b>		
One to one	10	(10.4)
1 nurse to 2 patients	60	(62.5)
1 nurse to 3 patients	24	(25.0)
1 nurse to more than 3 patients	2	(2.1)
<b>Type of ICU</b>		
Medical	42	(43.8)
Surgical	54	(56.3)

SD - standard deviation, ICU - intensive care unit

protocol. Poor practice was indicated by the percentage of participants who completed with correct answers (Tables 2 & 3). Forty-six percent of nurses provided the correct answer for frequency of oral care suction, and 63% for the frequency of using a toothbrush.

Table 4 represents nurses' attitudes towards oral care and ETT suctioning for MV patients. The attitude scores and their levels were as follows: most of the nurses claimed that oral care has a very high priority (82% strongly agreed and 15% somewhat agreed). The negative attitudes scores were as follows: 68% claimed that cleaning the oral cavity is an unpleasant task and 50% that the oral cavity is difficult to clean. Almost half (47%) stated that the mouth of most ventilated patients became worse whatever they did. Items for training and continuing education scored as follows: although 71% claimed that they had been provided adequate training in providing oral care, 78% would like to learn more about the best methods, as a personal priority, by attending continuing education workshops.

**Discussion.** It is widely understood that critical care nurses play an important role in the prevention of VAP in CCUs. This cross-sectional study assessed the current perceptions and attitudes of these nurses. Our results found them to be poor. Nurses were performing non-evidence-based oral care practices without protocols or guidelines covering the method,

**Table 2** - Nurses' perceptions of effective oral care.

Questionnaire statement	n (%)	
<b>Do you have a specific protocol for oral care</b>		
Yes	62	(64.5)
No	34	(35.4)
<b>Nurses' hand washing between patients</b>		
Always	69	(71.9)
Frequently	21	(21.9)
Sometimes	5	(5.2)
Rarely	1	(1.0)
<b>Wearing gloves when performing oral care</b>		
Always	77	(80.2)
Frequently	17	(17.7)
Sometimes	1	(1.0)
Rarely	1	(1.0)
<b>Frequency of oral suction</b>		
Every 4 hours	29	(30.2)
Every 8 hours	20	(20.8)
8 to 12 hours	3	(3.1)
Every 2 hours or less (as needed)	44	(45.8)
<b>Frequency of tooth brushing</b>		
Every 4 hours	10	(10.5)
Every 8 hours	15	(15.8)
8 to 12 hours	11	(11.5)
Every 2 hours or less (as needed)	60	(62.2)
<b>Antiseptic oral rinsing solution used</b>		
Chlorhexidine	26	(27.1)
Mouthwash	64	(66.7)
Others	4	(4.2)
None	2	(2.1)
<b>Moistening and lubricating lips</b>		
Every two hours or less (as needed)	55	(54.2)
per shift	31	(32.3)
never lubricate	10	(10.4)
<b>After finishing oral care</b>		
Cover non-disposable material	29	(30.2)
Non cover non-disposable material	5	(5.2)
Discard it	62	(64.6)
<b>Nurses' general perception toward oral care for intubated patient</b>		
It is important	90	(93.8)
Have economical value to hospitals	2	(2.1)
Not important	1	(1.0)

cleaning solution, cleaning instruments and the time and frequency. Most participants (94%) claimed that their general perception of oral care for intubated patients is important and a high priority, which is consistent with Alotaibi et al' study.<sup>11</sup> This percentage is higher than that found in other studies,<sup>31</sup> who reported that 76.2% of the participants claimed that oral care is important and necessary; 73.5% agreed that VAP can be prevented if oral care is provided and 48.6% did not believe in the effectiveness of oral care.<sup>31</sup> Miranda et al<sup>32</sup> reported that 83.1% of participants stated oral care is a priority. Our study demonstrates that the



**Table 3** - Nurses' perceptions of endotracheal tube suctioning.

Questionnaire statement	n	(%)
<i>Frequency of ETT suction</i>		
Every 4 hours	41	(42.7)
Every 8 hours	16	(16.7)
8 to 12 hours	3	(3.1)
Every 2 hours or less (as needed)	36	(37.5)
<i>Cleansing of bubble tube suction</i>		
Disposal after each use	52	(54.2)
After use	29	(30.2)
Only if visible mucus present	10	(10.4)
Rarely or not at all	5	(5.2)
<i>Rinsing of bubble tube suction</i>		
Tap water	17	(17.7)
Sterile normal saline	68	(70.8)
Do not rinse	11	(11.5)
For ETT suction use		
Closed system suction	76	(79.2)
Open system suction	20	(20.8)
<i>Before suctioning, do you perform hyper-oxygenation?</i>		
Yes	80	(79.2)
No	16	(16.7)
<i>If yes, duration of hyper-oxygenation</i>		
1 minute	48	(50.5)
2 minutes	41	(43.2)
More than 2 minutes	7	(7.2)
<i>Before suctioning</i>		
Inject sodium bicarbonate into the ETT	13	(13.5)
Inject normal saline into the ETT	53	(55.2)
Not inject any solution	30	(31.3)
<i>Duration of suction</i>		
10-30 seconds	71	(74.0)
31-60 seconds	15	(15.6)
More than 60 seconds	10	(10.4)
<i>Patient condition after suctioning procedure</i>		
Comfortable	54	(56.3)
Agitation	16	(16.7)
Spastic	2	(2.1)
ETT - endotracheal tube		

methods used by nurses in oral care were not based on standardized protocols or guidelines, such as the 2016 American VAP clinical guidelines.<sup>33</sup> Thirty-five percent of nurses claimed that they had no clear protocol for oral care. This is almost half of the result reported by Feider et al<sup>9</sup>, that 72% claimed that their units had an oral care policy. This could be reflected in our study's results that showed nurses' poor practice. For example, "only as needed" was the response provided by 46% of nurses for the frequency of oral suction; 63% for the frequency of toothbrush use; 67% for antiseptic oral rinsing solution using available mouthwash in their critical area; 27% for using chlorhexidine; and 54% for the frequency of lubricating lips. This is similar to the results reported from 4 Turkish hospitals: 99% of nurses

working in ICUs reported that they did not use oral assessment guidelines and 53.5% said their healthcare facility did not have a standardized protocol.<sup>31</sup> Most nurses in these 4 hospitals used oral care solutions (100%, 92.9%, 44.8% and 86.1%). However, only 27% used chlorhexidine as an oral care solution with tooth brushing in our study, which is low compared to the 38.4% in Turk et al's<sup>34</sup> study and 71.4% in Özveren & Özden's.<sup>31</sup> However, our nurses had good practical knowledge of ETT suction, with 72% washing their hands between patients, and 80% always wearing gloves when performing oral care. This is consistent with Feider et al<sup>9</sup> who reported that 73% performed standard precautionary assessment while suctioning the oral cavity, as the risk of contamination is higher than in open aspiration systems.<sup>8</sup> Seventy-nine percent of our study's nurses used closed system suction for ETT suction and half performed hyper-oxygenation for one minute before suctioning. This is consistent with Bagheri-Nesami and Amiri's<sup>35</sup> study, where 80.8% of nurses used a closed respiratory system in prevention of VAP. In terms of our nurses' attitudes towards oral care practices, the results showed negative attitudes, 68% of our nurses claiming that cleaning the oral cavity is an unpleasant task and almost 50% says that the oral cavity is difficult to clean. Approximately 47% agreed that "the mouth of most ventilated patients gets worse no matter what I do". Our results are consistent with previous studies.<sup>11,22,27,32</sup> For instance, Jahansefat et al<sup>36</sup> claimed that the attitude of healthcare workers towards VAP prevention is not very positive, and Özveren and Özden<sup>31</sup> that 68.1% of the participants said that cleaning the oral cavity is a difficult and unpleasant task. However, our result is higher than Saddki et al<sup>37</sup> which revealed that 40.8% of the participants stated it was difficult and 16.2% unpleasant, using appropriate oral care methods and having positive oral care attitudes.

There is an association between our findings and the conclusions of earlier studies. Nurses' attitudes are strongly influenced by thinking and reasoning, and by lack of time.<sup>31,36</sup> Poor knowledge can also lead to the negative attitudes of healthcare workers towards VAP, and we believe that our scores are for the same reason, that poor perception is illustrated by negative attitudes and non-compliance.<sup>38</sup> This could be supported by the training and continuing education item scores. Although 71% of our study nurses claimed that they had been given adequate training in providing oral care, 78% would like to learn more, by attending continuing education workshops; 80% indicated that they needed more information evidence-based standard procedures. One of the powerful variables in prevention measures

**Table 4 -** Nurses' attitudes towards oral care for MV patients.

Questionnaire statement	Strongly agree (1)	Somewhat Agree (2)	Neither agree nor disagree (3)	Somewhat disagree (4)	Strongly disagree (5)
Oral care is a top ICU nurse responsibility	78 (82.1)	14 (14.7)	3 (3.1)	-	-
Oral care is unpleasant task	30 (31.3)	36 (37.5)	13 (13.5)	11 (11.5)	6 (6.3)
Cleaning oral cavity is challenging	9 (9.4)	39 (40.6)	17 (17.7)	18 (18.8)	13 (13.5)
The oral cavity of intubated patients gets worse despite performing oral care	17 (17.7)	28 (29.2)	17 (17.7)	14 (14.6)	20 (20.8)
Oral care training is sufficient to perform the task	29 (30.2)	39 (40.6)	18 (18.8)	6 (6.3)	4 (4.2)
Nurses require more supplies or equipment	43 (44.8)	38 (39.6)	10 (10.4)	5 (5.2)	-
Nurses have enough supplies	29 (28.1)	38 (39.6)	17 (17.7)	6 (6.3)	8 (8.3)
Nurses have enough time to perform oral care task	32 (33.7)	38 (40.0)	14 (14.7)	6 (6.3)	5 (5.3)
Nurses have suitable toothbrush	16 (16.7)	34 (35.4)	19 (19.8)	8 (8.3)	19 (19.8)
I prefer other health care team to perform oral care tasks	29 (30.2)	32 (33.3)	22 (22.9)	11 (11.5)	2 (2.1)
I'm interested to have further education about recent oral care protocol	47 (49.0)	28 (29.2)	18 (18.8)	2 (2.1)	1 (1.0)
I'm interested to learn more about updated research regarding oral care	44 (45.8)	30 (34.3)	14 (14.6)	4 (4.2)	4 (4.2)
Attending workshops about oral care is highly priority for me	43 (44.8)	32 (33.3)	16 (16.7)	4 (4.2)	1 (1.0)

Values are expressed as number and percentage (%), MV - mechanical ventilation, ICU - intensive care unit

for MV patients' health is designing educational programmes for VAP prevention.<sup>7,35,36</sup> Education of nurses on oral care can result in effective improvement of their clinical work by translation of evidence-based knowledge into clinical practice, reflected in the clinical outcomes of MV patients.<sup>39</sup> This could be effective in our clinical settings if staff adherence is monitored, and an adequate supply of equipment such as toothbrushes and oral cavity care solutions provided.

This study explored ICU nurses' perceptions and attitudes towards oral care practice for MV patients. Its descriptive design affords limited generalization of the findings; a randomized controlled future study could explore more details about this area. Our study may be further limited by the small sample of nurses, compared to other studies in the same field, although it covers all the healthcare sectors in Jordan: government, military and private.

It is essential to stress that intensive care nurses should have adequate education, accompanied by competent skills in oral care to express a high quality of care given to their ICU patients. Acquiring adequate perceptions and attitudes in oral care for VAP patients in ICUs is not a guarantee of nurses' compliance and adherence in implementation and application in their daily practice. Therefore, written standards, guidelines or protocol available in nurses' hands throughout the day in their work area could improve the care of such patients.

In conclusion, the poor perception and attitudes of ICU nurses regarding oral care for MV patients require

the urgent attention of clinical administrators. Thus, in-hospital training regarding an oral care protocol for daily use could improve nurses' perception and attitudes. Further research might assist in explaining any lack of clarity in our results.

**Acknowledgment.** We would like to thank all the intensive care nurses who participated in this study. Also, we are grateful to the Scientific Research Committee of Mutah University, Jordan for funding this study.

## References

- Scannapieco FA, Binkley C. Modest reduction in risk for ventilator-associated pneumonia in critically ill patients receiving mechanical ventilation following topical oral chlorhexidine. *J Evid Based Dent Pract* 2012; 12: 103-106.
- Stoney K. Ventilator-associated pneumonia: the importance of oral care in intubated adults. *Crit Care Nurs Q* 2010; 33: 339-347.
- Alipour N, Manouchehrian N, Sanatkar M, Mohammadi Poor A, Hassan, Jahromi MSS. Evaluation of the effect of open and closed tracheal suction on the incidence of ventilator associated pneumonia in patients admitted in the intensive care unit. *Archives of Anesthesiology and Critical Care* 2016; 2: 193-196.
- Klompas M, Branson R, Eichenwald EC, Greene LR, Howell MD, Lee G, et al. Strategies to prevent ventilator-associated pneumonia in acute care hospitals: 2014 update. *Infect Control Hosp Epidemiol* 2014; 35: 133-154.
- Arabi Y, Al-Shirawi N, Memish Z, Anzueto A. Ventilator-associated pneumonia in adults in developing countries: a systematic review. *Int J Infect Dis* 2008; 12: 505-512.
- Chacko R, Rajan A, Lionel P, Thilagavathi M, Yadav B, Premkumar J. Oral decontamination techniques and ventilator-associated pneumonia. *Br J Nurs* 2017; 26: 594-599.

7. Kao CC, Chiang HT, Chen CY, Hung CT, Chen YC, Su LH, et al. National bundle care program implementation to reduce ventilator-associated pneumonia in intensive care units in Taiwan. *J Microbiol Immunol Infect* 2017; 1: S1684-1182.
8. Akin Korhan E, Hakverdioğlu Yönt G, Parlar Kılıç S, Uzelli D. Knowledge levels of intensive care nurses on prevention of ventilator-associated pneumonia. *Nurs Crit Care* 2014; 19: 26-33.
9. Feider L, Mitchell P, Bridges E. Oral care practices for orally intubated critically ill adults. *Am J Crit Care* 2010; 19: 175-183.
10. Yoo JY, Oh EG, Hur HK, Choi M. Level of knowledge on evidence-based infection control and influencing factors on performance among nurses in intensive care unit. *Korean Journal of Adult Nursing* 2012; 24: 232-243.
11. Alotaibi A, Alotaibi S, Alshayiqi M, Ramalingam S. Knowledge and attitudes of Saudi intensive care unit nurses regarding oral care delivery to mechanically ventilated patients with the effect of healthcare quality accreditation. *Saudi J Anaesth* 2016; 10: 208-212.
12. Soh KL, Shariff Ghazali S, Soh KG, Abdul Raman R, Sharif Abdullah SS, Ong SL. Oral care practice for the ventilated patients in intensive care units: A pilot survey. *J Infect Dev Ctries* 2012; 6: 333-339.
13. Rello J, Koulenti D, Blot S, Sierra R, Diaz E, De Waele JJ, et al. Oral care practices in intensive care units: a survey of 59 European ICUs. *Intensive Care Med* 2007; 33: 1066-1070.
14. Soh K, Soh K, Japar S, Raman R, Davidson P. A cross-sectional study on nurses' oral care practice for mechanically ventilated patients in Malaysia. *J Clin Nurs* 2011; 20: 733-742.
15. Jordan A, Badovinac A, Spalj S, Par M, Slaj M, Plančak D. Factors influencing intensive care nurses' knowledge and attitudes regarding ventilator-associated pneumonia and oral care practice in intubated patients in Croatia. *Am J Infect Control* 2014; 42: 1115-1117.
16. MCur JS, MCur SW. A survey of oral care practices in South African intensive care units. *Southern African Journal of Critical Care* 2011; 27: 42-46.
17. Hassan ZM, Wahsheh MA. Knowledge level of nurses in Jordan on ventilator associated pneumonia and preventive measures. *Nurs Crit Care* 2017; 22: 125-132.
18. Ali NS. Critical Care Nurses' knowledge and compliance with ventilator associated pneumonia bundle at Cairo university hospitals. *Journal of Education and Practice* 2013; 4: 66-77.
19. Sedwick MB, Lance-Smith M, Reeder SJ, Nardi J. Using evidence-based practice to prevent ventilator-associated pneumonia. *Crit Care Nurse* 2012; 32: 41-51.
20. Hua F, Xie H, Worthington HV, Furness S, Zhang Q, Li C. Oral hygiene care for critically ill patients to prevent ventilator-associated pneumonia. *Cochrane Database Syst Rev* 2016; 10: CD008367.
21. Moustafa MF, Tantawey NM, El-Soussi AH, Ramadan FA. The effect of oral care intervention on the occurrence of ventilator-associated pneumonia. *Gynecology & Obstetrics* 2016; 6: 383.
22. Montravers P, Harpan A, Guivarch E. Current and future considerations for the treatment of hospital-acquired pneumonia. *Adv Ther* 2016; 33: 151-166.
23. Swearer JN, Hammer CL, Matthews SM, Meunier JL, Medler KL, Kamer GS, et al. Designing Technology to Decrease Pneumonia in Intubated Trauma Patients. *J Trauma Nurs* 2015; 22: 282-289.
24. Zurmehly J. Oral care education in the prevention of ventilator-associated pneumonia: quality patient outcomes in the intensive care unit. *J Contin Educ Nurs* 2013; 44: 67-75.
25. Conley P, McKinsey D, Graff J, Ramsey AR. Does an oral care protocol reduce VAP in patients with a tracheostomy? *Nursing* 2013; 43: 18-23.
26. Al-Sayaghi KM. Prevention of ventilator-associated pneumonia: A knowledge survey among intensive care nurses in Yemen. *Saudi Med J* 2014; 35: 269-276.
27. Jansson M, Ala-Kokko T, Ylipalosaari P, Syrjälä H, Kyngäs H. Critical care nurses' knowledge of, adherence to and barriers towards evidence-based guidelines for the prevention of ventilator-associated pneumonia—A survey study. *Intensive Crit Care Nurs* 2013; 29: 216-227.
28. Mathai AS, Phillips A, Kaur P, Isaac R. Incidence and attributable costs of ventilator-associated pneumonia (VAP) in a tertiary-level intensive care unit (ICU) in northern India. *J Infect Public Health* 2015; 8: 127-135.
29. Blot SI, Labeau S, Vandijck D, Van Aken P, Claes B, Executive Board of the Flemish Society for Critical Care Nurses. Evidence-based guidelines for the prevention of ventilator-associated pneumonia: results of a knowledge test among intensive care nurses. *Intensive Care Med* 2007; 33: 1463-1467.
30. IBM Corp. IBM SPSS Statistics for Windows, Version 21.0. Armonk: NY: IBM Corp.; 2012.
31. Özveren H, Özden D. Turkish nurses' attitudes and practices regarding oral care. *Int J Nurs Knowl* 2015; 26: 163-169.
32. Miranda A, de Paula R, de Castro Piau C, Costa P, Bezerra A. Oral care practices for patients in Intensive Care Units: A pilot survey. *Indian J Crit Care Med* 2016; 20: 267-273.
33. Kalil AC, Metersky ML, Klompas M, Muscedere J, Sweeney DA, Palmer LB, et al. Management of adults with hospital-acquired and ventilator-associated pneumonia: 2016 clinical practice guidelines by the infectious diseases society of America and the American thoracic society. *Clin Infect Dis* 2016; 63: 575-582.
34. Türk G, Güler KE, Eser I, Khorshid L. Oral care practices of intensive care nurses: A descriptive study. *Int J Nurs Pract* 2012; 18: 347-353.
35. Bagheri-Nesami M, Amiri M. Nurses' knowledge of evidence-based guidelines for preventing ventilator-associated pneumonia in intensive care units. *Journal Of Nursing And Midwifery Sciences* 2014; 1: 44-48.
36. Jahansfat L, Vardanjani MM, Bigdelian H, Massoumi G, Khalili A, Mardani D. Exploration of knowledge of, adherence to, attitude and barriers toward evidence-based guidelines (EBGs) for prevention of ventilator-associated pneumonia (VAP) in healthcare workers of pediatric cardiac intensive care units (PICICUs): A Quali-Quantitative survey. *International Journal of Medical Research & Health Sciences* 2016; 5: 67-73.
37. Saddki N, Mohamad Sani FE, Tin-Oo MM. Oral care for intubated patients: a survey of intensive care unit nurses. *Nurs Crit Care* 2017; 22: 89-98.
38. Aloush SM. Nurses' implementation of ventilator-associated pneumonia prevention guidelines: an observational study in Jordan. *Nurs Crit Care* 2017.
39. Cherian S, Karkada S. Effect of education related to oral care practices on nurses' knowledge, practice and clinical outcomes of mechanically ventilated patients in Dubai. *International Journal of Nursing Research and Practice* 2015; 2: 9-14.