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# Dysphagia in patients in acute period of ischemic stroke: What is the relationship of dysphagia with infarct localization, cognition, malnutrition, and independence level?

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**Abstract**

*Background and Objective:* Swallowing and nutritional disorders can occur for many different reasons after stroke. This study aimed to evaluate dysphagia, malnutrition, and independence in patients with an acute period of ischemic stroke, and to examine the relationship between dysphagia and lesion location, cognition, malnutrition, and dependence. *Methods:* Ischemic stroke patients (n: 109, mean age: 72.91 ± 11.78 year) were evaluated within the first 5 days after stroke. Standardized Mini-Mental State Examination (SMMSE), Combining pulse oximetry with a 10 milliliter (ml) Bedside Water Drinking Test (CPOBWDT), Mini Nutritional Assessment (MNA), and Barthel Index (BI) were performed. *Results:* Dysphagia was detected in 57.8% of the patients; malnutrition was present in 19.27% and 55.96% were at risk of malnutrition. In patients with dysphagia, it was observed that the most common site of infarct involved the superior cortical division of the middle cerebral artery. SMME ($p<0.001$) and BI ($p=0.001$) were significantly worse in patients with dysphagia than patients without dysphagia. *Conclusion:* This study showed that more than half of the ischemic stroke patients are at risk of dysphagia and malnutrition in the acute period after stroke. The localization of the infarct and a decrease in the cognitive level are among the factors that are associated with dysphagia. Dysphagia is associated with increased dependence for functional activities. Therefore, in patients with ischemic stroke, swallowing and malnutrition should be evaluated during the acute phase.

*Keywords:* Stroke, swallowing, dysphagia, cognition, malnutrition

## INTRODUCTION

Globally stroke is a medical emergency that ranks second among diseases that cause morbidity.[1] It often results in high socio-economic burden to the patient and his family; frequently resulting in hospital admissions incurring significant health expenditures.[2] Many complications can occur after a stroke. These include symptoms related to the musculoskeletal, psychological, gastrointestinal system, and communication. Among the gastrointestinal system, dysphagia, dehydration, and malnutrition are common after stroke.[3,4] As for mobility, the impairment lead to increased dependence and decrease in the quality of life.[5-8]

In the literature, it is stated that swallowing and nutritional disorders can occur for many different reasons after stroke. The frequency of dysphagia in stroke has been reported at very different rates depending on the method used, disease duration, and lesion location.[6,9,10]

There are many previous studies on swallowing and malnutrition in stroke. In these studies, evaluations were mostly performed with the Toronto Bedside Swallowing Test, or Yale protocol.[6,11-13] In our study, dysphagia screening was performed using the 10 ml bedside water drinking test which consisted of a water-drinking test and oxygen saturation monitoring. However, in these studies, the relation of dysphagia with infarct localization, independence, malnutrition, and cognitive level in the first five days after

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stroke was not examined.[11,14] So, this study aimed to examine the relationship between dysphagia and lesion site, cognition, malnutrition, and independence levels.

## METHODS

This study was conducted in the Neurology Clinic of the T.C Health Sciences University Dışkapı Yıldırım Beyazıt Training and Research Hospital. Ethical approval was obtained from the ethics committee of the hospital, with written consent of the patients.

### *Participants*

The study was conducted in 109 patients (53 females, 56 males) between the ages of 42-90 (mean 72.9 ± 11.8 years), who were hospitalized within seven months (January-July, 2019).

The study subjects consisted of patients age 18 years and above with acute ischemic stroke, diagnosed clinically and confirmed with imaging by computerized brain tomography or magnetic resonance imaging; who continued to have oral intake, and could cooperate with Standardized Mini-Mental State Examination (SMMSE).

The classification of the ischemic vascular regions was as follow: Supratentorial infarcts: middle cerebral artery (MCA), deep middle cerebral artery (capsular interna, caudate nucleus, putamen, pallidum), subcortical lesions (corona radiata and centrum semiovale), superior cortical division of the MCA, inferior cortical division of the MCA; anterior cerebral artery (ACA). Infratentorial region: brainstem (medulla, pons, midbrain), cerebellum, posterior cerebral artery (superficial, deep (thalamus) or the entire posterior cerebral artery (PCA) region.[15,16]

Excluded from the study were those who have had a previous stroke, or head and neck surgery; patients with neurodegenerative or muscle disease that would lead to a swallowing disorder; those with a history of malignancy, those with bilateral cerebral infarction and psychiatric diseases.

### *Procedures and assessment tools*

The patients were evaluated in the first 5 days of acute stroke. First, information about age, diabetes mellitus (DM), hypertension (HT), hemisphere with infarction, and treatment methods were obtained from the patients' files. The smoking status (never smoked-drank) was obtained. All swallowing tests were performed with the head of the patient upright, or when on the bed, with the feet extended.

SMMSE was used for cognitive assessment. It consisted of five sub-sections: orientation (10 points), memory (3 points), attention and calculation (5 points), recall (3 points), and language (9 points) over 30 points in total.[17]

A Mini Nutritional Assessment (MNA) was used for evaluation of nutritional status. It consisted of 4 parts: anthropometric assessment (BMI, weight, arm, and calf circumference), general assessment (lifestyle, medication, mobility, depression and dementia symptoms), brief nutrition assessment (number of meals, food, and fluid intake, autonomy in nutrition) subjective assessment (health and self-perception about nutrition). There were 18 questions in total. The gradings were based on 24-30 points (normal nutrition), 17.5-23.5 (at risk of malnutrition), below 17 points (malnutrition).[18]

For the evaluation of dysphagia, Combining Pulse Oximetry with a 10 milliliter (ml) Bedside Water Drinking Test (CPOBWDT) was applied. The test have a sensitivity of 73% to 100%, specificity 62% to 76%.[14,19] The test consisted of drinking 10 milliliters (ml) of water. The grading was: within the next 1 minute, the presence of cough (condition 1) and dysphonia (condition 2); while drinking water by spitting (condition 3), water flow from the rim (condition 4) and absence of laryngeal movement (condition 5); decrease in oxygen saturation of 2% and above that occurred while drinking water and within 10 minutes (condition 6). Each of these 6 conditions was given 1 for the presence and 0 for the absence, and if the total score was between 0-2, it was interpreted as normal swallowing and between 3-6 as dysphagia. Beurer Po 40 pulse oximeter device was used for saturation monitoring.[11]

The Barthel Index (BI) was applied to evaluate the independence levels of the patients. Activities of daily living were evaluated in 10 items and the level of independence in functional activities was determined by scoring between 0-100. The gradings were: 0-20 points (fully dependent), 21-61 points (highly dependent), 62-90 points (moderately dependent), 91-99 points (mildly dependent), 100 points (fully independent).[20]

### *Statistical analysis*

The analysis was carried out with the IBM SPSS 23.0 program. Descriptive findings were evaluated by number, percentage, minimum, maximum, mean, median, and standard deviation. The compliance of continuous data to normal distribution was evaluated by the Kolmogorov

Smirnov and Shapiro-Wilk tests, as well as histogram graphics. The analysis of continuous variables that did not meet the parametric test assumptions was performed using the Mann-Whitney U test. A Chi-square test was used in the comparison of categorical variables. The statistical significance level in the analysis was accepted as $p < 0.05$.

## RESULTS

Of the patients evaluated in their acute period, 55% had left hemisphere infarction, 45% had right hemisphere infarction. Of the underlying risk factors, 56.9% had HT and 23.9% had DM. The most common infarct location was the superior cortical division of MCA (20.2%), followed by deep MCA (18.3%) (Table 1).

Dysphagia was found in 57.8% of the patients. The mean SMMSE was 20.92 ± 2.91. Malnutrition was present in 19.27% of the patients with an average MNA of 20.27 4.03, and 55.96 were at risk of malnutrition. As for the level of independence, only 1.84% of the patients were found to be fully independent (Table 2).

For the factors that may affect dysphagia, 41.27% of the patients with dysphagia and 50% of those without dysphagia had right infarction. There was no statistically significant difference between stroke patients with and without dysphagia in terms of smoking, DM, HT, the affected hemisphere, and treatment of stroke (Table 3).

The mean SMMSE of the patients with dysphagia (19.76 ± 1.82) was found to be significantly lower than the patients without dysphagia (22.52 ± 3.35, $p < 0.001$). Orientation, recall, and language sections of the SMMSE subsections were significantly lower in the dysphagia group. The mean of BI was found to be 53.96 ± 26.89 in patients with dysphagia and was significantly lower than in patients without dysphagia ($p = 0.001$). (Table 4)

There was no significant difference between patients with and without dysphagia when the numbers of individuals with malnutrition, risk of malnutrition, and normal nutrition according to the MNA result were compared. (Table 5)

**Table 1: Patients' demographic characteristics, infarct location, and risk factors for dysphagia**

| **Variable** | | **n** | **%<br>mean ± ss** |
|---|---|---|---|
| Age | | 109 | 72.91±11.78 |
| Gender | Female | 53 | 48.6 |
| | Male | 56 | 51.4 |
| Infarct localization | Deep MCA | 20 | 18.3 |
| | Sup. cortical div MCA | 22 | 20.2 |
| | Inf. cortical div MCA | 18 | 16.5 |
| | ACA | 10 | 9.2 |
| | Subcortical | 14 | 12.8 |
| | Brainstem + cerebellar | 16 | 14.7 |
| | PCA | 9 | 8.3 |
| A history of smoking | Absence | 78 | 71.6 |
| | Presence | 31 | 28.4 |
| Affected hemisphere | Left | 60 | 55.0 |
| | Right | 49 | 45.0 |
| HT | Absence | 47 | 43.1 |
| | Presence | 62 | 56.9 |
| DM | Absence | 83 | 76.1 |
| | Presence | 26 | 23.9 |

hypertension (HT), diabetes mellitus(DM), middle cerebral artery (MCA), superior cortical division of the MCA (Sup. cortical div MCA), inferior cortical division of the MCA (Inf. cortical div MCA), anterior cerebral artery (ACA) posterior cerebral artery (PCA)

**Table 2: Cognition, dysphagia, malnutrition and independence status of the patients**

| Variable | | n | % mean ± SS |
|---|---|---|---|
| SMMSE | Orientation | 109 | 6.53 ± 2.17 |
| | Recording memory | 109 | 2.95 ± 0.21 |
| | Attention and calculation | 109 | 4.11 ± 1.33 |
| | Recall | 109 | 1.42 ± 0.96 |
| | Language | 109 | 6.36 ± 1.59 |
| | Total | 109 | 20.92 ± 2.91 |
| Dysphagia | Presence | 63 | 57.80 |
| | Absence | 46 | 42.20 |
| MNA | Malnourished | 21 | 19.27 |
| | At risk of malnutrition | 61 | 55.96 |
| | Normal nutrition | 27 | 24.77 |
| | Total | 109 | 20.27 ± 4.03 |
| BI | Fully dependent | 23 | 21.10 |
| | Highly dependent | 24 | 22.01 |
| | Moderately dependent | 43 | 39.45 |
| | Mildly dependent | 17 | 15.60 |
| | Fully independent | 2 | 1.84 |
| | Total | 109 | 61.14 ± 27.87 |

Standardized Mini-Mental State Examination (SMMSE), Mini Nutritional Assessment (MNA), Barthel Index (BI)

**Table 3: Comparison of factors that may affect dysphagia between patients with and without dysphagia**

| | | | Dysphagia | | | |
|---|---|---|---|---|---|---|
| | | | Presence | Absence | Total | p |
| **A history of smoking** | Absence | n | 42 | 36 | 78 | 0.267 |
| | | % | 53.8% | 46.2% | 100.0% | |
| | Presence | n | 21 | 10 | 31 | |
| | | % | 67.7% | 32.3% | 100.0% | |
| **Affected hemisphere** | Left | n | 37 | 23 | 60 | 0.478 |
| | | % | 61.7% | 38.3% | 100.0% | |
| | Right | n | 26 | 23 | 49 | |
| | | % | 53.1% | 46.9% | 100.0% | |
| **HT** | Absence | n | 22 | 25 | 47 | 0.068 |
| | | % | 46.8% | 53.2% | 100.0% | |
| | Presence | n | 41 | 21 | 62 | |
| | | % | 66.1% | 33.9% | 100.0% | |
| **DM** | Absence | n | 48 | 35 | 83 | 1.000 |
| | | % | 57.8% | 42.2% | 100.0% | |
| | Presence | n | 15 | 11 | 26 | |
| | | % | 57.7% | 42.3% | 100.0% | |
| **Treatment modalities** | Thrombolytic | n | 14 | 8 | 22 | 0.799 ($\chi^2$=0.4478) |
| | | % | 63.6% | 36.4% | 100.0% | |
| | Thrombectomy | n | 6 | 4 | 10 | |
| | | % | 60% | 40% | 100% | |
| | Standard | n | 43 | 34 | 77 | |
| | | % | 55.8% | 44.2% | 100% | |

Hypertension (HT), Diabetes mellitus(DM)

When a comparison is made between those with and without dysphagia in terms of infarct locations; dysphagia was observed in 86.4% of patients with a superior cortical division of MCA and 35% of patients with deep MCA infarction. The difference was statistically significant (p = 0.005, p = 0.042, respectively). In the different location of infarct, those with superior cortical division of MCA infarctions (86.4%) and brainstem + cerebellar infarction (75%) were most commonly reported to have dysphagia. (Table 6).

## DISCUSSION

In many previous studies, dysphagia, malnutrition, and independence levels of patients with stroke at different stages were examined, with varied results.[11,13,21,22]

Dysphagia is one of the most important causes of morbidity after stroke. It also causes an increase in mortality due to pulmonary complications from aspiration. Changes such as a delay in triggering the swallowing reflex and a decrease in tongue movements may contribute to the dysphagia.[5] The frequency of developing dysphagia after stroke varies greatly according to methods of evaluation. In our study, dysphagia was seen in 57.8% of the patients in the acute phase, based on the assessment by the bedside water drinking test. The frequency of dysphagia determined using clinical tests in acute phase stroke patients by Barer[12] was 29%, Hamdy *et al*.[23] 30%, and Parker *et al*.[24] 55%. While the rate of dysphagia in the acute period of ischemic and hemorrhagic stroke was 30-65% in clinical examinations; when the evaluation was by videofluoroscopy or fiberoptic endoscopy, the rate increased to 64-78%.[5]

Although we did not assess our patients using fiberoptic endoscopy, we evaluated patients with SMMSE of 18 and above, who had better alertness, attention and cognition, the frequency of dysphagia was also observed to be high. This may be because performing the bedside swallowing test and pulse oximetry together is more effective in evaluating dysphagia[14,19], as the measurement of oxygen saturation prevents the silent aspiration from being overlooked. If patients with lower SMMSE scores were included in our study, this dysphagia rate could be even higher. In addition, we did not include hemorrhagic stroke in our study. In the literature, it is reported that dysphagia is seen in 19-81% of stroke, inclusive of different types of stroke and methods of evaluation.[25]

It has been reported that DM, HT, and smoking negatively affect the prognosis of stroke.[26,27]

**Table 4: Comparison of cognition, malnutrition, and independence between patients with and without dysphagia**

| | | Dysphagia | n | Mean | SS | z | p |
|---|---|---|---|---|---|---|---|
| **SMMSE** | orientation | Presence | 63 | 5.45 | 1.64 | -4.599 | ***<0.001*** |
| | | Absence | 46 | 8.00 | 1.94 | | |
| | recording memory | Presence | 63 | 2.87 | 0.53 | -1.492 | 0.067 |
| | | Absence | 46 | 3.00 | 0.00 | | |
| | attention and calculation | Presence | 63 | 3.03 | 1.74 | -0.283 | 0.389 |
| | | Absence | 46 | 4.24 | 0.91 | | |
| | recall | Presence | 63 | 1.18 | 0.98 | -2.379 | **0.009** |
| | | Absence | 46 | 1.75 | 0.84 | | |
| | language | Presence | 63 | 5.87 | 1.36 | -3.333 | **0.004** |
| | | Absence | 46 | 7.04 | 1.67 | | |
| | Total | Presence | 63 | 19.76 | 1.82 | -4.439 | **0.000** |
| | | Absence | 46 | 22.52 | 3.35 | | |
| **MNA** | | Presence | 63 | 19.77 | 4.42 | -1.396 | 0.163 |
| | | Absence | 46 | 20.95 | 3.35 | | |
| **BI** | | Presence | 63 | 53.96 | 26.89 | -3.365 | **0.001** |
| | | Absence | 46 | 70.97 | 26.40 | | |

Standardized Mini-Mental State Examination (SMMSE), Mini Nutritional Assessment (MNA), Barthel Index (BI)

**Table 5: Comparison of malnourished, at risk of malnutrition,and normal nutrition between patients with and without dysphagia**

| | | | MNA | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | **Malnourished** | **At risk of malnutrition** | **Normal nutrition** | **Total** | **$\chi^2$** | **p** |
| **Dysphagia** | Presence | n | 16 | 31 | 16 | 63 | 4.1539 | 0.125 |
| | | % | 25.40 | 49.20 | 25.40 | 100 | | |
| | Absence | n | 5 | 30 | 11 | 46 | | |
| | | % | 10.87 | 65.22 | 23.91 | 100 | | |

Mini Nutritional Assessment (MNA)

Paciaroni *et al.* stated that dysphagia in stroke patients is associated with smoking history and not with HT and DM.[28] In our study, these three factors were examined and it was found that there was no difference between patients with and without dysphagia. The treatment modalities also did not affect the rate of dysphagia. This allow us to focus on the effects of cognition and infarct localization that may be associated with dysphagia. In another study, Barer[12] evaluated 357 stroke patients at the 48th hour after stroke and reported that the level of consciousness, gaze paralysis, and sensory disturbances were risk factors associated with dysphagia. Patients with SMMSE 18 and above were included in the study, whereas patients who were unconsciousness were excluded. SMMSE scores were found to be significantly lower in the group with dysphagia. This confirmed the association between the decline in cognitive functions and dysphagia. We also observed that orientation, recall, and language sub-sections of the SMMSE were lower in patients with dysphagia. In a study examining the relationship between dysphagia and cognition, it was reported that orientation was associated with dysphagia and especially aspiration status.[29] This was similar to our study. Orientation problems can cause dysphagia by affecting the oral preparation and oral voluntary phases of swallowing. In the study of Martin *et al.*, a significant positive correlation was found between dysphagia and communication disorder.[30] We also found language scores, a

**Table 6: Comparison of infarct localization between patients with and without dysphagia**

| | | Dysphagia | | | |
|---|---|---|---|---|---|
| | | **Presence** | **Absence** | **Total** | **p** |
| **Deep MCA** | n | 7 | 13 | 20 | **0.042** |
| | % | 35.0% | 65.0% | 100.0% | |
| **Sup. cortical div MCA** | n | 19 | 3 | 22 | **0.005** |
| | % | 86.4% | 13.6% | 100.0% | |
| **Inf. cortical div MCA** | n | 9 | 9 | 18 | 0.637 |
| | % | 50.0% | 50.0% | 100.0% | |
| **ACA** | n | 5 | 5 | 10 | 0.740 |
| | % | 50.0% | 50.0% | 100.0% | |
| **Subcortical** | n | 8 | 6 | 14 | 1.000 |
| | % | 57.1% | 42.9% | 100.0% | |
| **Brainstem + cerebellar** | n | 12 | 4 | 16 | 0.217 |
| | % | 75.0% | 25.0% | 100.0% | |
| **PCA** | n | 3 | 6 | 9 | 0.163 |
| | % | 33.3% | 66.7% | 100.0% | |

middle cerebral artery (MCA), superior cortical division of the MCA (Sup. cortical div MCA), inferior cortical division of the MCA (Inf. cortical div MCA), anterior cerebral artery (ACA) posterior cerebral artery (PCA) sub-branch of communication disorders, were lower patients with dysphagia. Some studies found a strong correlation between oral phase swallowing problems and memory, and in this study, the recall evaluated in memory was found to be low in patients with dysphagia.[31,32] In our study, similar to the study by Jo *et al.*, it was observed that recall function of patients with dysphagia were statistically significantly lower than those without dysphagia.[31] However, in our study, unlike previous studies, it was observed that even though the attention scores were lower in the dysphagia group, it was not statistically significant. One reason could be the low number of patients without dysphagia.

As for the factor of the hemisphere that the infarct was located, we did not find any significant difference. This was similar to the reports of Hamdy *et al.* and Paciaroni *et al.*[23,28]

As for the anatomical location of infarct that causes dysphagia; the cortical areas and the width of the lesion were reported to be important.[33] Some areas such as the precentral gyrus, capsule interna, corona radiata, and insular region, which are subcortical areas, were found to be important in swallowing disorder.[28] Strokes due to cerebral, cerebellar, or brainstem infarctions can also impair different stages of swallowing function. Cerebral lesions may affect the control of voluntary muscles during chewing in the oral phase.[5,34] When the infarct areas were evaluated in our study, the superior cortical division infarct of MCA, which includes the precentral gyrus and insular sage, was the most frequently encountered area and was statistically significant when compared to those without swallowing disorder. The damage to this area may cause dysphagia by impairment in the motor control of the opposite face, lips, and tongue and also in the pharyngeal peristaltic movement.[35,36] In our study, dysphagia was also common when infarct occurred in in the brainstem. The infarcts in this region impair swallowing function by sensory impairment in the mouth and also the swallowing initiation time of the pharyngeal muscles, glottic closure, and cricopharyngeal relaxation.[37] Although dysphagia was observed in 75% of patients with brainstem infarction in our study, it was not significant statistically. This may be due to the small number of patients with brain stem infarction. Paciaroni *et al.* as in our study, reported that infarcts in the anterior circulation region was the most important.[28] The inferior precentral gyrus and anterior insular region has been reported to be critical areas in swallowing disorder.[28,33]

Stroke may lead to complication of malnutrition. Malnutrition may leads to secondary problems such as memory loss, delay in wound healing, and pressure ulcers.[38] Acute stroke patients, especially those who cannot be fed orally, are at risk for malnutrition.[39] In the literature, it is stated that approximately 90% of stroke patients carry the risk of malnutrition and the rate of malnutrition detected at the time of admission to the hospital in acute stroke patients varies between 3.8-32%.[40] In our study, 19.27% of acute stroke individuals with swallowing disorder were found to have malnutrition, 55.96% were found to be at risk of malnutrition. With such a high proportion are at risk for malnutrition, stroke patients should be evaluated, and necessary intervention given early. Immobilization and dysphagia are reported risk factors in stroke for malnutrition.[41] Although MNA scores were worse in patients with dysphagia in our study, it was not statistically significant. In addition, there was no difference in the number of people with malnutrition, malnutrition risk, and normal nutrition between patients with and without dysphagia. This may be because the evaluation was done within the first 5 days of stroke, and the dysphagia has still not caused an impact on the nutritional status. Studies performed within the first 3 months after stroke have reported a higher malnutrition in patients with dysphagia.[11]

Impairment of motor, sensory and cognitive functions may all affect performance in activities of daily living and result in dependence.[42] Only 1.84% of the patients in our study were fully independent. This was thought to be contributed by the fact that the study was performed in the acute phase of stroke, and some of the patients had disabilities including dysphagia and malnutrition. The results were similar to other studies.[40,42] It was observed that the degree of dependence of the patients in our study on daily activities was worse in patients with dysphagia. This is similar to a report from Terré *et al.*[43]

The limitations of this study are firstly, it is performed in the acute phase of stroke, and secondly, dysphagia was not evaluated with instrumental imaging methods.

In conclusion, this study showed that more than half of the patients in the acute period after stroke have dysphagia and are at risk of malnutrition. The localization of the infarct and a decrease in the cognitive level are among the factors that are associated with dysphagia. The infarct location involving the superior cortical division of MCA is an important region that can cause dysphagia. Dysphagia is also associated with reduced independence and worsening activities of daily living. Therefore, in patients with stroke, especially those involving the superior cortical division of the middle cerebral artery and brainstem, and those with cognitive impairment, swallowing function should be assessed early.

## DISCLOSURE

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## REFERENCES


1. Benjamin EJ, Virani SS, Callaway CW, *et al*. Heart disease and stroke statistics—2018 update: a report from the American Heart Association. *Circulation* 2018;137(12):e67-e492.
2. Yesilbalkan ÖU. Evidence-Based Practices in Hyperacute Tretament in Patient with Acute Ischemic Stroke.*Turkiye Klinikleri Internal Medicine Nursing*-Special Topics**.** 2015;1(1):22-30.
3. Ramos-Lima MJM, Brasileiro IdC, Lima TLd, Braga-Neto P. Quality of life after stroke: impact of clinical and sociodemographic factors. *Clinics* 2018;73.
4. Utku U. Stroke: Definition, Etiology, Classification and Risk Factors. *Turkish J Physical Med Rehabil* 2007;53(1).
5. Martino R, Foley N, Bhogal S, Diamant N, Speechley M, Teasell R. Dysphagia after stroke: incidence, diagnosis, and pulmonary complications. *Stroke* 2005;36(12):2756-63.
6. Yi JH, Chun MH, Kim BR, Han EY, Park JY. Bowel function in acute stroke patients. *Ann Rehabil Med* 2011;35(3):337.
7. Eyıgör S. General Rehabilitation Principles, Quality of Life and Outcome Assessment in Patients with Stroke.*Turkish J Physical Med Rehabil* 2007;53.
8. Martino R, Knutson P, Mascitelli A, Powell-Vinden B. Management of dysphagia in acute stroke: an educational manual for the dysphagia screening professional. Heart and Stroke Foundation of Ontario**.** 2006:1-48.
9. Summers D, Leonard A, Wentworth D, *et al*. Comprehensive overview of nursing and interdisciplinary care of the acute ischemic stroke patient: a scientific statement from the American Heart Association. *Stroke* 2009;40(8):2911-44.
10. Boyraz S. Swallow and Nutrition in Stroke Individuals. *Turkiye Klinikleri Journal of Internal Medicine Nursing*-Special Topics 2015;1(1):48-53.
11. Umay EK, Gürçay E, Ünlü E, Eksioglu E, Çakci A. Functional and nutritional effects of dysphagia in early stroke patients. *Türkiye Klinikleri Tip Bilimleri Dergisi* 2010;30(3):925.
12. Barer D. The natural history and functional consequences of dysphagia after hemispheric stroke. *J Neurol Neurosurg Psychiatry* 1989;52(2):236-41.
13. Remesso GC, Fukujima MM, Chiappetta ALdML, *et al*. Swallowing disorders after ischemic stroke. *Arquivos de Neuro-psiquiatria* 2011;69(5):785-9.
14. Smith HA, Lee SH, O'Neill PA, Connolly MJ. The combination of bedside swallowing assessment and oxygen saturation monitoring of swallowing in acute stroke: a safe and humane screening tool. *Age Ageing* 2000;29(6):495-9.
15. Öncel Ç, Kalaycı D, Cura Ç, Can İ, Kalkancı Ö. Depression and cognitive dysfunction in patients with acute stroke. Journal of Turkish Cerebrovascular Diseases 2009 15:1; 7-11.
16. Tatu L, Moulin T, Bogousslavsky J, Duvernoy H. Arterial territories of the human brain: cerebral hemispheres. *Neurology* 1998;50(6):1699-708.
17. Molloy DW, Standish TI. A guide to the standardized Mini-Mental State Examination. *Int Psychogeriatrics* 1997;9(S1):87-94.
18. Vellas B, Guigoz Y, Garry PJ, *et al*. The Mini Nutritional Assessment (MNA) and its use in grading the nutritional state of elderly patients. *Nutrition* 1999;15(2):116-22.
19. Lim SH, Lieu P, Phua S, *et al*. Accuracy of bedside clinical methods compared with fiberoptic endoscopic examination of swallowing (FEES) in determining the risk of aspiration in acute stroke patients. *Dysphagia* 2001;16(1):1-6.
20. Kucukdeveci A, Yavuzer G, Tennant A, Suldur N, Sonel B, Arasil T. Adaptation of the modified Barthel Index for use in physical medicine and rehabilitation in Turkey. *Scand J Rehabil Med* 2000;32(2):87-92.
21. Crary MA, Humphrey JL, Carnaby-Mann G, Sambandam R, Miller L, Silliman S. Dysphagia, nutrition, and hydration in ischemic stroke patients at admission and discharge from acute care. *Dysphagia* 2013;28(1):69-76.
22. Duncan S, McAuley DF, Walshe M, *et al*. Interventions for oropharyngeal dysphagia in acute and critical care: a systematic review and meta-analysis. *Intensive Care Med* 2020;46:1326-38.
23. Hamdy S, Aziz Q, Rothwell JC, *et al*. Explaining oropharyngeal dysphagia after unilateral hemispheric stroke. *Lancet* 1997;350(9079):686-92.
24. Parker RG. Reminiscence as continuity: Comparison of young and older adults. *J Clin Geropsychology* 1999;5(2):147-157.
25. Mann G, Hankey GJ, Cameron D. Swallowing disorders following acute stroke: prevalence and diagnostic accuracy. *Cerebrovasc Dis* 2000;10(5):380-6.
26. Milionis HJ, Liberopoulos E, Goudevenos J, Bairaktari ET, Seferiadis K, Elisaf MS. Risk factors for first-ever acute ischemic non-embolic stroke in elderly individuals. *Int J Cardiol* 2005;99(2):269-75.
27. Kaarisalo MM, Räihä I, Sivenius J, *et al*. Diabetes worsens the outcome of acute ischemic stroke. *Diabetes Res Clin Pract* 2005;69(3):293-8.
28. Paciaroni M. Mazzotta C, Corea F, *et al*. Dysphagia following stroke. *Eur Neurol* 2004;51:162-7.
29. Leder SB, Suiter DM, Warner HL. Answering orientation questions and following single-step verbal commands: effect on aspiration status. *Dysphagia* 2009;24(3):290.
30. Martin BJ, Corlew MM. The incidence of communication disorders in dysphagic patients. *J*

*Speech Hear Disord* 1990;55(1):28-32.
31. Jo SY, Hwang JW, Pyun SB. Relationship between cognitive function and dysphagia after stroke. *Ann Rehabil Med* 2017;41(4):564.
32. Kim JS, Youn J, Suh MK, *et al*. Cognitive and motor aspects of Parkinson's disease associated with dysphagia. *Can J Neurol Sci* 2015;42(6):395-400.
33. Smithard D, Smeeton N, Wolfe C. Long-term outcome after stroke: does dysphagia matter? *Age Ageing* 2007;36(1):90-4.
34. Zald DH, Pardo JV. The functional neuroanatomy of voluntary swallowing. *Ann Neurol* 1999;46(3):281-6.
35. Daniels SK, Brailey K, Foundas AL. Lingual discoordination and dysphagia following acute stroke: analyses of lesion localization. *Dysphagia* 1999;14(2):85-92.
36. Veis S, Logemann J. Swallowing disorders in persons with cerebrovascular accident. *Arch Physical Med Rehabil* 1985;66(6):372-5.
37. Martino R, Terrault N, Ezerzer F, Mikulis D, Diamant NE. Dysphagia in a patient with lateral medullary syndrome: insight into the central control of swallowing. *Gastroenterology* 2001;121(2):420-6.
38. Allison SP. Malnutrition, disease, and outcome: Elsevier; 2000.
39. Foley NC, Salter KL, Robertson J, Teasell RW, Woodbury MG. Which reported estimate of the prevalence of malnutrition after stroke is valid? *Stroke* 2009;40(3):e66-e74.
40. Arsava EM, Aydoğdu İ, Güngör L, Işıkay CT, Yaka E. nutritional approach and treatment in patients with stroke, an expert opinion for Turkey. *Turk Noroloji Dergisi* 2018;24(3):226.
41. Chai J, Chu F, Chow T, Shum N. Prevalence of malnutrition and its risk factors in stroke patients residing in an infirmary. *Singapore Med J* 2008;49(4):290.
42. Aksakalli E, Turan Y, Şendur ÖF. Outcome Scales in Stroke Rehabilitation. *Turkish J Physical Med Rehabil* 2009;55(4).
43. Terre R, Mearin F. Oropharyngeal dysphagia after the acute phase of stroke: predictors of aspiration. *Neurogastroenterol Motil* 2006;18(3):200-5.