

The Relationship Between Oral Health and Dysphagia in Patients with Acute Stroke: A Cross-Sectional and Correlational Study

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ABSTRACT

Purpose: Dysphagia is a common complication after a stroke. Maintaining oral health is of vital importance in stroke patients. This study aimed to examine the relationship between oral health and dysphagia in acute stroke patients upon Intensive Care Unit (ICU) admission.

Methods: This descriptive and correlational study was conducted with 82 acute stroke patients in the neurology and stroke ICU of a hospital in southern Türkiye. Data were collected within 24 hours of admission using the Patient Information Form, Turkish Modified Mann Swallowing Assessment Test (TR-MMASA Test), and Oral Assessment Guide (OAG). Analyses included t-test, ANOVA, Mann–Whitney U test, and linear regression.

Results: The mean age of the patients was 65.4 ± 12.9 ; 64.5% were male. The mean OAG score was 7.52 ± 3.58 , and the mean TR-MMASA score was 83.04 ± 24.68 . Oral health status explained 80% of the variance in dysphagia levels.

Conclusions: Within the first 24 hours of ICU admission, patients showed moderate oral health risk, which significantly influenced their dysphagia levels.

Keywords: Dysphagia; acute stroke; oral health; intensive care unit; nursing care

ÖZET

Amaç: Bu çalışma, akut inme hastalarında yoğun bakım ünitesine (YBÜ) kabul sırasında ağız sağlığı ile disfaji arasındaki ilişkiyi incelemek amacıyla gerçekleştirildi.

Gereç ve Yöntem: Tanımlayıcı ve ilişki arayıcı tasarımdaki araştırma, Türkiye'nin güneyinde bir hastanenin nöroloji ve inme YBÜ'sinde yatan 82 akut inme hastası ile yürütüldü. Veriler, hastanın YBÜ'ne kabulünden sonraki ilk 24 saat içinde Hasta Bilgi Formu, Türkçe Modifiye Mann Yutma Değerlendirme Testi (TR-MMASA) ve Oral Değerlendirme Rehberi (OAG) kullanılarak toplandı. Analizlerde t-testi, ANOVA, Mann–Whitney U testi ve doğrusal regresyon yöntemleri kullanıldı.

Bulgular: Hastaların yaş ortalaması 65.4 ± 12.9 olup, %64.5'i erkekti. Ortalama OAG skoru 7.52 ± 3.58 , ortalama TR-MMASA skoru ise 83.04 ± 24.68 olarak bulundu. Ağız sağlığı düzeyinin, disfaji düzeyindeki değişimin %80'ini açıkladığı belirlendi.

Sonuç: YBÜ'ye kabulün ilk 24 saatinde hastaların orta düzeyde ağız sağlığı riskine sahip olduğu ve bu durumun disfaji düzeylerini anlamlı şekilde etkilediği saptandı.

Anahtar Kelimeler: Disfaji; akut inme; ağız sağlığı; yoğun bakım; hemşirelik bakımı

Stroke, a major global health problem today, ranks among the leading causes of disability and death worldwide. Stroke is a clinical condition that begins acutely and is characterized by neurological symptoms lasting 24 hours or more, resulting from inadequate cerebral perfusion due to a vascular cause (1).

Various sensorimotor impairments are observed in patients with stroke. These impairments can affect the tongue, lips, and masticatory muscles, leading to dysphagia, a common complication following stroke (2,3). While most stroke patients regain normal swallowing function within one week, approximately 11–13% recover this function only after a longer period, such as six months (3).

In the care of acute stroke patients, it is important to identify the risk factors that contribute to the development of post-stroke dysphagia, to regularly monitor patients by assessing their swallowing status, and to determine an appropriate feeding method based on the stage of dysphagia through comprehensive evaluation of those with suspected dysphagia (4). Nurses, as the healthcare professionals most frequently present during patients' feeding, are in a primary position to recognize dysphagia, initiate screening and referrals, manage interventions, educate patients and caregivers, and assess swallowing function within the first 24 hours of admission using valid and reliable screening tools (5). Considering the adverse effects of post-stroke dysphagia, identifying all potential contributing factors is of critical importance. Oral health has been reported to influence dysphagia. Dental caries and tooth loss may lead to reduced chewing function and, indirectly, difficulty in swallowing. Tooth loss negatively affects the oral preparatory phase of swallowing (6).

It is the responsibility of nurses to assess the entire oral structure (including voice and swallowing) daily for oral health risk factors, to evaluate the patient's ability to perform oral care independently, to plan oral hygiene together with the patient if possible, and to ensure appropriate oral care for patients unable to maintain self-care (7). Despite the importance of oral hygiene and care being highlighted, it is often neglected or underestimated by nurses (8). Despite growing evidence, the relationship between oral health and dysphagia in acute stroke patients remains insufficiently explored. This study was conducted to assess the oral health and dysphagia status of patients with acute stroke within the first 24 hours of their admission to a Neurology and Stroke-Centered Intensive Care Unit (ICU) and to evaluate the effect of oral health on dysphagia. It's believed that this study will

increase nurses' awareness regarding the assessment of oral health and dysphagia in patients with acute stroke.

The study question is as follows:

- What is the relationship between oral health and dysphagia in acute stroke patients in neurology and stroke intensive care units?

Materials and Methods

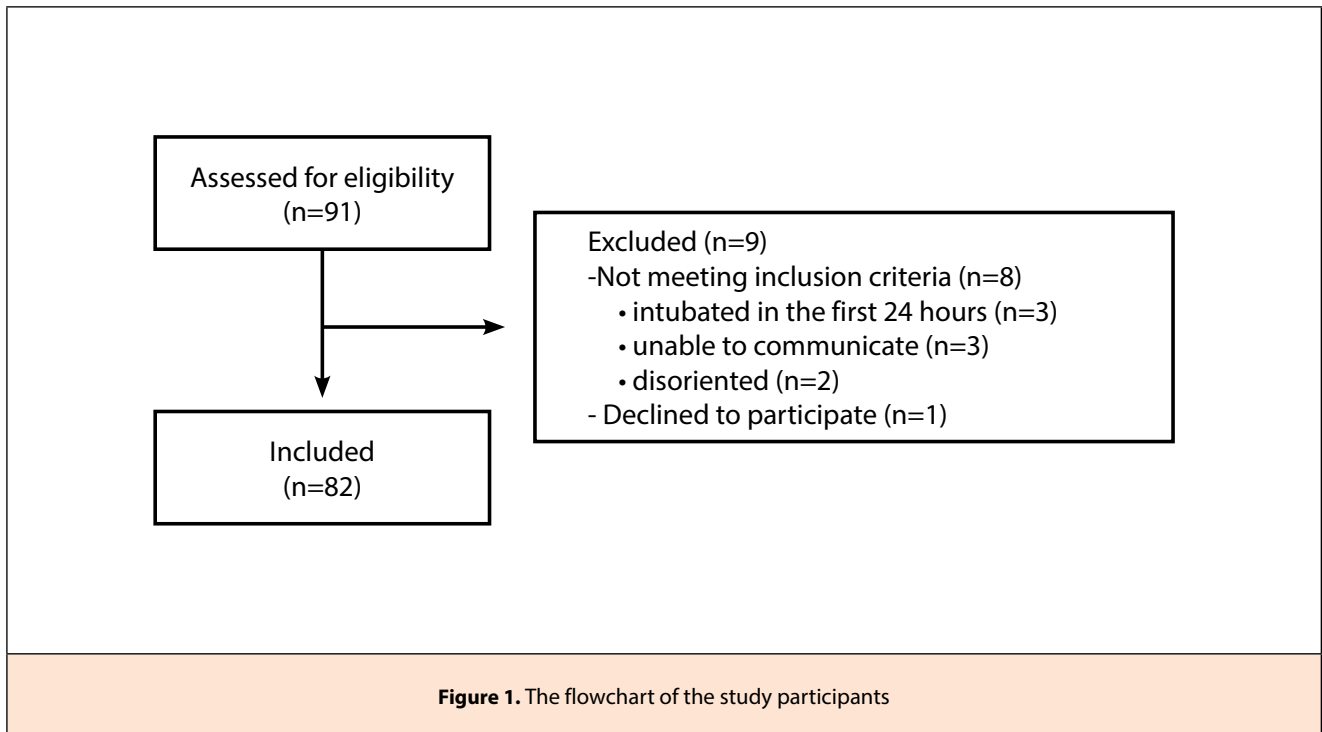
Study Design and Setting

This descriptive and correlational study was conducted in the Neurology and Stroke Center ICU of a Training and Research Hospital in southern Turkey between June 1 and July 31, 2024. The unit has 12 patient beds and a total of 24 nurses. The Stroke-Centered ICU is located within this unit and has two beds. Incoming patients receive treatment and care in the Neurology ICU section based on bed availability. While routine oral health assessments are performed using a screening tool in the unit, no risk assessment for dysphagia is conducted. This study was reported in accordance with the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines for cross-sectional studies (9).

Study Population and Sample

The study population consisted of acute stroke patients admitted to the Neurology and Stroke Center ICU of a training and research hospital. The sample included patients who met the inclusion criteria and volunteered to participate. The study included patients over 18 years of age who were not intubated, had no previous history of stroke, had no other diseases affecting swallowing ability independent of stroke, were able to communicate, and were fully oriented.

The sample size required for the study was calculated using the G*Power 3.1.9.7 program. The sample size for simple linear regression analysis was determined to be at least 55, assuming a medium effect size ($f^2 = 0.15$), a 5% margin of error, and 80% power. Considering potential data loss, the sample size was increased by 20%, resulting in a final sample of at least 66 patients (10). Between June 1 and July 31, 2024, 91 patients were hospitalized with a diagnosis of acute stroke. The study was completed with 82 patients. A flowchart of the study participants is provided in Figure 1.



Data Collection Tools

The data were collected using the “Patient Information Form”, “Oral Assessment Guide (OAG)” and “Turkish Modified Mann Swallowing Assessment Test (TR-MMASA Test)”.

Patient Information Form: The form, developed by the researchers based on the literature, includes 12 items related to patients’ sociodemographic characteristics (age, gender, education level, smoking and alcohol use history, etc.), health-related characteristics (chronic diseases, presence of a nasogastric (NG) tube, affected area, type of stroke, etc.), and oral care-related characteristics (methods used in routine oral care, frequency of patients performing their daily oral care) (2,3,7).

Oral Assessment Guide (OAG): The Turkish validity and reliability study was carried out by Palloş and Şendir (2018) (11). In the guide, lips, mucous membranes/tongue, gums, teeth, and saliva are scored between 1 and 3 points. The total score obtained from the guide indicates the individual’s risk level for oral health problems. 5 is considered “no risk”, 6-10 points is considered “medium risk”, and 11-15 points is considered “high risk”. The Cronbach alpha coefficient of the scale was 0.71 (11). The Cronbach alpha coefficient of the scale for this study is 0.90.

Turkish Modified Mann Swallowing Assessment Test (TR-MMASA Test): The MMASA test is a modified version of the MASA swallowing assessment test and includes 12 of the 24 items of the MASA test, providing a comprehensive clinical evaluation. Unlike the MASA test, a “no response” option has been added to the “auditory perception” section. The Turkish validity and reliability study of the test was conducted by Berber Çiftçi and Topbaş (2022) (12). The TR-MMASA Test includes the following items: alertness, salivation, cooperation, tongue movement, respiration, tongue strength, expressive speech, gag, auditory perception, cough reflex, dysarthria, and palate movement. The highest score on the test is 100. The cut-off score for the presence of dysphagia was 94 out of 100. Patients who score 95 or above on the test are considered eligible to begin oral feeding as tolerated. For patients scoring 94 or below, oral feeding is not recommended, and referral to a speech and language therapist is advised. The Cronbach alpha coefficient of the scale was 0.90 (12). The Cronbach alpha coefficient for the scale for this study was 0.90.

Data Collection

Data were collected by one of the researchers via a survey method within the first 24 hours after admission of acute stroke patients to the unit between June and July 2024. To

assess alertness, the first item of the TR-MMASA test was used. Participants were given simple, clear instructions, such as "Hello, how are you?", and their appropriate gestures, facial expressions, or verbal responses were scored. Items 8, 9, 10, 11, and 12 of the TR-MMASA test were evaluated using a tongue depressor according to the instructions. Data were collected for each patient in an average of 20-25 minutes.

Data Analysis

The data were analyzed using the SPSS 22 software package. The conformity of the data to normal distribution was evaluated using Skewness and Kurtosis (± 2.5) values Tabachnick and Fidell, 2013 (13). Descriptive statistics, Independent-Samples t-test, One-Way ANOVA, and Mann-Whitney U test were used for data analysis. A Post Hoc Bonferroni test was performed to determine within-group differences. Pearson's correlation coefficient (r) was used to examine the relationship between continuous variables. Simple linear regression analysis was used to determine the effect of patients' oral health (independent variable) on dysphagia (dependent variable). A significance level of 0.05 was accepted for all statistical analyses.

Ethical Considerations

Prior to data collection, the necessary ethics committee approval was obtained from Hatay Mustafa Kemal University Non-Clinical Research Ethics Committee (Date: 04.03.2024, Number of Meetings: 02, Number of Decisions: 20) and the institutional permission (dated 02.05.2024 and numbered E-11289099-050.04-242576179) from Adana City Training and Research Hospital where the study was conducted. The patients were informed about the purpose of the study, that participation was voluntary, that their data would not be used for any other purpose, and that their written consent was obtained. The study adhered to the Declaration of Helsinki throughout the process.

Results

The mean age of the patients was 65.41 ± 12.94 years, with 64.5% being male and 68.3% having graduated from primary school. Additionally, 24.4% of the patients reported smoking, and 13.4% consumed alcohol. Descriptive characteristics of the patients are shown in Table 1.

The OAG score averages within the first 24 hours after patients' admission to the unit showed statistically

significant differences based on age, presence of a nasogastric (NG) tube, affected region, and the frequency with which patients performed their own daily oral care ($p < 0.05$). Specifically, patients aged over 65 had significantly higher mean OAG scores compared to those under 65 ($t = -2.317$, $p = 0.023$). Patients with an NG tube had significantly higher scores than those without ($z = -5.199$, $p < 0.001$). Patients with left-sided or bilateral motor deficits had significantly higher OAG scores compared to those without motor deficits ($F = 8.934$, $p < 0.001$) (Table 1).

Additionally, there was a statistically significant and weak negative correlation between the frequency of patients' self-performed daily oral care and their mean OAG scores. This suggests that an increase in the frequency of routine oral care was associated with a decrease in OAG scores ($r = -0.279$, $p = 0.011$) (Table 1).

The mean TR-MMASA test scores of the patients showed statistically significant differences based on age, presence of an NG tube, and the affected region ($p < 0.05$). Specifically, the TR-MMASA test scores were significantly higher in patients without an NG tube compared to those with an NG tube. Patients with right-sided motor deficits had significantly higher scores than those with bilateral involvement. Patients with left-sided motor deficits had significantly higher scores than those without motor deficits. Patients with bilateral motor deficits had significantly higher scores than those without motor deficits ($p < 0.05$) (Table 1).

The patients' OAG score averages were 7.52 ± 3.58 (Range = 5-15). The risk level of patients in terms of oral health problems was classified as "no risk" (5 points), "moderate risk" (6-10 points), and "high risk" (11-15 points) according to their OAG score averages. It was determined that 61.0% of the patients were "not at risk" for oral health problems, 14.6% were at "moderate risk", and 24.4% were at "high risk".

The average TR-MMASA test score was 83.04 ± 24.68 (Range: 19-100). A test score of 95 or above indicates that the patient may begin oral feeding as tolerated, whereas a score of 94 or below indicates that oral intake is not recommended. Based on the assessment conducted within the first 24 hours following admission, it was determined that 54.9% of the patients could begin feeding as tolerated, while 45.1% were not eligible for oral intake (Table 2).

Table 1. Swallowing and oral assessment levels according to sociodemographic characteristics and general health-related characteristics.

Category	Mean±sd (min-max)	OAG Total Score r, p-value	TR-MMASA Test Total Score r, p-value
Hours in intensive care	21.24±4.08 (8-24)	.125, .264	.012, .914
The patients' routine daily oral care number	2.00±1.50 (0-5)	-.279*, .011	.167, .135
Category	N (%)	Mean±sd	Mean±sd
Age (years) Mean±sd (min-max)			
65.41±12.94 (28-88)			
< 65 years	39 (47.6)	6.58±3.30	87.69±24.28
≥ 65 years	43 (52.4)	8.37±3.65	78.83±24.55
Test (t)		-2.317	1.639
p		.023	.105
Gender			
Female	29 (35.4)	7.17±3.44	85.51±24.32
Male	53 (64.6)	7.71±3.68	81.69±25.00
Test (t)		-.655	.668
p		.514	.506
Education situation			
Completed primary school	56 (68.3)	7.44±3.61	83.26±25.69
Completed ≥Middle school	26 (31.7)	7.69±3.58	82.57±22.82
Test (t)		-.287	.117
p		.775	.907
Smoking use			
Yes	20 (24.4)	7.30±3.64	85.40±23.78
No	62 (75.6)	7.59±3.59	82.29±25.10
Test (z)		-.344	.844
p		.731	.399
Alcohol use			
Yes	11 (13.4)	7.09±3.33	86.45±20.33
No	71 (86.6)	7.59±3.64	82.52±25.37
Test (t)		-.429	.489
P	9	.669	.626
Chronic disease**			
Yes	39 (47.6)	7.41±3.53	80.62±26.83
No	43 (52.4)	7.62±3.67	85.71±22.10
Test (t)		-.273	.932
p		.786	.354
NG tube			
Yes	9(11.0)	14.00±1.11	38.44±17.28
No	73 (89.0)	6.72±2.90	88.68±19.42
Test (z)		-5.199	-4.679
p		<0.001	<0.001
Affected region***			
Right ^a	16(19.5)	7.37±3.61	80.06±27.66
Left ^b	21(25.6)	9.95±3.86	68.71±27.44
Bilateral ^c	2(2)	13.00±1.41	24.00±1.41
No motor deficit ^d	43 (52.4)	6.13±2.57	93.90±12.24
Test (F)		8.934	.13.061
p		<0.001 (b-d, c-d)	<0.001 (a-c, b-d, c-d)
Stroke Type			
Ischemic	74 (90.2)	7.40 ±3.55	83.51±24.84
Hemorrhagic	8 (9.8)	8.62±3.92	78.75±24.31
Test (z)		-.765	-.665
p		.445	.506
Methods in routine oral care			
Brushing teeth	47(57.3)	7.53±3.76	83.38±24.86
Rinsing	35(42.7)	7.51±3.38	82.60±24.79
Test (t)		.022	.141
p		.983	.888

t: Independent samples t-test, one-way ANOVA, and Mann-Whitney U test were used for data analysis.

* p < 0.05 Pearson correlation

** Patients had various chronic diseases, including hypertension, diabetes mellitus, cardiovascular disease, Parkinson's disease, epilepsy, asthma, chronic kidney disease, hypercholesterolemia, chronic obstructive pulmonary disease (COPD), thyroid disorders, coronary artery disease, and rheumatoid arthritis.

*** According to the post hoc Bonferroni test, the superscript letters a, b, c, and d indicate significant differences between groups.

Table 2. The distribution of mean scores of OAG and Swallowing TR-MMASA Test

Scales and subscales	Range	Mean ± SD	Cronbach alpha
OAG	5-15	7.52±3.58	0.90
TR-MMASA Test	19-100	83.04±24.68	0.90

OAG: Oral Assessment Guide; TR-MMASA Test: Turkish Modified Mann Swallowing Assessment Test; SD: Standard Deviation

Table 3. Patients' Dysphagia Risk Status According to their Oral Health Levels

		TR MMASA Test n(%)		OAG Total Score	Test p
		Non-oral	Oral	n (%)	
OAG	No Risk (0-5 score)	7 (18.9)	43(52.4)	50 (61.0)	χ ² =50.958 p<0.001
	Medium Risk (6-10 score)	10 (27.0)	2(2.5)	12 (14.6)	
	High Risk (11-15 score)	20(54.1)	0(0.0)	20(24.4)	
TR-MMASA Test Total Score n(%)		37(45.1)	45(54.9)		

χ²=chi-square test

Table 4. Effect of oral health risk assessment level on dysphagia risk level

Independent Variable	Dependent Variable	β	Standard Error	Beta	t	p	F	Model (p)	Adj. R ²	Durbin Watson	%95 CI Upper-lower
OAG	TR-MMASA Test	-6.174	0.340	-0.897	-18.185	0.000*	330.679	0.000*	0.805	1.685	(-5.498) -(-6.850)

*p<0.05, β=Unstandardized Coefficient, Beta= Standardized Coefficient

The dysphagia status of the patients was examined according to their OAG levels. Among the patients with the following oral health risk levels; 14.0% of patients with no risk (n=50), 83.3% of patients with moderate risk (n=12), 100% of patients with high risk (n=20)

had not been able to eat anything by mouth, requiring further evaluation. The association between oral health risk levels and dysphagia risk was statistically significant (χ² = 50.958, p<0.001) (Table 3). According to the TR-MMASA test, the majority of patients with dysphagia risk, who were recommended for non-oral feeding, were functionally dependent (Table 3).

The results of the regression analysis revealed that the established model was statistically significant (F = 330.679; p < 0.05). Oral health had a statistically significant and negative effect on the level of dysphagia. Specifically, oral health was found to significantly affect the dysphagia risk (t = -18.185, p < 0.05). A one-unit increase in oral health resulted in a 6.174 decrease in the dysphagia level (β = -6.174). Oral health level explained 80% of the variation in dysphagia risk (Adjusted R² = 0.805). Additionally, no

autocorrelation problem was found in the established model, as indicated by the Durbin-Watson value of 1.685 (Table 4).

Discussion

Dysphagia is a common complication after stroke. The recovery of oral health and swallowing function plays an important role in restoring oral intake in acute stroke patients. Several factors, including gender, age, occupational status, education level, stroke type, and stroke risk factors, influence the oral health of stroke patients (6). Poor oral health can lead to severe complications such as aspiration pneumonia, malnutrition, dehydration, and even death (14). Although oral health is more widely recognized for its role in pneumonia and other respiratory tract infections, it is also a critical yet underemphasized factor in patients with dysphagia (15). Previous studies have shown that oral health frequently deteriorates during hospitalization, particularly among patients requiring mechanical ventilation in intensive care units (16). Despite the recognized importance of oral

care, nurses often assess oral health before intervention without using standardized or validated oral assessment tools (17). A national prevalence study further reveals substantial variability in oral care practices and methods, indicating a lack of consensus and standardization. Moreover, oral health assessments are infrequently performed in a systematic manner using multiple assessment instruments (16). In the present study, patients exhibited a high oral health risk score. Poor oral health was more prevalent among older patients, those with nasogastric tube feeding, bilateral or left-sided motor involvement, and inadequate routine daily oral care. These findings highlight the need for integrating standardized oral health assessment tools and evidence-based oral care protocols into routine nursing practice. For acute stroke patients, systematic oral health assessment and timely oral care interventions should be considered essential components of comprehensive nursing care to reduce complications and improve clinical outcomes. In addition, prioritizing ongoing education and training for nurses is essential to ensure consistent, evidence-based oral health assessment and care.

Dysphagia is common during the acute phase of stroke, with approximately 50% of stroke patients experiencing dysphagia within the first few days after the event (18). In this study, the average TR-MMASA test score indicated a risk of dysphagia. Several factors, including ischemic stroke type, smoking and alcohol use, age, stroke history (19–21), low education levels (20), bilateral hemisphere stroke, and upper gastrointestinal symptoms (22), were found to be significantly correlated with dysphagia. However, some studies have shown no correlation between dysphagia and factors such as stroke type (21), gender, smoking and alcohol use, and chronic diseases (20). In our study, although the presence of an NG tube and left or bilateral motor deficits were associated with higher dysphagia risk scores, no significant correlation was found between dysphagia and ICU stay duration, the number and method of routine oral care prior to hospital admission, or factors like age, gender, education level, smoking, alcohol use, chronic disease, and stroke type.

Studies have shown that neurologic patients and stroke patients have poor oral health (23,24). A study comparing oral health status and swallowing function in hospitalized stroke patients found that those with dysphagia had poorer oral health compared to those without dysphagia (25). Another study demonstrated a negative correlation between stroke patients' oral health and their ability to swallow (26). While the number of studies is limited,

some have found a relationship between oral health and swallowing function (25,26), while others have found no significant association (20). Previous studies have consistently shown that patients with dysphagia have poorer oral health status compared to those without dysphagia, underscoring the importance of increased attention to oral health assessment and management by nurses in stroke patients with dysphagia (25,27). Despite its importance, oral care is often regarded as less important and assigned a lower priority than other nursing tasks (28). In addition, nurses frequently report insufficient training in providing oral care or oral health education to stroke patients with dysphagia, leading to a lack of confidence and perceived knowledge deficits (27). The findings of the present study support previous literature by demonstrating a significant association between oral health status at admission and the severity of dysphagia. These results suggest that early oral health assessments performed by nurses may play a critical role in clinical decision-making and treatment planning in acute stroke care.

Limitations

This study has several limitations. First, changes in oral health status were not assessed prior to hospital discharge; therefore, the findings are limited to the acute phase of stroke. Second, potential confounding factors that may influence dysphagia outcomes, such as stroke severity, degree of neurological impairment, and comorbid conditions, were not included in the analysis.

Neurological impairments, including cognitive deficits, memory loss, behavioral changes, and physical limitations, may restrict patients' ability to perform self-care activities such as oral hygiene. The absence of these variables represents an additional limitation. Future studies incorporating these factors and longitudinal follow-up may provide a more comprehensive understanding of the complex relationship between oral health and dysphagia in stroke patients.

Conclusion

This study revealed that patients admitted to the Neurology and Stroke Center ICU had a moderate risk for oral health problems and a high risk for dysphagia. Age, NG tube presence, stroke side, and daily oral care influenced oral health risk, while NG tube presence and stroke side affected dysphagia risk.

Given these findings, future research should be conducted with larger sample sizes and a variety of study methods, addressing additional variables that affect oral health and dysphagia risk levels. It's also recommended that nurses assess stroke patients' oral health and dysphagia risk using standardized, evidence-based screening tools and integrate this practice into routine clinical care. To ensure the success of this process, a collaborative approach among all healthcare team members, including nursing managers and policymakers, is essential.

Relevance To Clinical Practice

Routine oral health and dysphagia risk assessments conducted by nurses caring for acute stroke patients are crucial for providing quality, individualized, and holistic nursing care. By regularly monitoring stroke patients' oral health and dysphagia, nurses can significantly reduce the risk of complications, enhance patient safety, and ensure that patient-centered care remains a priority.

Declarations

Funding

Not applicable

Conflicts of interest/Competing interests

No conflict of interest has been declared by the authors.

Ethics approval

The study was approved by the Hatay Mustafa Kemal University Non-Clinical Research Ethics Committee (Date: 04.03.2024, Number of Meetings: 02, Number of Decisions: 20) and the institutional permission (dated 02.05.2024 and numbered E-11289099-050.04-242576179) from Adana City Training and Research Hospital where the study would be conducted.

Availability of data and material

Data can be provided by requesting it from the corresponding author via e-mail.

Authors' contributions

S.G.U., I.K.T., and E.B. contributed to conceptualization and methodology. S.G.U. and I.K.T. performed the formal analysis and provided supervision. S.G.U. and I.K.T. were

responsible for roles/writing – original draft. Writing – review, editing, and critical revisions for important intellectual content were carried out by S.G.U. and I.K.T. Data collection was conducted by E.B.

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