

# A Survey Study of Oral Care Given by Nurses in Intensive Care Units

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**Purpose:** The study aims to analyze whether having a specialty certification (SC) among intensive care unit (ICU) nurses is associated with their knowledge, attitudes, and practices regarding oral care and related complications during hospitalization.

**Patients and Methods:** This cross-sectional study included 188 ICU nurses in Eskisehir, Turkey, between April and June 2021. A 20-item questionnaire was used to assess demographic data, knowledge, attitudes, and practices regarding oral care. Chi-square tests ( $p = 0.05$ ) were used to analyze relationships.

**Results:** A highly significant proportion of nurses having SC were satisfied with the level of oral hygiene instructions they had received,  $\chi^2 = 12.29$ , d.f. = 1,  $n = 188$ ,  $p < 0.001$ , and the factor of awareness of its benefits associated with SC education,  $\chi^2 = 6.55$ , d.f. = 1,  $p = 0.010$ . Nurses who spend less time on oral hygiene performed less oral examinations,  $\chi^2 = 16.73$ , d.f. = 4,  $p = 0.002$ , and there was an inverse relationship between the number of ICU patients per nurse and the time spent on oral care per patient,  $\chi^2 = 33.24$ , d.f. = 8,  $p < 0.001$ . The majority of nurses carried out oral care for 2–5 minutes per patient daily ( $n = 72$ , 38.29%). SC nurses preferred manual toothbrush with toothpaste over foam stick or sodium carbonate,  $\chi^2 = 4.16$ , d.f. = 1,  $p = 0.04$ . Regardless of the specialization, a highly significant relationship was observed between the duration of oral care and the experience of nurse in ICU, d.f. = 4,  $p < 0.001$ .

**Conclusion:** Having SC significantly affects ICU nurses' ability and willingness to prioritize oral care to improve patients' oral hygiene.

**Keywords:** intensive care unit, ICU, intensive care nurse, oral care, oral health, specialty certification, SC

## Introduction

Ensuring adequate knowledge of oral hygiene among ICU nurses is crucial for the overall health and well-being of patients, particularly those in critical condition, as it allows comprehensive oral health care and helps to address potential oral health disparities, ultimately improving quality of life.

Given the compromised immune system, extended bed rest, and invasive medical interventions that ICU patients often experience,<sup>1</sup> maintaining good oral health is paramount. This is because oral health is prerequisite for systemic health, and inadequate oral hygiene can result in infections, respiratory complications, and various other health issues.<sup>2</sup> Among these complications, ventilator-associated pneumonia (VAP) is a significant concern in ICU patients, and maintaining a supervised oral health care protocol reduces VAP occurrence in patients 33.3 times.<sup>3</sup> ICU nurses, possessing proficient knowledge pertaining to oral care protocols and their interrelation with overall health, are aptly positioned to evaluate, mitigate, and address potential oral complications of patients.<sup>3</sup> The use of certificate programs for oral care endows ICU nurses with indispensable resources to administer a comprehensive and holistic standard of care, consequently improving patient outcomes and elevating the quality of critical care.<sup>1–4</sup>

However, the significance of oral health is often overlooked and not given the deserved attention.<sup>2</sup> Several protocols facilitate the implementation of oral care for ICU patients and ICU nurses are expected to fulfill these protocols in practice.<sup>5</sup> However, lack of adherence to oral health care protocols is common among ICU nurses and may lead to a failure to effectively

differentiate and address oral health problems.<sup>2,6-9</sup> Additionally, the use of various oral hygiene products or therapeutic approaches by ICU nurses has been reported to not be optimized to patient's individual needs.<sup>9</sup> The intricate link between oral health and systemic health is sometimes overlooked in the demanding work conditions of ICU; however, attending SC programs and strict enforcement of oral health care guidelines can significantly improve patient outcomes and reduce potential health risks associated with neglected oral health. Strikingly, in a study observing registered nurses working in state hospitals in the USA, mortality rates decreased by 6% when the number of nurses with SC was increased by 10% during the 30-day assessment.<sup>10</sup>

In Turkey, education programs in intensive care nursing were standardized by the Ministry of Health in 2015 and conducted in over a hundred compliant centers since the 1990s.<sup>11</sup> In such centers approved by the Ministry of Health of the Republic of Turkey, nurses who participate in the SC program, have a total of 120-hour theoretical and 120-hour practical courses. Following the course, an accredited final exam has to be succeeded to get the SC certification.<sup>12</sup> In a Turkish cohort study, the ICU nurses emphasized that although training programs had successfully increased their knowledge, they did not sufficiently contribute to their professional skills.<sup>11</sup> In this sense, the current study addresses the question of whether ICU nurses with a SC have sufficient knowledge and awareness regarding oral care and complications related insufficient oral care. Our aim is to analyze the potential relationship between knowledge, attitude, and practice regarding oral care practices among the ICU nurses working in the Eskisehir region of Turkey.

## Materials and Methods

### Ethical Approval

This study was approved by the “Non-Invasive Medical Research Ethical Committee” of the Eskisehir Osmangazi University; Eskisehir, Turkey; under the reference number: 2020-478 (issue date: 26.01.2021). The informed consent agreement was obtained by all participants of survey for research purpose. The authors confirm that survey was performed in full accordance with the regulations and guidelines of the “World Medical Association Declaration of Helsinki in 2013”.<sup>13</sup>

### Criteria of Participants

This cross-sectional study was conducted in Eskisehir and included ICU nurses who graduated from nursing colleges or high school programs in Turkey, with or without SC. The study population comprised ICU nurses working in one university hospital, two public hospitals, and one private hospital, all of which had tertiary-level intensive care units. All participants held an active license and were employed in the ICU of these hospitals. Nurses who did not agree with the terms of the consent form or did not complete the questionnaire were excluded from the study. The ICU nurses included in this study provide a representative sample of ICU nurses working in Eskisehir, Turkey.

### SC Program

Centers providing SC program are authorized by the Ministry of Health of the Republic of Turkey. Accredited course centers are third level adult ICUs with a specialist doctor available twenty-four hours a day. These centers must be equipped with laboratory and radiology services, and advanced invasive monitoring for at least 20 patients. Trainers of the SC course must have SC and MSc degrees in any nursing program or a bachelor's degree with at least three years of experience in the ICU.<sup>12</sup> In the SC program participants have a total of 120-hour theoretical and 120-hour practical courses. Following the course, an accredited final exam must be successfully passed to be granted with SC certification.

### Study Design

A 20-item self-administered questionnaire ([Supplementary Figure 1](#)) was used as the primary data collection tool for the study. The survey questions were modified on the basis of Agarwal et al.<sup>14</sup> Experts' opinions were obtained to evaluate whether the modified items were consistent with the original scale.

In addition to that, the internal consistency of the scale was evaluated using Cronbach's Alpha analysis.<sup>15</sup> The obtained alpha coefficient was 0.71, indicating a reliable level of internal consistency ( $0.70 \leq \alpha < 0.80$ ). The survey was

implemented using a licensed online survey platform ([www.onlineanketler.com](http://www.onlineanketler.com)) between April and June 2021 in Eskisehir, Turkey. To ensure data accuracy and prevent duplicate responses, the platform's IP address monitoring system allowed each participant to complete the survey only once. Additionally, once the survey period ended, the data were exported in Excel format for further analysis. To maximize external validity and to determine any bias in respondents from different hospitals, full sampling method was employed. The survey consisted of two sections. The first part included questions about demographic characteristics such as age, place of employment, holding the SC, and work history in general nursing and/or ICU nursing in years (items no. 1–9). The second section of the survey focused on nurses' knowledge, attitudes, and practices regarding oral care in intensive care units. The knowledge component (items no. 10–12, and 20) assessed nurses' awareness of the importance of oral hygiene, the feasibility of providing adequate oral care, their perception of the sufficiency of their training, and the perceived benefits of oral care for critically ill patients. The attitude component (items no. 13–16) explored nurses' perspectives on oral assessments upon ICU admission, whether oral hygiene should be limited to intubated patients, and their opinions on the healthcare professionals responsible for oral evaluations and hygiene procedures. Lastly, the practice component (items no. 17–19) examined the actual implementation of oral care, including the time allocated per patient, the instruments used, and preferences for dental care solutions. The complete survey questions are provided in the [Supplementary Figure 1](#).

## Data Analysis

Data analysis was conducted using the SPSS (v20.0; IBM Corp., Armonk, NY). Descriptive statistics were calculated, including the mean and standard deviation for numerical variables and frequency and percentage for categorical variables. The chi-square test ( $\chi^2$ ) was employed to examine the relationship between the variables where applicable.  $p < 0.05$  was accepted as statistically significant.

## Results

### Demographics of Participants

A cohort of 234 clinical nurses employed in five ICUs were enlisted to the study. The sample consisted of 188 nurses, of whom 130 (69.1%) were female and 58 (30.9%) were male. Demographics of the nurses are listed in [Table 1](#). The majority of the nurses ( $n = 92.49\%$ ) were within the age range of 26 to 35 years. The secondary and tertiary majority age ranges were 36–45 ( $n = 55$ , 29%) and <25 ( $n = 34$ , 18%), respectively. Most of the nurses ( $n = 119$ , 63%) possessed a baccalaureate degree, whereas 28% ( $n = 52$ ) had graduated from vocational college in the medical nursing program. The average duration of general nursing experience was  $10.41 \pm 7.93$  years (min = 1, max = 30), whereas the average duration of ICU nursing experience was  $6.07 \pm 5.14$  years (min = 0.00, max = 24.00). 45% ( $n = 85$ ) of the cohort had SC, whereas 55% ( $n = 103$ ) did not. Among participants, the frequency of SC was 71.76% ( $n = 61$ ) for female and 28.23% ( $n = 24$ ) for male,  $\chi^2$  (d.f. = 1,  $n = 188$ ) = 0.30,  $p = 0.58$ . The distribution of SC holders varied notably between the age ranges. In age groups of 26–35 ( $n = 40$ , 47.05%) and 36–45 ( $n = 37$ , 43.52%) there were significantly more SC certified nurses compared to <25-year-olds ( $n = 5$ , 5.88%) and 46–55-year-olds ( $n = 3$ , 3.52%),  $\chi^2$  (d.f. = 3,  $n = 188$ ) = 23.70,  $p < 0.001$ . The average number of patients per nurse in the ICUs was  $3.33 \pm 2.27$ . Descriptive details of the cohort are listed in [Table 2](#).

### Knowledge, Attitude and Practices of Oral Care Given to ICU Patients

#### Knowledge

Regarding knowledge, as shown in [Table 3](#), nearly all participants ( $n = 176$ , 93.62%) expressed a high agreement with the importance of maintaining oral hygiene for patients in intensive care. About 49.51% ( $n = 51$ ) of nurses who did not have SC reported receiving insufficient oral hygiene instructions for performing oral care procedures to ICU patients. Nurses who had passed the SC program expressed satisfaction with the level of oral hygiene instruction they had received ( $n = 65$ , 76.47%),  $\chi^2$  (d.f. = 1,  $n = 188$ ) = 12.29,  $p < 0.001$ . ICU nurses holding SC spent more time attending to patients' oral care needs ( $n = 63$ , 74.11%) compared to their non-certified colleagues ( $n = 68$ , 66.01%),  $\chi^2$  (d.f. = 1,  $n = 188$ ) = 2.68,  $p = 0.29$ . When comparing the scope of awareness of the benefits of oral care a highly significant relationship with the attendance to SC education was observed for the factor "Preventing the occurrence of pneumonia

**Table 1** Demographics of the Intensive Care Units' Nurses

Characteristics	Level	Number (n)	Percentage (%)	p-value*
Sex	Male	58	31	< 0.001
	Female	130	69	
Age	<25	34	18	< 0.001
	26–35	92	49	
	36–45	55	29	
	46–55	7	4	
Education	Nursing College	52	28	< 0.001
	University (nursing program)	119	63	
	University (paramedic program)	3	2	
	Others	14	7	
Facility you work	Public/University hospital	61	32	< 0.001
	Public/ State hospital	117	62	
	Private hospital	10	5	
Specialty Certification	Yes	85	45	0.21
	No	103	55	

**Note:** The chi-square test (\*) indicates a significant difference ( $p < 0.05$ ).

**Table 2** Descriptive Statistics of the Intensive Care Units' Nurses

	Working Experience as a Nurse (Year)	Working in Intensive Care Units (Year)	Daily Patient Load
Valid	188	188	188
Missing	0	0	0
Mean	10.41	6.07	3.33
Std. Deviation	7.93	5.14	2.27
Minimum	1.00	0.00	2.00
Maximum	30.00	24.00	21.00

associated with ventilation”,  $X^2$  (d.f. = 1,  $n = 188$ ) = 6.55,  $p = 0.01$  and for the factor “Prevention of periodontal disease”  $X^2$  (d.f. = 1,  $n = 188$ ) = 4.03,  $p = 0.04$ .

### Attitude

Regarding attitude, a great majority of the nurses ( $n = 171$ , 90.95%) specified that they perform oral examination before oral care. No significant difference in attitude were observed between nurses who had a SC and those who did not have it,  $X^2$  (d.f. = 1,  $n = 188$ ) = 2.65,  $p = 0.10$ . Concerning the answer for item 14, “Should oral care services be limited to intubated patients in the intensive care unit?” no statistically significant differences were observed between nurses with a SC and those without one,  $X^2$  (d.f. = 1,  $n = 188$ ) = 1.86,  $p = 0.17$  as all nurses expressed that oral services should not be limited to intubated patients.

**Table 3** Frequencies of Nurses with Specialty Certification Part I

	Nurses with Specialty Certification					
	Yes	No	Total	p-value*	X <sup>2</sup> value	Degrees of Freedom Value
Male	24 (28.23%)	34 (33.01%)	58 (30.85%)	0.58	0.29	1
Female	61 (71.76)	69 (66.99%)	130 (69.14%)			
<25-year-old	5 (5.88%)	29 (28.15%)	34 (18.08%)	< 0.001*	23.70	3
26–35-year-old	40 (47.05%)	52 (50.48%)	92 (48.93%)			
36–45-year-old	37 (43.52%)	18 (17.47%)	55 (29.25%)			
46–55-year-old	3 (3.52%)	4 (3.88%)	7 (3.72%)			
Nursing College	24 (28.23%)	28 (27.18%)	52 (27.66%)			
University (nursing program)	52 (61.17%)	67 (65.04%)	119 (63.29%)	0.19	4.66	3
University (paramedic program)	0 (0.00%)	3 (2.91%)	3 (1.59%)			
Other education	9 (10.58%)	5 (4.85%)	14 (7.44%)			
Public/University hospital	27 (31.76%)	34 (33.01%)	61 (32.44%)			
Public/ State hospital	55 (64.70%)	62 (60.19%)	117 (62.23%)	0.57	1.10	2
Private hospital	3 (3.52%)	7 (6.79%)	10 (5.31%)			
Do you think ensuring the oral hygiene of intensive care patients is important? (item no 10)						
Totally agree	81 (95.29%)	95 (92.23%)	176 (93.61%)	0.26	2.68	2
Somewhat agree	3 (3.52%)	8 (7.76%)	11 (5.85%)			
Neither agree nor disagree	1 (1.17%)	0 (0.00%)	1 (0.53%)			
Do not quite agree	0 (0.00%)	0 (0.00%)	0 (0.00%)			
Strongly disagree	0 (0.00%)	0 (0.00%)	0 (0.00%)			
Is it feasible to provide sufficient time to address the oral care requirements of patients in the intensive care unit? (item no 11)						
Yes	63 (74.11%)	68 (66.01%)	131 (69.68%)	0.29	1.08	1
No	22 (25.88%)	35 (33.98%)	57 (30.31%)			
Do you believe that the training you have received in delivering oral care to patients in intensive care units has been sufficient? (item no 12)						
Yes	65 (76.47%)	52 (50.48%)	117 (62.23%)	< 0.001*	12.29	1
No	20 (23.52%)	51 (49.51%)	71 (37.76%)			
Who do you think should do the oral evaluation of a patient treated in the intensive care unit? (item no 15)						
Nurses	12 (14.11%)	7 (6.79%)	19 (10.10%)	0.03*	10.64	4
Intensive care nurses	40 (47.05%)	34 (33.01%)	74 (39.36%)			
Dentists	13 (15.29%)	29 (28.15%)	42 (22.34%)			
General Practitioners	0 (0.00%)	2 (1.94%)	2 (1.06)			
Intensive care specialists	20 (23.52%)	31 (30.09%)	51 (27.12%)			

(Continued)

**Table 3** (Continued).

	Nurses with Specialty Certification					
	Yes	No	Total	p-value*	X <sup>2</sup> value	Degrees of Freedom Value
Do you examine the present oral condition of a patient who has recently been admitted to the intensive care unit? (item no 13)						
Yes	81 (95.29%)	90 (87.37%)	171 (90.95%)	0.10	2.65	1
No	4 (4.70%)	13 (12.62%)	17 (9.04%)			
Should oral hygiene services be only provided to patients who are intubated in the intensive care unit? (item no 14)						
Yes	6 (7.05%)	2 (1.94%)	8 (4.25%)	0.17	1.86	1
No	79 (92.94%)	101 (98.05%)	180 (95.74%)			
Who do you think should perform the oral hygiene of intensive care patients? (item no 16)						
Nurses	19 (22.35%)	9 (8.73%)	28 (14.89%)	0.014*	12.51	4
Intensive care nurses	58 (68.23%)	71 (68.93%)	129 (68.61%)			
Dentists	6 (7.05%)	13 (12.62%)	19 (10.10%)			
Intensive care specialists	0 (0.00%)	6 (5.82%)	6 (3.19%)			
Other	2 (2.35%)	4 (3.88%)	6 (3.19%)			
What is the time allocation for oral care in each case of an intensive care patient? (item no 17)						
< 1 minute	3 (3.52%)	12 (11.65%)	15 (7.97%)	0.13	7.04	4
2–5 minutes	30 (35.29%)	42 (40.77%)	72 (38.29%)			
6–10 minutes	24 (28.23%)	27 (26.21%)	51 (27.12%)			
11–15 minutes	14 (16.47%)	13 (12.62%)	27 (14.36%)			
> 15 minutes	14 (16.47%)	9 (8.73%)	23 (12.23%)			

**Note:** The chi-square test (\*) indicates a significant difference ( $p < 0.05$ ).

## Practice

Practice duration of oral care performed by ICU nurses is listed in Table 3. No statistically significant differences were found for duration of oral care between SC nurses and nurses without SC education,  $X^2$  (d.f. = 4,  $n = 188$ ) = 7.04,  $p = 0.13$ . However, it seems that SC nurses tended to spend more time on oral care. Nurses who spent less time on oral hygiene also performed fewer oral examinations,  $X^2$  (d.f. = 4,  $n = 188$ ) = 16.73,  $p = 0.002$ . Also, there was an inverse relationship between the number of ICU patients per nurse and the time spent on oral care per patient,  $X^2$  (d.f. = 8,  $n = 188$ ) = 33.24,  $p < 0.001$ .

Table 4 shows that in the entire study cohort the most preferred mechanical cleaning methods were foam swab ( $n = 175$ , 93.08%), sterile gauze ( $n = 117$ , 62.23%), manual toothbrush ( $n = 24$ , 12.76%), and motorized toothbrush ( $n = 2$ , 1.06%). A statistically significant difference was found only in the preference for manual toothbrush use between nurses with and without SC.  $X^2$  (d.f. = 1,  $n = 188$ ) = 4.16,  $p = 0.04$ .

Although the difference was not statistically significant, a higher proportion of nurses without specialty certification (SC) reported using foam sticks ( $n = 98$ , 95.14%) compared to SC nurses ( $n = 77$ , 90.58%). Of the alternative cleaning methods, the use of aqueous sodium bicarbonate ( $n = 139$ , 73.93%) was the most popular, followed by 0.12% chlorhexidine digluconate ( $n = 85$ , 45.21%), sterile saline ( $n = 83$ , 44.14%), tap water ( $n = 25$ , 13.29%), povidone iodine ( $n = 10$ , 5.31%), and aqueous hydrogen peroxide ( $n = 8$ , 4.25%). No statistically significant difference was found for the use of alternative cleaning methods between nurses with and without SC education,  $p > 0.05$ . Furthermore, a

**Table 4** Frequencies of Nurses with Specialty Certification Part 2

	Nurses with Specialty Certification					
	Yes	No	Total	p-value*	X <sup>2</sup> value	Degrees of Freedom Value
Which of the following instruments are used for administering oral hygiene to patients in intensive care unit? (item no 18)						
Foam swabs						
Yes	77 (90.58%)	98 (95.14%)	175 (93.08%)	0.34	0.87	1
No	8 (9.41%)	5 (4.85%)	13 (6.91%)			
Manual toothbrush						
Yes	16 (17.78%)	8 (7.67%)	24 (12.76%)	0.04*	4.16	1
No	69 (81.17%)	95 (92.23%)	164 (87.23%)			
Motorized toothbrush						
Yes	2 (2.35%)	0 (0.00%)	2 (1.06%)	0.39	0.72	1
No	83 (97.64%)	103 (100%)	186 (98.93%)			
Sterile gauzes						
Yes	51 (60%)	66 (64.07%)	117 (62.23%)	0.67	0.17	1
No	34 (40%)	37 (35.92%)	71 (37.76%)			
Solutions						
Yes	69 (81.17%)	87 (84.46%)	156 (82.97%)	0.68	0.16	1
No	16 (18.82%)	16 (15.53%)	32 (17.02%)			
Moisturizer						
Yes	68 (80.00%)	72 (69.90%)	140 (74.46%)	0.15	1.99	1
No	17 (20.00%)	31 (30.09%)	48 (25.53%)			
When considering the use of oral care solutions in intensive care patients, which of the following options do you have a preference for? (item no 19)						
Saline						
Yes	36 (42.35%)	47 (45.63%)	83 (44.14%)	0.76	0.09	1
No	49 (57.64%)	56 (54.36%)	105 (55.85%)			
Hydrogen peroxide						
Yes	5 (5.88%)	3 (2.91%)	8 (4.25%)	0.52	0.41	1
No	80 (94.11%)	100 (97.08%)	180 (95.74%)			
Sodium bicarbonate						
Yes	65 (76.47%)	74 (71.84%)	139 (73.93%)	0.58	0.30	1
No	20 (23.52%)	29 (28.15%)	49 (26.06%)			
Chlorhexidine digluconate						
Yes	44 (51.76%)	41 (39.80%)	85 (45.21%)	0.13	2.28	1
No	41 (48.23%)	62 (60.19%)	103 (54.78%)			

(Continued)

**Table 4** (Continued).

	Nurses with Specialty Certification					
	Yes	No	Total	p-value*	X <sup>2</sup> value	Degrees of Freedom Value
Povidone-iodine						
Yes	6 (7.05%)	4 (3.88%)	10 (5.31%)	0.52	0.40	1
No	79 (92.94%)	99 (96.11%)	178 (94.68%)			
Tap water						
Yes	7 (8.23%)	18 (17.47%)	25 (13.29%)	0.10	2.69	1
No	78 (91.76%)	85 (82.52%)	163 (86.70%)			
One of the advantages of administering oral care to patients in critical care is. (item no 20)						
The prevention of periodontal disease						
Yes	71 (83.52%)	72 (69.90%)	143 (76.06%)	0.04*	4.03	1
No	14 (16.47%)	31 (30.09%)	45 (23.93%)			
The prevention of halitosis						
Yes	62 (72.94%)	72 (69.90%)	134 (71.27%)	0.76	0.08	1
No	23 (27.05%)	31 (30.09%)	54 (28.72%)			
The prevention of ventilation-associated pneumonia						
Yes	64 (75.29%)	58 (56.31%)	122 (64.89%)	0.01*	6.55	1
No	21 (24.70%)	45 (43.68%)	66 (35.10%)			
Enhancing patient comfort						
Yes	63 (74.11%)	68 (66.01%)	131 (69.68%)	0.29	1.08	1
No	22 (25.88%)	35 (33.98%)	57 (30.31%)			
Reducing the duration of hospitalization in the intensive care unit						
Yes	35 (41.17%)	41 (39.80%)	76 (40.42%)	0.96	0.002	1
No	50 (58.82%)	62 (60.19%)	112 (59.57%)			

**Note:** The chi-square test (\*) indicates a significant difference ( $p < 0.05$ ).

statistically significant positive relationship was seen between oral care applications and ICU work experience, (d.f. = 4,  $n = 188$ )  $p < 0.001$ .

## Discussion

Maintaining proper dental hygiene is an essential element of overall well-being, especially in individuals who are severely ill and encounter difficulties in performing oral care due to intubation, limited movement, or other medical conditions. In the current study, a relationship was observed between the knowledge, attitudes, and practices of nurses based on whether they possessed SC or not. We also asked the respondents to estimate the oral care service intervals (4–6-hour intervals) and their oral care practices.

In a recent study of Lithuanian ICU nurses' attitudes and practices Narbutaite et al found that about four-fifths of the nurses acknowledged the importance of oral care,<sup>16</sup> which agrees with our results. In the current study, almost all the



nurses agreed on the importance of maintaining oral hygiene. Almost all Lithuanian ICU nurses (99%) expressed willingness for further education, younger more than older.<sup>16</sup> In our study, the nurses found the targeted education of oral care helpful and SC holders felt that they had received sufficient training. On the contrary, nurses that did not have SC expressed that their knowledge on oral care was not sufficient. Furthermore, SC holders spent more time attending to patient's oral care needs, indicating that certified ICU nurses prioritized oral care more and understood the unique challenges faced by the critically ill patients. SC holders were aware that without proper oral care periodontal disease can progress rapidly, and potentially lead to pneumonia or to other complications. Moreover, patients in ICU may have specific challenges in their oral health, such as difficulty of swallowing, dry mouth, or impaired immune responses. ICU nurses with SC are trained to address these challenges effectively and promote optimal oral hygiene to mitigate potential complications.<sup>17,18</sup>

According to our results, nurses with longer work experience spend more time performing oral care for patients in the ICU than nurses with shorter work history. Specialized training equips ICU nurses with necessary knowledge and skills to comprehend the significance of oral hygiene in mitigating difficulties, including VAP and other oral health-related concerns. VAP is one of the most prevalent nosocomial infections in ICUs.<sup>17</sup> The importance of meticulous oral care for ICU patients and the requirement for ICU staff to acquire the necessary knowledge and skills to perform adequate oral hygiene procedures are highlighted due to the high risk of VAP.<sup>18</sup> The tendency to provide more time for oral care was more pronounced among nurses with SC education. The provision of oral treatment in the ICU frequently necessitates the adoption of a more comprehensive and all-encompassing strategy towards the well-being of the patient. Supporting this viewpoint, SC nurses expressed that oral care for patients in the ICU should be performed by nurses, when they were asked which of the professionals should perform the oral care, the other options included dentists and ICU specialists. Furthermore, SC holders expressed receiving sufficient training in this area. There was a significant difference in the aforementioned attitudes between SC holders and nurses who had not received additional education for oral care.

Previous studies have shown the efficacy of mechanical toothbrushing as a vital intervention for oral care and plaque control for patients in ICU.<sup>19,20</sup> However, it was found that only about one-tenth of nurses indicated the use of a toothbrush. Toothbrush use frequency significantly differed between SC certified and non-SC certified nurses. The disparities in toothbrush use among ICU nurses may be attributed to a lack of information, equipment availability, or nurses' professional preference. However, given that patients in the ICU are critically ill, they may have medical conditions or treatments that increase their susceptibility to injury or discomfort, and thus in some cases the use of a traditional toothbrush can cause inadvertent tissue damage.<sup>21</sup> Specifically, the majority of the nurses expressed their preference for relatively quicker mechanical cleaning instruments such as foam swab and sterile gauze. The utilization of foam swabs yields comparable outcomes to toothbrushes in terms of enhancing oral hygiene to a large extent.<sup>22</sup>

Moreover, the choice of instrument for administering oral hygiene may depend also on other aspects, besides the level of training, including the standard oral care protocols in use in the given ICU and availability of materials. Indeed, the use of foam swabs as the primary tool in oral care was consistent with the previous findings.<sup>23,24</sup> Even though ICU nurses prefer to use foam swabs, they need to be aware of the new studies pointing out that foam swabs have a limited capacity to eliminate dental plaque.<sup>25,26</sup>

Sodium bicarbonate reduces inflammation by neutralizing butyric acid, a notable virulence factor associated with oral pathogens, thereby establishing a protective barrier against its detrimental impact.<sup>27,28</sup> In the context of periodontal disease prevention, our study revealed a notable preference among ICU nurses for sodium bicarbonate solution (73.74%). This tendency corresponds with the findings by Turk et al,<sup>29</sup> who found that sodium bicarbonate emerges as the predominant choice for an alternative cleansing approach, being favored by four-fifths of the respondents.

Chlorhexidine digluconate is used as a mouthwash or oral rinse to maintain oral hygiene and to prevent infections in critical care settings, and it has been frequently described as the most popular approach. DeKeyser et al found that majority of nurses preferred chlorhexidine digluconate (75%), followed by toothpaste (33%),<sup>30</sup> and Jones et al reported that almost a half of ICU nurses regularly used chlorhexidine digluconate.<sup>23</sup> However, also much lower percentages for chlorhexidine use have been reported, such as in a study by Binkley et al in which roughly 20% preference was found.<sup>24</sup> In our study, approximately 46% of the nurses expressed using chlorhexidine digluconate solution as their preferred alternative cleaning method. This finding is in agreement with the reported frequencies of 50% and 36% for

chlorhexidine as the alternative method by Binkley et al<sup>24</sup> and Narbutaitė et al<sup>16</sup> respectively. However, as previously mentioned, the preferences and practices of ICU nurses regarding oral hygiene products, including chlorhexidine digluconate, can vary based on institutional policies, guidelines, individual patient needs, and professional judgment.

The SC education is an important aspect of professional development and the quality of care for ICU nurses in Turkey. While specific information available on the certification process for ICU nurses in Turkey is limited, the skills and knowledge gained at the SC program have been previously investigated.<sup>31,32</sup> To the best of our knowledge, our study is the first comprehensive study to address the impact of the SC program on oral care procedures in practice. Our study had a notable response rate, and the questionnaire used has been previously employed both in the European Union and the United States. Our findings have significant practical consequences, particularly in implementation of complete oral health standards and providing assistance to hospital management and intensivists to improve oral care in intensive care.

To our knowledge, this is the first study to compare oral care knowledge, attitudes, and practices between Turkish nurses with and without specialty certification. However, the nature of the questionnaire-based study design is considered a limitation, because the practices and the outcomes of oral care were not objectively observed. Nonetheless, the baseline data presented in this study provide respondent's self-reported point of view of their knowledge, attitude, and practice of oral care services. The survey was carried out in Turkey, and therefore administrative or national characteristics might influence the findings, when carried out in different populations.

This research is a cross-sectional study carried out in the Eskisehir district. To assess the usefulness of this study, future research is required to evaluate the performance, willingness, attitude of ICUs on oral care, with national involvement in Turkey.

## Conclusion

Having SC significantly affects ICU nurses ability and willingness to prioritize oral care to improve patients' oral hygiene. Additionally, we found a significant relationship between patient number per nurse and time allocated to oral care. Therefore, to encourage more broad recognition of the importance of oral care in critically ill, further studies are required to improve nurses' oral care education and to create written standards for oral care protocols in Turkish ICUs.

## Abbreviations

ICU, intensive care unit; SC, specialty certification; VAP, ventilator-associated pneumonia.

## Data Sharing Statement

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

## Ethics Approval and Consent to Participate

This study was approved by the “Non-Invasive Medical Research Ethical Committee” of the Eskisehir Osmangazi University; Eskisehir, Turkey; under the reference number: 2020-478 (issue date: 26.01.2021). The informed consent agreement was obtained by all participants of the survey for research purposes. All participants' information was anonymous and confidential. The authors confirm that surveys were performed in full accordance with the regulations and guidelines of the “World Medical Association Declaration of Helsinki in 2013”.<sup>12</sup>

## Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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## Disclosure

Dr Kari Eklund reports personal fees for lecture from Lilly, personal fees for advisory board from UCB, outside the submitted work. The authors report no other conflicts of interest in this work.

## References

- Bingham M, Ashley J, De Jong M, Swift C. Implementing a unit-level intervention to reduce the probability of ventilator-associated pneumonia. *Nurs Res*. 2010;59(1):40–47. doi:10.1097/NNR.0b013e3181c3bffc
- Feider LL, Mitchell P, Bridges E. Oral care practices for orally intubated critically ill adults. *Am J Crit Care*. 2010;19(2):175–183. doi:10.4037/ajcc2010816
- Karimi S, Kolyaei E, Karimi P, Rahmani K. Effectiveness of supervised implementation of an oral health care protocol on ventilator-associated pneumonia patients in intensive care units: a double-blind multicenter randomized controlled trial. *Infect Prev Pract*. 2023;5(3):100295. doi:10.1016/j.infpip.2023.100295
- Zhang Q, Li C, Worthington HV, Hua F. Oral hygiene care for critically ill patients to prevent ventilator-associated pneumonia. *Cochrane Database Syst Rev*. 2020;(12). doi:10.1002/14651858.CD008367.pub4
- Cutler CJ, Davis N. Improving oral care in patients receiving mechanical ventilation. *Am J Crit Care*. 2005;14(5):389–394. doi:10.4037/ajcc2005.14.5.389
- Johnstone L, Spence D, Koziol-McClain J. Oral hygiene care in the pediatric intensive care unit: practice recommendations. *Pediatr Nurs*. 2010;36(2):85–96.
- Gavin C. 2016 guide to nursing certification boards by specialty. *Dimens Crit Care Nurs*. 2016;35(1):3–9. doi:10.1097/DCC.0000000000000159
- Shi Z, Xie H, Wang P, et al. Oral hygiene care for critically ill patients to prevent ventilator associated pneumonia [Intervention Protocol]. *Cochrane Database Syst Rev*. 2010;(2):1–14. doi:10.1002/14651858.CD008367
- Danser MM, Gómez SM, Van der Weijden GA. Tongue coating and tongue brushing: a literature review. *Int J Dent Hyg*. 2003;1(3):151–158. doi:10.1034/j.1601-5037.2003.00034.x
- Kendall-Gallagher D, Aiken LH, Sloane DM, Cimiotti JP. Nurse specialty certification, inpatient mortality, and failure to rescue. *J Nurs Scholarsh*. 2011;43(2):188–194. doi:10.1111/j.1547-5069.2011.01391.x
- Göktepe N, Türkmen E, Bozkurt G, et al. Views of critical care nurses participating in an adult intensive care nursing certification program. *Türk Yoğun Bakım Dergisi*. 2021;19(3):123. doi:10.4274/tybd.galenos.2020.58076
- Ministry of Health. Sağlık alanı sertifikalı eğitim standartları. 2015. Available from: <https://dosyamerkez.saglik.gov.tr/Eklenti/41589/0/yogun-bakim-hemsireligi-sep-standartlari-revizyonpdf.pdf>. Accessed November 20, 2023.
- World Medical Association. World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects. *JAMA*. 2013;310(20):2191–2194. doi:10.1001/jama.2013.281053
- Agarwal V, Singhal R, Khanna R, Rastogi P, Agarwal A, Tripathi S. Survey of extent of translation of oral healthcare guidelines for ICU patients into clinical practice by nursing staff. *Crit Care Res Pract*. 2017;2017:1348372. doi:10.1155/2017/1348372
- Tavakol M, Dennick R. Making sense of Cronbach's alpha. *Int J Med Educ*. 2011;2:53–55. doi:10.5116/ijme.4dfb.8dfd
- Narbutaitė J, Skirbutytė G, Virtanen JI. Oral care in intensive care units: Lithuanian nurses' attitudes and practices. *Acta Odontol Scand*. 2023;81(5):408–413. doi:10.1080/00016357.2022.2163285
- Kalanuria AA, Zai W, Mirski M. Ventilator-associated pneumonia in the ICU. *Crit Care*. 2014;18:1–8. doi:10.1186/cc13775
- Takahama A, de Sousa VI, Tanaka EE, et al. Analysis of oral risk factors for ventilator-associated pneumonia in critically ill patients. *Clin Oral Investig*. 2021;25:1217–1222. doi:10.1007/s00784-020-03426-x
- Jang CS, Shin YS. Effects of combination oral care on oral health, dry mouth and salivary pH of intubated patients: a randomized controlled trial. *Int J Nurs Pract*. 2016;22(5):503–511. doi:10.1111/ijn.12460
- de Camargo L, da Silva SN, Chambrone L. Efficacy of toothbrushing procedures performed in intensive care units in reducing the risk of ventilator-associated pneumonia: a systematic review. *J Periodontol Res*. 2019;54(6):601–611. doi:10.1111/jre.12668
- Berry AM, Davidson PM. Beyond comfort: oral hygiene as a critical nursing activity in the intensive care unit. *Intensive Crit Care Nurs*. 2006;22(6):318–328. doi:10.1016/j.iccn.2006.04.003
- Marino PJ, Hannigan A, Haywood S, et al. Comparison of foam swabs and toothbrushes as oral hygiene interventions in mechanically ventilated patients: a randomized split mouth study. *BMJ Open Respir Res*. 2016;3(1):e000150. doi:10.1136/bmjresp-2016-000150
- Jones H, Newton JT, Bower EJ. A survey of the oral care practices of intensive care nurses. *Intensive Crit Care Nurs*. 2004;20(2):69–76. doi:10.1016/j.iccn.2004.01.004
- Binkley C, Furr LA, Carrico R, McCurren C. Survey of oral care practices in US intensive care units. *Am J Infect Control*. 2004;32(3):161–169. doi:10.1016/j.ajic.2003.05.001
- Munro CL, Grap MJ. Oral health and care in the intensive care unit: state of the science. *Am J Crit Care*. 2004;13(1):25–34. doi:10.4037/ajcc2004.13.1.25
- Pearson LS, Hutton JL. A controlled trial to compare the ability of foam swabs and toothbrushes to remove dental plaque. *J Adv Nurs*. 2002;39(5):480–489. doi:10.1046/j.1365-2648.2002.02313.x
- Takigawa S, Sugano N, Ochiai K, Arai N, Ota N, Ito K. Effects of sodium bicarbonate on butyric acid-induced epithelial cell damage in vitro. *J Oral Sci*. 2008;50(4):413–417. doi:10.2334/josnusd.50.413
- Kothiwale S, Kella M, Hombal L, Rathore A. Evaluation of sodium bicarbonate as an adjunct to non-surgical periodontal therapy and its effect on oxidative stress: a clinico-biochemical study. *J Dent Oral Disord Ther*. 2014;2(2):5. doi:10.15226/jdodt.2014.00116
- Türk G, Kocaçal Güler E, Eşer İ, Khorshid L. Oral care practices of intensive care nurses: a descriptive study. *Int J Nurs Pract*. 2012;18(4):347–353. doi:10.1111/j.1440-172X.2012.02045.x
- Ganz FD, Fink NF, Raanan O, et al. ICU nurses' oral-care practices and the current best evidence. *J Nurs Scholarsh*. 2009;41(2):132–138. doi:10.1111/j.1547-5069.2009.01264.x

31. Yaman Aktas Y, Nagórska M, Karabulut N. Problems in critical care nurse-patient communication: examples of Poland and Turkey. *Acta Clin Croat.* 2017;56(3):437–445. doi:10.20471/acc.2017.56.03.10
32. Gulnur K, Kazan EE. Evaluation of skills of intensive care nurses regarding central venous catheter care: an observational study. *Marmara Med J.* 2021;34(3):298–306. doi:10.5472/marumj.1012090

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