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Effectiveness of Oral Health Care in Stroke Patients with Dysphagia: A Quasi-Experimental Study

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Abstract

Objectives: To evaluate the oral health and function of hospitalized stroke patients with dysphagia and assess the effectiveness of an oral health care program during swallowing rehabilitation.

Methods: A quasi-experimental study was conducted with 46 dysphagic stroke patients randomly selected via block randomization from the rehabilitation ward of Chiang Mai Neurological Hospital, Thailand. The control group received usual daily oral hygiene care, while the intervention group followed oral health care program recommendations, including tongue brushing before swallowing therapy data collection covered demographics, oral health status, oral function (oral hygiene, tongue movement, and tongue pressure), swallowing severity, nasogastric feeding duration, and oral comfort. Descriptive and analytical statistics were used for analysis.

Results: Both groups improved swallowing ability. However, the intervention group had a significantly faster nasogastric tube removal rate than the control group (7.8±2.9 vs. 10.6±4.2 days, $p<0.05$). The intervention group also showed significant improvements in tongue coating index (57.5±15.2 vs. 76.8±9.3, $p<0.05$), diadochokinesis "ka" (3.4± 0.3 vs. 3.2±0.3 times/second, $p<0.05$), tongue pressure (15.6±5.0 vs. 11±3.8 kPa, $p<0.05$), and oral comfort (91.3% vs. 56.5%, $p<0.05$).

Conclusions: The oral health care program improves oral function and facilitates nasogastric tube removal in stroke patients undergoing swallowing rehabilitation. Healthcare providers should recommend suitable oral health programs to enhance oral function in post-stroke dysphagia rehabilitation.

Keywords: dysphagia, oral function, oral health, oral hygiene, stroke, tongue strength

Introduction

Dysphagia is common condition, over 50% of stroke patients[1], is often accompanied by hypofunction or orofacial dysfunction.[2-6] It leads to malnutrition, immune decline, and an increased risk of infection. Impaired daily activities worsen oral hygiene neglect, promoting bacterial buildup and heightening the risk of respiratory infections such as aspiration pneumonia.[7] Dysphagia significantly impacts oral, physical, and psychosocial health.[8-13] Swallowing recovery depends on multiple factors.[14,15] Oral dysphagia is primarily managed with conventional therapy, including oromotor exercises[16,17], sensory stimulation, dietary modifications, and compensatory techniques. This approach effectively help most patients discontinuing feeding tubes before discharge.[18,19]

Post-stroke patients with dysphagia receiving oral care from a multidisciplinary team tend to achieve better outcomes.[20-25] Their oral healthcare differs from other patients[20-23,26] and consists of two key components[7]: (1) oral hygiene, including mechanical cleaning and decontamination to prevent colonization and aspiration, and (2) oral function improvement through oromotor exercises and saliva stimulation to reduce aspiration risk. Combining mechanical cleaning of the teeth and tongue is more effective than tooth brushing alone.[27,28] Tongue brushing stimulates saliva production, essential in the oral preparatory phase, making it an indirect swallowing training method.[29] Studies show that tongue brushing enhances respiratory and swallowing functions by activating tongue muscles and strengthening the suprahyoid muscles, improving swallowing and coughing efficiency.[30-32] Comprehensive oral care, including tooth and tongue brushing alongside oral function training, strengthens swallowing muscles[32], enhances oral sensation and taste perception[33,34], increases nasogastric tube removal rates[26], and reduces aspiration and pneumonia incidence.[7,21,26,29] A multidisciplinary team coordinates care to optimize oral health and reduce aspiration pneumonia risk.[12,23]

Most studies on oral healthcare for stroke patients with dysphagia focus on those hospitalized during the acute phase[20,24,35], with fewer addressing care during swallowing rehabilitation.[21,26] These patients require a comprehensive oral healthcare program, including swallowing training, orofacial exercises, and oral hygiene, to improve swallowing and oral function. This study aimed to evaluate the effectiveness of oral health care program during rehabilitation, examining oral status and functions related to swallowing outcomes.

Materials and Methods

Study design and participants

This quasi-experimental study recruited stroke inpatients with dysphagia from the Rehabilitation Department of Chiang Mai Neurological Hospital, Thailand, between June 2022 and July 2023. The intervention was initiated immediately upon ward admission for patients who met the following inclusion criteria: (a) stroke diagnosis confirmed by a neurologist, (b) dysphagia assessment using the Water Swallowing Test (WST) conducted by an occupational therapist, (c) ability to undergo swallowing rehabilitation, (d) ability to communicate and follow instructions evaluated through a Basic Swallowing Evaluation conducted by an occupational therapist, and (e) daily oral hygiene maintained with tooth brushing and/or mouthwash. Exclusion criteria: (a) inability to follow instructions or uncooperative behavior, and (b) regular tongue cleaning. Block randomization assigned patients to two groups. The intervention group received daily oral hygiene care per the recommended program during hospitalization and rehabilitation, while the control group followed their usual routine.

A G*Power 3.1 analysis determined the minimum sample size, setting the effect size (ES) at 1.34 based on hospital data. With a type I error (α) of 0.05 and power (1-β) of 0.95, each group required 14 patients. To account for dropout rates, the sample size was increased to 23 per group, totaling 46 patients.

Procedures

Control group: During hospital-based dysphagia rehabilitation, patients maintained their usual daily oral hygiene -independently or with caregiver assistance- including tooth brushing and/or mouth rinsing twice a day (morning and evening).

Oral health care group: Patients and caregivers were trained by a dentist, and all participants followed a structured oral hygiene regimen before swallowing therapy and throughout the day, using recommended tools and protocols based on relevant studies[10,26,36] (Table 1). Both groups underwent oral and functional assessments before therapy and upon changes in food intake severity or rehabilitation completion. Oral hygiene adherence was

monitored through observation and patient interviews assessing oral comfort.

Measurement

Participant characteristics: Demographic data include gender, age, Body Mass Index (BMI)[37], stroke type, comorbidity history, and site of stroke, as recorded in hospital medical records. Oral care behaviors are assessed through patient and family interviews on self-oral care abilities, methods, and dental visit frequency.

Oral health status: Oral health status: A dentist assessed the patient's oral health, including the number of present teeth, functional teeth (FT; natural teeth excluding remaining roots and those with grade 3 mobility), occlusal pairs (OPs), and denture status. Masticatory performance was categorized as FT<20 or ≥20 and OPs 4 or ≥4.[38,39]

Oral function: Oral function refers to the mouth's ability to speak, chew, and swallow. Seven standard evaluation criteria were used to assess function: oral hygiene, dryness, occlusal force, tongue-lip motor function, tongue pressure, mastication, and swallowing.[38,39] A dentist trained in standardized oral function measurement conducted the evaluations. Intra reliability, measured using Cohen's Kappa Coefficient, was 0.83 and 0.85. Interrater reliability was 0.89 and 0.85, indicating excellent agreement. This study assessed three criteria related to swallowing ability in stroke patients with dysphagia.

(1) Oral hygiene: Assessed using the Tongue Coating Index (TCI)[40] as an alternative method.[38] A TCI score ≥50% indicated poor oral hygiene.[38] (2) Tongue-lip motor function: Tongue-lip motor function: Oral diadochokinesis (ODK) evaluated lip and tongue movement speed and coordination using the syllables /pa/, /ta/, and /ka/. Participants repeated each as many times as possible in 5 seconds. The syllable count was recorded via the pen dotting method, with a cut-off rate of <6 per second indicating impaired function.[6,38,39] (3) Tongue pressure: Measured using a tongue pressure measuring instrument (TPM-01, JMS Co., Ltd.). A balloon placed between the anterior hard palate and tongue was pressed with maximum force for 3 seconds.[6] The procedure was explained beforehand. TP was measured three times with rest intervals to calculate the mean. Values <30 kPa indicated reduced function.[38]

Table 1: Oral hygiene management of an oral health care program for stroke patients with dysphagia.

Oral hygiene tools	
	• Small-headed, soft-bristled toothbrush with a large handle. • High-fluoride toothpaste (1,450 ppm) with Sodium Lauryl Sulfate (SLS) free. • Tongue brush. • 0.12% Chlorhexidine gluconate solution. • Water-based oral moisturizer. • Other equipment: interdental brush, dental floss, cotton swab, and gauze.
Oral hygiene guidelines	
Positioning	• Sit or recline with the head elevated 30-45 degrees. Use a pillow to support the back or neck, keeping the neck straight.
Frequency	• At least twice daily: morning and before bedtime.
Morning – 30 minutes before swallowing rehabilitation	Step 1: remove food residues and sputum from the oral cavity with a cotton swab, gauze, or suction device. Clear as much as possible. Step 2: Brush teeth with a small-headed, soft-bristled toothbrush with a large handle. Use a pea-sized amount (0.5 cm) of high-fluoride toothpaste (>1,000 ppm fluoride), SLS-free, and employ minimal water for rinsing or use the "spit, don't rinse" technique. Spend at least 2 minutes brushing. Step 3: Use a tongue brush. Instruct the patient to extend their tongue as far as possible. Gently sweep the tongue brush outward toward the tip, brushing five times. The patient should feel slight resistance while brushing
Daytime care during the day	• Use a 0.12% chlorhexidine gluconate solution to wipe or spray the gums and oral mucosa, short duration (7-14 days). ***Stop use immediately if any adverse effects occur and inform the healthcare staff for further advice*. • Apply a water-based lubricant to moisturize dry lips.
Bed time	Perform steps 1 and 2.

Patient's self-oral care abilities: The researcher interviewed patients or caregivers about the patient's oral hygiene ability, categorizing them via the Barthel Index into three levels: dependent, requiring full assistance; independent with assistance, needing help with tasks like equipment preparation or reminders; and completely independent, managing oral hygiene alone.

Oral comfort: The researcher adapted the Numerical Rating Scale (NRS) and Faces Pain Rating Scale (FPRS) to assess oral comfort. Patients rated their oral comfort daily after swallowing rehabilitation using facial emotion icons and a color-coded system for easier decision-making. Oral comfort was classified into five levels: very low, low, neutral, good, and very good.

Severity of dysphagia: Swallowing rehabilitation data included admission date, nasogastric tube insertion and removal dates, and dysphagia severity before and after the program. An occupational therapist assessed clinical severity using the Functional Oral Intake Scale (FOIS), which consists of seven levels categorized into tube feeding (levels 1-3) and oral feeding (levels 4-7).[41] Nasogastric tube removal was based on daily clinical swallowing assessments by occupational therapists, diet progression tolerance, and physician approval, following standardized criteria for all patients.

Data collection

One day before the sample group began swallowing rehabilitation, the researcher collected demographic data, swallowing status, self-oral care abilities, and oral care behaviors from medical records and interviews, documenting them in a record form. Oral examinations were conducted, and oral functions were assessed by photographing the tongue for coating evaluation, measuring speech repetition rates, and assessing tongue pressure. During hospital rehabilitation, the intervention group received daily oral hygiene care per the oral health care program, while the control group followed their usual oral care routine. Both groups were monitored daily for oral hygiene care and assessed for oral comfort by nurses and nursing assistants. After daily rehabilitation, both groups were clinically evaluated by an occupational therapist to determine their swallowing ability, ensuring safe food texture modifications or readiness for progression. The final assessment determined whether participants had achieved safe swallowing and had their nasogastric tubes removed or were discharged despite continued dysphagia. The researcher recorded dysphagia severity, conducted oral examinations, assessed oral functions, and provided oral health care guidance for homecare. Data was recorded and entered into the researcher's password-protected computer to ensure restricted access.

Ethics

This study was reviewed and approved by the Ethics Committee of the Faculty of Dentistry, Chiang Mai University, Thailand (Approval No. 21/2565) and the Chiang Mai Neurological Hospital, Thailand (Approval Nos. EC 007-65 and EC 015-66). Participants were informed about the study's purpose, content, and their right to participate or withdraw. Informed consent was obtained from those who voluntarily agreed.

Statistical analysis

Data were analyzed using SPSS 29.0 software (IBM Corp., Armonk, NY, USA). Descriptive statistics, including percentages, frequencies, means, and standard deviations, summarized the data. The Chi-square test and T-test were used to compare categorical variables and differences between the intervention and control groups. A significance level of $p<0.05$ was used to reject the null hypothesis.

Results

A total of 46 stroke patients with dysphagia were recruited. Baseline characteristics were similar between groups, except for a history of hypertension ($p<0.05$) (Table 2). Baseline oral status also showed no significant difference ($p>0.05$) (Table 3). Before rehabilitation, all participants in both groups (100%) had poor oral hygiene, reduced tongue-lip motor function, and decreased tongue pressure, with no significant intergroup differences ($p>0.05$) (Table 3). After hospital rehabilitation, most patients in the intervention and control groups improved their swallowing ability. The majority resumed oral feeding (82.6% vs. 73.9%), while fewer required nasogastric feeding (17.4% vs. 26.1%), with no significant difference ($p>0.05$). The intervention group had a significantly shorter time to nasogastric tube removal (7.8±2.9 vs. 10.6±4.2 days; $p=0.015$). Oral comfort ratings of good to very good were significantly higher in the intervention group (91.3% vs. 56.5%; $p=0.017$) (Table 4). Post-

rehabilitation, oral function was significantly better in the intervention group, with lower TCI (57.5% vs. 76.8%), higher ODK /ka/ (3.4 vs. 3.2 times/s), and greater TP (15.6 vs. 11.0 kPa) (p<0.05) (Table 5).

Discussion

This quasi-experimental study evaluated the effectiveness of an oral health program for stroke patients with dysphagia. It assessed oral health and function, comparing tongue brushing before swallowing therapy to a control group. The intervention group showed significantly better oral hygiene, tongue pressure, posterior tongue movement, and a shorter nasogastric tube removal rate.

Participants were mostly male over 60 with ischemic stroke. Hypertension was the most common comorbidity, followed by diabetes and hyperlipidemia, consistent with other studies.[3,24,26,42,43] Patients experienced chewing difficulties due to limited functional teeth, absence of posterior occlusal pairs[38], infrequent denture use during hospitalization, and decreased self-care abilities, relying on others for oral health care. Neither group used tongue brushes despite visible tongue coating, likely due to concerns about gag reflex, aspiration, or lack of awareness of the importance of oral hygiene during hospitalization.[26] Before rehabilitation, participants exhibited reduced oral function, similar to findings in studies of dysphagic

Table 2: Baseline characteristics of participants.

	Total (N=46)	Oral health care group (n=23)	Control groups (N=23)	χ^2	p-value
Gender, n (%)				0.088	0.767
Male	25(54.4)	12(52.2)	13(56.5)		
Female	21(45.6)	11(47.8)	10(43.5)		
Age, Mean (SD)	69.1 (10.2)	67.0 (11.5)	71.2 (8.4)		0.162b
Body Mass Index, n (%)				1.099	0.577
Underweight (≤18.5)	11(23.9)	7(30.4)	4(17.4)		
Normal (18.6-22.9)	17(37.0)	8(34.8)	9(39.1)		
Overweight (≥23.0)	18(39.1)	8(34.8)	10(43.5)		
Type of stroke, n (%)				3.209	0.233a
Infarction	43(93.5)	20(87.0)	23(100)		
Hemorrhagic	3(6.5)	3(13.0)	0(0)		
Comorbidity, n (%)					
Hypertension	41 (89.1)	18 (78.3)	23 (100)	5.610	0.049[a,*]
Dyslipidemia	33 (71.7)	18 (78.3)	15 (65.2)	0.965	0.326
Diabetes mellitus	18 (39.1)	10 (43.5)	8 (34.8)	0.365	0.546
Other	7 (15.2)	4 (17.4)	3 (13.0)	0.168	1.000[a]
Site of stroke, n (%)				0.348	0.555
Left	24 (52.2)	13 (56.5)	11 (47.8)		
Right	22 (47.8)	10 (43.5)	12 (52.2)		
Self-oral care abilities, n (%)				0.817	0.665
Independent	7(15.2)	4(17.4)	3(13.0)		
Partial assist	20(43.5)	11(47.8)	9(39.1)		
Dependent	19(41.3)	8(37.8)	11(47.8)		
Method, n (%)				4.381	0.112
no	1(2.2)	0(0)	1(4.4)		
Mouthwash	3(6.5)	0(0)	3(13.0)		
Brushing teeth	42(91.3)	23(100)	19(82.6)		
Tongue brushing	0(0)	0(0)	0(0)		
Frequency, n (%)				1.037	0.595
0 time	1(2.2)	0(0)	1(4.4)		
1 time	27(58.7)	14(60.9)	13(56.5)		
2 times	18(39.1)	9(39.1)	9(39.1)		
Dental service in 1 year, yes, n (%)	0(0)	0(0)	0(0)		

n, number of samples Chi-square test, [a]Fisher's exact test, [b]independent t-test, Significant value: * p<0.05.

stroke patients using comparable or alternative methods and tools.[2,4,5,44,45] They demonstrated lower tongue strength and movement than older adults[39,46], highlighting the correlation between tongue function and swallowing performance.[47] Although these patients can safely resume swallowing, their oral function remains below typical standards for older adults. Thus, patients should be encouraged to perform regular oromotor exercises, particularly tongue-strengthening exercises, to reduce swallowing problems.[48] Likewise, studies have shown that continuous facial muscle exercises in older adults, both short-term (at least 2 months)[49] and long-term (6-12 months), improve tongue function to near-normal levels.[16,17,50]

Patients received daily 30-minute swallowing therapy from occupational therapists, combining direct and indirect techniques such as oromotor exercises, sensory stimulation, dietary modification, and compensatory techniques. Swallowing rehabilitation improves tongue function. The intervention group showed higher tongue pressure (15.6±5.0 vs. 11.0±3.8 kPa) and a greater rate of syllable 'ka' repetition (3.4±0.3 vs. 3.2±0.9 times/second, $p<0.05$), indicating an association between tongue pressure and oral motor function. This relationship is supported by previous studies[51,52], although causality cannot be confirmed. Other factors, such as age, oral health,

Table 3: Baseline of oral status and function.

	Oral health care group (N=23)	Control groups (N=23)	χ^2	*p*-value
Number of functional teeth, n (%)			0.840	0.359
< 20 functional teeth	13(56.5)	16(69.6)		
≥ 20 functional teeth	10(43.5)	7(30.4)		
Mean (SD)	17.2(7.9)	12.4(8.4)		0.069[b]
Number of occlusal pairs, n (%)			1.533	0.216
< 4 occlusal pairs	13(56.5)	17(73.9)		
≥ 4 occlusal pairs	10(43.5)	6(26.1)		
Mean (SD)	3.1(2.6)	1.9(1.8)		0.365[b]
Range (Min-Max)	(0-8)	(0-5)		
Active denture, n (%)			0.107	0.743
No	17(73.9)	16(69.6)		
Yes	6(26.1)	7(30.4)		
Active Wearing Denture), n (%)			0.258	1.000a
No	5(83.3)	5(71.4)		
Yes	1(16.7)	2(28.6)		
Oral hygiene, n (%)				
Poor (TCI ≥50%)	23(100)	23(100)		
Normal (TCI <50%)	0(0)	0(0)		
TCI, Mean (SD)	83.1(10.9)	84.4(8.3)		0.866[b]
Tongue-lip motor function, n (%)				
Low (ODK <6 times/second)	23(100)	23(100)		
Normal (ODK ≥6 times/second)	0(0)	0(0)		
ODK/pa/, times/second, Mean (SD)	1.5(0.4)	1.5(0.4)		0.877[b]
ODK/ta/, times/second, Mean (SD)	1.8(0.4)	1.8(0.4)		0.911[b]
ODK/ka/, times/second, Mean (SD)	1.8(0.4)	1.6(0.4)		0.09[b]
Tongue pressure, n (%)				
Low (TP <30 kPa)	17(73.9)	16(69.6)		
Normal (TP ≥30 kPa)	6(26.1)	7(30.4)		
TP, Mean (SD)	8.1(2.5)	6.4(1.6)		0.07[b]

Active denture, refers to patients who have dentures; Active denture wearing, refers to patients who not only have dentures but also use them during hospitalization TCI, Tongue Coating Index; ODK, Oral Diadochokinesis; TP, Tongue pressure n, number of samples; SD, standard deviation; kPa, kilopascal Chi-square test, [a]Fisher's exact test), [b]Mann-Whitney U test, Significant value: *$p<0.05$

may also contribute. Tongue brushing–requiring patients to protrude, steady, and resist while cleaning the tongue coating–mimics resistance exercises and improves range of motion. Patients in the oral health program exhibited increased tongue strength, resulting in greater protrusion beyond the lower lip and improved posterior tongue stimulation. This enhancement led to more effective pronunciation of tongue-base sounds, such as 'ka,' compared to the control group. Furthermore, enhanced strength and mobility of the tongue base improve swallowing by propelling the bolus into the pharynx, sealing the oral cavity, protecting the airway, and coordinating with pharyngeal muscles. The primary objective in dysphagia management is to ensure patients can safely transition to oral intake. Therefore, analyzing swallowing function outcomes using FOIS scores, dichotomized by tube feeding status, directly reflects this critical clinical outcome and facilitates clear outcome differentiation. This study shows that stroke patients with dysphagia in the oral health care program, which included tongue brush-

Table 4: Effects of the oral health program on the severity of dysphagia, nasogastric tube removal rate and the level of oral comfort.

		Oral health care group (N=23)	Control groups (N=23)	χ^2	*p*-value
Severity of dysphagia, n (%)					
Before	Tube feeding	23(100)	23(100)		
	Oral feeding	0(0)	0(0)		
After	Tube feeding	4(17.4)	6(26.1)	0.511	0.475
	Oral feeding	19(82.6)	17(83.9)		
Oral comfort, n (%)					
Before	Very low-neutral	18(78.3)	21(91.3)	-1.218	0.414
	Good-very good	5(21.7)	2(8.7)		
After	Very low-neutral	2(8.7)	10(43.5)	-2.657	0.017*
	Good-very good	21(91.3)	13(56.5)		
Nasogastric tube removal rate, ** **n (%)**		(n=19)	(n=17)		
1-7 days		11(57.9)	5(29.4)		
≥8 days		8(42.1)	12(70.6)		
Mean (SD)		7.8(2.9)	10(4.2)	-2.442	0.015[b*]
Median		7	10		
Range (Min-Max)		5-16	6-21		

** Nasogastric tube removal time was calculated from the initiation date of the oral care program.

n, number of sampls; SD, standard deviation Chi-square test, [b]Mann-Whitney U test, Significant value: *p<0.05

Table 5: Effects of the oral health program on the oral function.

		Oral health care group			Control groups			Z	*p*-value
		Mean	(SD)	Range	Mean	(SD)	Range		
TCI, %	Before	83.1	(10.9)	50.0-100	84.4	(8.3)	61.1-100	-0.169	0.866
	After	57.5	(15.2)	27.6-88.9	76.8	(9.3)	55.6-88.9	-4.151	<0.001*
ODK, times/second		1.5	(0.4)	0.8-2.0	1.5	0.4	0.6-2.0	-0.155	0.877
/pa/	Before	3.3	(0.4)	2.6-4.0	3.2	0.3	2.8-3.8	-1.166	0.244
	After	1.8	0.4	1.0-2.0	1.8	0.4	0.6-2.3	-0.112	0.911
/ta/	Before	3.6	0.3	3.0-4.2	3.5	0.3	3.0-4.4	-1.365	0.172
	After	1.8	0.4	1.0-2.5	1.6	0.4	0.6-2.2	-1.659	0.09
/ka/	Before	3.4	0.3	2.8-4.0	3.2	0.3	2.8-4.0	-2.132	0.033*
	After								
TP, kPa	Before	8.1	2.5	4.7-14.4	6.4	1.6	4.3-12.1	-2.741	0.07
	After	15.6	5.0	7.5-29.2	11.0	3.8	6.5-21.3	-3.175	0.01*

TCI, Tongue Coating Index; ODK, Oral Diadochokinesis; TP, Tongue pressure; kPa, kilopascal; SD, standard deviation Mann-Whitney U test, Significant value: *p<0.05

ing, resumed oral feeding (82.6%, $p>0.05$), experienced earlier nasogastric tube removal (7.8±2.9 days; $p=0.015$). Tongue brushing promotes oral hygiene, reduces coating buildup, and stimulates oral nerves and muscles, thereby strengthening the swallowing mechanism and enabling earlier resumption of feeding. Patients who performed tongue brushing before swallowing training had their tubes removed sooner[26], which is clinically important as it reduces the risks of pneumonia and malnutrition. Additionally, tongue brushing enhances sensory stimulation, improving food sensation and taste perception.[33] Izumi and Akifusa (2021) reported that tongue cleaning reduces coating, enhances taste, decreases halitosis, and stimulates the tongue and suprahyoid muscles–crucial for swallowing and speech.[32] Moreover, the oral health care program with tongue brushing reduces bacterial accumulation on the tongue, lowering aspiration risk during swallowing training, and is recommended to improve oral health and food intake in dysphagia patients.[25] While the improvement may reflect the spontaneous recovery of swallowing function[53], our findings suggest that the oral health program offers benefits beyond the natural recovery.

Study limitations include that subacute stroke patients often present cognitive and communication impairments, such as aphasia or apraxia, hindering their ability to follow instructions for assessing oral functions like repetition rate and tongue pressure. Evaluating tongue coating was challenging due to limited mouth opening, which required both photography and visual inspection. Hospital rehabilitation relied on a multidisciplinary team and caregivers; however, some caregivers were hesitant or lacked skills for tongue cleaning with a brush, and frequent caregiver changes necessitated nursing support to ensure adherence to the oral care program. This study may be adapted for stroke patients with dysphagia in various settings, including rehabilitation facilities and community care. When advanced measurement tools are unavailable or patients cannot follow complex instructions, simpler clinical assessments are feasible. For example, tongue strength can be evaluated by assessing symmetrical tongue protrusion, and tongue mobility by observing whether the tongue extends beyond the lips. These evaluations support initial assessments and facilitate periodic monitoring of rehabilitation progress. The small sample size limited statistical adjustment for confounders. Future studies should increase the sample size and use multivariable analyses to better assess factors influencing swallowing rehabilitation and oral function. Additionally, research should evaluate whether tongue range of motion affects swallowing training. The limited follow-up period constrains the interpretation of long-term outcomes. To enable comprehensive evaluation, future studies should incorporate extended follow-up durations and detailed clinical parameters, including stroke severity, length of hospital stay, duration of bed rest, present of xerostomia, and incidence of aspiration pneumonia.

Conclusions

In conclusion, rehabilitation for stroke patients with dysphagia should include daily tongue brushing as part of oral care before swallowing therapy. This practice contributes to improved oral hygiene, tongue mobility, strength, and swallowing function, facilitating earlier nasogastric tube removal. Furthermore, strengthening policy support and interdisciplinary teamwork can help integrate and promote oral care into stroke rehabilitation to optimize outcomes.

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Conflict of Interest

The authors declare no conflict of interest.

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