

# Swallowing Ability In Patients With Dysphagia After Ischemic Stroke

Jelvina Khaflita, Marlina, Teuku Tahlil

*Master Program Of Nursing Science Student, Faculty Of Nursing, Syiah Kuala University, Banda Aceh, Indonesia*

*Lecture, Faculty Of Nursing, Syiah Kuala University, Banda Aceh, Indonesia*

*Faculty Of Nursing, Syiah Kuala University, Banda Aceh, Indonesia*

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## **Abstract**

**Background:** Ischemic stroke is a neurological disorder caused by impaired blood flow to the brain, which may result in dysphagia. Dysphagia can reduce swallowing ability and increase the risk of aspiration, malnutrition, and dehydration. The Functional Oral Intake Scale (FOIS) is commonly used to assess swallowing ability in patients with dysphagia.

**Objective:** This study aimed to describe swallowing ability in patients with dysphagia after ischemic stroke.

**Methods:** This study employed a quantitative descriptive design with a cross-sectional approach. The study was conducted at Aceh Regional General Hospital from February 6 to May 19, 2026. Purposive sampling was used to recruit 60 respondents. Data were collected using the Functional Oral Intake Scale (FOIS). Data were analyzed descriptively using frequency distribution, percentages, mean, median, and standard deviation.

**Results:** Assessment of swallowing ability showed that most respondents were at FOIS level 5 (25 respondents; 41.7%) and FOIS level 4 (22 respondents; 36.7%), Level 2 (5 respondents; 8.3%) and Level 3 (8 respondents; 13.3%).

**Conclusion:** Most patients with dysphagia after ischemic stroke had moderate swallowing ability and still required dietary consistency restrictions or compensatory strategies. Assessment of swallowing ability using FOIS is important in determining dysphagia management in patients with ischemic stroke.

**Keywords:** ischemic stroke, dysphagia, swallowing ability, FOIS

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## **I. Introduction**

Stroke is one of the leading causes of death worldwide <sup>(1,2)</sup>. Stroke is one of the leading causes of acquired disability in adults and is categorized as a cerebrovascular disease with significant impacts on both health and social aspects, not only because of its high prevalence and incidence but also due to its substantial consequences on patients' dependency levels and quality of life for both patients and their families. Ischemic stroke is the most common type of stroke, caused by obstruction of cerebral blood vessels, resulting in impaired blood flow and oxygen supply to brain tissue. The obstruction may be temporary or permanent and can lead to cerebral infarction or brain tissue death. Ischemic stroke may cause various neurological disorders depending on the location and extent of the ischemic brain area. Neurological impairments include visual, speech, cognitive, emotional, and motor deficits, including swallowing difficulties (dysphagia)<sup>(4,5)</sup>. The severity of the condition is influenced by several factors, such as duration of obstruction, degree of ischemia, systemic blood pressure, and location of cerebral infarction <sup>(6,7)</sup>. Dysphagia was also significantly associated with age, brainstem stroke, communication disorders, and facial paralysis <sup>(8)</sup>.

Dysphagia is a disorder or difficulty in the swallowing process. Dysphagia is characterized by symptoms such as difficulty swallowing, regurgitation, pain during swallowing, excessive salivation (drooling), unexplained weight loss, and nutritional deficits. This condition also negatively affects psychosocial health and quality of life <sup>(9)</sup>. Dysphagia may increase the risk of aspiration pneumonia, malnutrition, and dehydration, and may contribute to increased morbidity and mortality as well as prolonged recovery time <sup>(10,11,5)</sup>.

The Functional Oral Intake Scale (FOIS) is an instrument used to measure the functional level of food and fluid intake in patients with dysphagia. FOIS has demonstrated good validity, reliability, and sensitivity to changes in functional oral intake. This instrument can objectively determine and monitor the range of patients' oral intake. In addition, it is used to monitor patients' rehabilitation progress over time. FOIS was developed by Crary et al. (2005) at the Department of Communicative Disorders, Health Science Center, University of Florida, and has been widely used internationally <sup>(12)</sup>.

Based on the description above, dysphagia is one of the common complications experienced by patients with ischemic stroke and may result in serious consequences for patients' health conditions and quality

of life. Therefore, assessment of swallowing ability in patients with dysphagia after ischemic stroke is necessary to identify their swallowing condition. This study aimed to describe swallowing ability in patients with dysphagia after ischemic stroke.

## **II. Materials And Methods**

This study employed a quantitative descriptive design with a cross-sectional approach. The cross-sectional approach was used to describe swallowing ability in patients with dysphagia following ischemic stroke. The study was conducted at Aceh Regional General Hospital from February 6, 2026, to May 19, 2026. The sample consisted of 60 respondents, including both males and females aged  $\geq 19$  years.

**Study Design:** Quantitative descriptive design with a cross-sectional approach.

**Study Location:** This study was conducted in the neurological ward of Banda Aceh Regional General Hospital, Indonesia.

**Study Duration:** From February 6 to May 19, 2026.

**Sample size:** 60 patients

**Sample size calculation:** The population of this study consisted of all ischemic stroke patients experiencing dysphagia. The sample size was determined using G\*Power with  $\alpha = 0.05$ , power = 0.80, and medium effect size (13), resulting in a minimum sample size of 52 respondents. An additional 15% was added to prevent dropout, resulting in a total sample size of 60 respondents.

**Subjects & selection method:** Purposive sampling was used, in which participants were selected based on inclusion and exclusion criteria established by the researchers. Data were collected using the Functional Oral Intake Scale (FOIS) to assess patients' swallowing ability. The instrument used had been tested for validity and reliability. Inter-rater reliability was very high, with perfect agreement in 85% of assessments. Kappa statistics ranged from 0.86 to 0.91, indicating excellent agreement. Consensual validity was also high (0.90). Criterion validity was high both at stroke onset and one month after stroke. FOIS demonstrated significant associations with stroke disability scales and showed significant correlations with two physiological measures of swallowing function.

The collected data were analyzed descriptively and presented in the form of frequency distributions, percentages, mean, and standard deviation to describe respondents' characteristics and swallowing ability in patients with dysphagia after ischemic stroke.

### **Inclusion criteria:**

1. Respondents aged 19 years and older
  2. Respondents experienced difficulty swallowing liquids, semi-solid foods, or solid foods
  3. Respondents were fully conscious with a Glasgow Coma Scale (GCS) score of 15
- Respondents had impairment in one of the following cranial nerves: VII, IX, X, or XII

### **Exclusion criteria:**

1. Uncooperative respondents
  2. Respondents with neurological disorders other than stroke
- Respondents with decreased level of consciousness

### **Procedure methodology**

The research procedure began with obtaining ethical approval and administrative permission from the Director of Aceh Regional General Hospital. After approval was granted, the researchers coordinated with the nurses in the inpatient wards to identify patients diagnosed with ischemic stroke who experienced dysphagia. Respondents were then selected using a purposive sampling technique based on the inclusion and exclusion criteria established by the researchers. Patients who met the criteria were provided with an explanation regarding the objectives, procedures, benefits, and confidentiality of the study. Respondents who agreed to participate were asked to sign an informed consent form. Data collection was conducted from February 6 to May 19, 2026. The researchers collected demographic data, including age, sex, marital status, education level, comorbidities, and stroke history, using a demographic questionnaire. Subsequently, swallowing ability was assessed using the Functional Oral Intake Scale (FOIS). The FOIS assessment was performed by observing the

patient's oral intake ability and determining the appropriate FOIS level based on the patient's swallowing condition.

**Statistical analysis**

After all data had been collected, the researchers checked the completeness and accuracy of the data before proceeding to data processing and analysis. Data analysis was performed descriptively using frequency distributions, percentages, mean, and standard deviation to describe respondents' demographic characteristics and swallowing ability in patients with dysphagia after ischemic stroke.

**III. Results**

Respondents' demographic characteristics included age, sex, marital status, education level, comorbid history, and stroke history. Demographic data were presented using frequency distribution, percentages, mean, and standard deviation as shown in Table 1. The presentation of these data aimed to provide an overview of respondents' characteristics. Based on Table 1, the mean age of respondents was 56.17 years. Most respondents were male (34 respondents; 56.7%). The majority were married (54 respondents; 90.0%). Most respondents had completed senior high school education (46 respondents; 76.7%), and hypertension was the most common comorbidity (52 respondents; 86.7%). Most respondents experienced their first stroke attack (41 respondents; 68.3%).

**Table no 1:** Frequency Distribution of Respondents Demographic Characteristics (n = 60)

Demographic Characteristics		
<b>Age</b>		
Mean		56,17
Min-Max		22 - 76
<b>Sex</b>		
Male	34	56,7
Female	26	43,3
<b>Marital Status</b>		
Single	4	6,7
Married	54	90,0
Widowed	2	3,3
<b>Education Level</b>		
Elementary School	1	1,7
Junior High School	7	11,7
Senior High School	46	76,7
Bachelor's Degree	6	10,0
<b>Comorbidities</b>		
Hypertension	52	86,7
Diabetes Mellitus	4	6,7
Hypertension and Diabetes Mellitus	4	6,7
<b>Stroke History</b>		
First Attack	41	68,3
Recurrent Stroke	19	31,7

**Table no 2:** Frequency Distribution of Swallowing Ability Using the Functional Oral Intake Scale (FOIS) (n=60)

Swallowing Ability Using the Functional Oral Intake Scale (FOIS)			
1	Nothing by mouth	-	-
2	Tube dependent with minimal attempts of food or liquid intake	5	8,3
3	Tube dependent with consistent oral intake of food or liquid	8	13,3
4	Total oral diet of a single consistency	22	36,7
5	Total oral diet with multiple consistencies requiring special preparation or compensations	25	41,7
6	Total oral diet with multiple consistencies without special preparation but with specific food limitations	-	-
7	Total oral diet with no restrictions	-	-

The frequency distribution of swallowing ability using the Functional Oral Intake Scale (FOIS) showed that most respondents were at swallowing ability level 5 (25 respondents; 41.7%). This finding indicates that the majority of respondents were able to consume food orally with special modifications or preparations. Furthermore, 22 respondents (36.7%) were at swallowing ability level 4, indicating that respondents were only able to consume oral food with a single consistency. No respondents were found at swallowing ability levels 1, 6, or 7.

#### **IV. Discussion**

This study demonstrated that most ischemic stroke patients with dysphagia had moderate swallowing ability based on FOIS, particularly at level 4 (total oral diet of a single consistency) and level 5 (total oral diet with multiple consistencies requiring compensation or special preparation). Swallowing is a process in which liquids or solids move from the mouth to the stomach through the pharynx and esophagus. This process occurs approximately 600 times daily, especially when an individual is awake and eating, although it also occurs less frequently during sleep. Swallowing involves complex coordination between various muscles and nerves<sup>(15)</sup>. Normal swallowing includes a set of complex, integrated, and interdependent eating behaviors resulting from cranial nerve interactions in the brainstem and regulated by neural mechanisms in the medulla as well as cortical sensorimotor and limbic systems<sup>(16)</sup>.

The anatomical structures involved in swallowing include bones such as the mandible, maxilla, hard palate, hyoid bone, and cervical vertebrae, as well as cartilages including the thyroid, cricoid, arytenoid, and epiglottis. Teeth, salivary glands (parotid, sublingual, and submandibular glands), and muscles are also involved in this process. After passing through the oral cavity, food enters the pharynx and subsequently the esophagus before being transported to the stomach. More than 30 pairs of muscles are activated during swallowing. Most are striated muscles, except for the medial and distal esophagus, which contain partially or fully smooth muscle segments. These muscular movements are controlled by several cranial and peripheral nerves and coordinated within the brainstem. Somatic afferent and efferent feedback mechanisms also contribute to swallowing regulation<sup>(15)</sup>.

Ischemic stroke, also known as cerebrovascular accident (CVA) or “brain attack,” is a sudden loss of function caused by disruption of blood supply to a part of the brain<sup>(4)</sup>. Ischemic stroke may lead to dysphagia due to impaired blood flow to brain regions responsible for swallowing. This condition results in brain tissue damage and impaired neuromuscular coordination regulating swallowing function. In ischemic stroke patients, dysphagia occurs because of damage to the cerebral cortex, brainstem, or neural pathways controlling motor and sensory swallowing functions. Such disturbances may affect cranial nerves including the trigeminal nerve (V), facial nerve (VII), glossopharyngeal nerve (IX), vagus nerve (X), and hypoglossal nerve (XII), which play essential roles in mastication, bolus formation, swallowing reflex, tongue movement, and pharyngeal muscle function. When cranial nerve function is impaired, swallowing coordination becomes ineffective, leading to difficulty swallowing food and liquids<sup>(15,17)</sup>.

Oropharyngeal dysphagia in patients with neurological disorders may be characterized by symptoms associated with cranial nerve involvement, such as muscle weakness, hemiplegia, drooling, tremor, ataxia, fatigue, and speech difficulties. Patients commonly experience choking or coughing during eating and drinking, difficulty initiating swallowing, repeated swallowing attempts, nasal regurgitation, and changes in voice quality such as hoarseness or wet voice. These symptoms indicate impaired coordination of oral and pharyngeal muscles during swallowing, leading to decreased swallowing ability in patients with dysphagia<sup>(18)</sup>. According to Jin et al., (2025) the absence of standardized post-stroke dysphagia rehabilitation assessments has resulted in wide variations in reporting swallowing recovery outcomes. Nurses need to implement targeted preventive interventions in patients aged  $\geq 70$  years, with low BMI, bilateral stroke, high NIHSS scores, tracheal intubation, and aspiration to improve swallowing recovery in patients with post-stroke dysphagia<sup>(19)</sup>.

#### **V. Conclusion**

This study demonstrated that swallowing ability in patients with dysphagia after ischemic stroke was predominantly at a moderate level based on the Functional Oral Intake Scale (FOIS), particularly at levels 4 and 5. Most respondents were able to consume food orally but still required dietary consistency restrictions, compensatory strategies, or special preparation during meals. Ischemic stroke may cause dysphagia due to impairment in brain regions and cranial nerves involved in the swallowing process, resulting in disrupted coordination of oral and pharyngeal muscles. This condition decreases swallowing ability and increases the risk of complications such as aspiration, malnutrition, and dehydration. Therefore, assessment of swallowing ability using the FOIS instrument is essential as a basis for determining dysphagia management and rehabilitation in patients with ischemic stroke.

**Study Limitations:** This study had several limitations. First, the cross-sectional design only described swallowing ability at a single point in time. Second, the study was conducted in a single hospital with a limited sample size; therefore, the findings cannot be generalized broadly.

**Recommendations:** Future studies are recommended to use longitudinal or repeated observational designs to evaluate changes in swallowing ability among ischemic stroke patients with dysphagia over time. In addition,

studies with larger sample sizes and involving multiple hospitals are needed to improve the representativeness of the findings.

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