

## EFFECT OF A DYSPHAGIA ASSESSMENT EDUCATION PROGRAM ON NURSES' KNOWLEDGE AND SKILLS REGARDING EARLY DETECTION AND PREVENTION OF ASPIRATION FOR PATIENT WITH STROKE

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### Abstract

**Background:** Dysphagia is one of the most prominent symptoms in patients with acute stroke. It is an independent predictor of poor prognosis following acute stroke, can become chronic after the acute phase, and affects all aspects of the patient's life. Nurses have a vital role in the early detection and identification of signs and symptoms of dysphagia in patients with stroke on admission. **Aim:** This research was conducted to assess the effect of the dysphagia assessment education programme on nurses' knowledge and skills regarding early detection and prevention of aspiration for patients with stroke. **Design:** A quasi-experimental research design was used to accomplish the study's aim. **Setting:** The study was conducted in the general intensive care unit and stroke unit at Menoufia University Hospital. **Subjects:** A convenient sample of forty nurses provide direct patient care in the previously mentioned setting, and forty patients are diagnosed with acute stroke. **Tools:** Three tools were used in this study: the dysphagia assessment questionnaire (tool I), the acute stroke dysphagia screen (tool II), and the patient assessment outcomes (tool III). **Results:** A statistically significant improvement was found between nurses' knowledge and skills before and immediately following the implementation of the education programme, as well as an improvement in the overall nurses' knowledge about acute stroke dysphagia and early detection of patient aspiration. **Conclusion:** The level of knowledge and skills possessed by nurses was generally improved following the implementation of an education programme about dysphagia assessment and early identification of patient aspiration. **Recommendations:** Nursing continuing education in the assessment of a dysphagia programme is essential for the early diagnosis of aspiration in patients with stroke and, as a result, its consequences.

**Key words:** Acute stroke, Dysphagia, Education program, Nurses knowledge and skills

## Introduction:

Dysphagia is one of the most prevalent issues among patients diagnosed with stroke. However, the incidence rate depends on the definition of dysphagia and the chosen diagnostic tool. Post-stroke dysphagia (PSD) continues to be up to 50% common among patients with acute stroke (**Balcerak, et al., 2022**). PSD is typically referred to as difficulty swallowing following stroke. It is a common problem experienced by patients in the initial hours and days after a stroke. Undetected dysphagia may result in aspiration and, subsequently, aspiration pneumonia (**Oliveira, et al., 2020**).

Dysphagia is a significant predisposing factor for aspiration pneumonia. According to **Wangen et al. (2019)**, other dysphagia problems include poor nutrition, dehydration, a prolonged hospital stay, hospital readmissions, social isolation, lung abscesses, and a greater mortality rate. According to **Oliveira et al., (2020)** aspiration is the most severe symptom of dysphagia. Aspiration is described as the access of solids or liquids into the airway behind the vocal cords and is more often seen while swallowing fluids.

Screening for patients with acute stroke for early detection of dysphagia and, consequently, prevention of associated complications is one of the most significant concerns for these patients: A dysphagia screening should be conducted within 24 hours of stroke patient admission (**Boaden et al., 2017**). PSD can be detected by clinical bedside examination or fiberoptic endoscopic swallowing evaluation, but instrumental evaluation is more difficult to perform within a few hours of a stroke. Clinical bedside diagnostics are the only reliable options for early detection. The water swallow test was recommended as a straightforward screening bedside test in several hyperacute stroke studies (**Farneti, Turrone, & Genovese, 2018**).

There are different management protocols for PSD, though the foremost objectives in handling it are to maintain hydration and dietary support, reduce the risk of aspirating food and liquids into the respiratory tract, and resume oral intake. Changing the texture, frequency, and quantity of the food supplied, situating the patient during and after feeding, and feeding the patient via a nasogastric tube or percutaneous endoscopic gastrostomy (PEG) tube are all examples of specific management protocols for sustaining nutrition (**Moss et al., 2020**). Numerous academic studies have suggested that early detection of PSD and the beginning of interventions may be necessary not only to help prevent complications caused by dysphagia but also to help maintain and restore a person's ability to tolerate oral intake and, as a result, improve long-term health consequences and quality of life (**Benfield et al., 2022**).

Nurses who work in the stroke unit and intensive care are the first healthcare professionals to engage with patients after a stroke; they are also available to patients at the hospital twenty-four hours a day, seven days a week, which is crucial in the dysphagia screening process (**Palli et al., 2017**). Therefore, improving the knowledge and skills of nurses regarding the dysphagia screening

process is very important. In accordance with a number of studies by **Rhoda & Pickel-Voight (2015)** ; **Khoja (2018)**, nurses' training should cover how to do a basic screening test, such as the bedside water swallow test, as well as the proper way to posture a patient at mealtime. According to **Barnard (2011)**, screening for dysphagia by nurses is a critical first step in the early identification of PSD and permits PSD therapy with specificity. **Rhoda & Pickel-Voight (2015)** pointed out that while nurses can screen for and manage dysphagia, they cannot take on the role of other medical specialists. Therefore, nurses must have a thorough understanding of conditions in order to screen patients properly and intervene with appropriate interventions to prevent complications of dysphagia.

### **Significant of the study:**

According to an updated evaluation (**Hussain et al., 2021; Boaden et al., 2017**), there are numerous instruments available that may be useful for nurses to use while doing dysphagia assessments. There should be official dysphagia screening procedures in place, and nurses should be trained to apply them. Patients with acute stroke may spend less time without proper nutrition and hydration if nurses examine them within 24 hours of arrival, which may improve clinical outcomes. Instead of replacing other healthcare experts' assessments, dysphagia screening by nurses improves the care given to patients with stroke so that early detection and intervention may take place. Therefore, the study was carried out in order to assess the effect of a dysphagia assessment education programme on nurses' knowledge and skills regarding early detection and prevention of aspiration for patients with stroke.

### **Aim of study:**

This study was done to assess the effect of a dysphagia assessment education programme on nurses' knowledge and skills regarding early detection and prevention of aspiration in patients with stroke.

### **Research hypotheses:**

- Nurses who undergo a dysphagia assessment education programme show improvement in knowledge regarding early detection and prevention of aspiration for patients with acute stroke.
- Nurses who undergo a dysphagia assessment education programme show improvement in skills regarding early detection and prevention of aspiration for patients with acute stroke.

### **Subject and methods:**

#### **Research design:**

A quasi-experimental research design was used in this study.

### Setting:

This study was carried out in the general intensive care unit and stroke unit at Menoufia University Hospital.

### Subjects:

- A convenient sample of forty nurses providing direct patient care in the previously mentioned setting from September 2021 to December 2021.
- A convenient sample of forty patients diagnosed with acute stroke meets the following inclusion criteria: age between 18 and 60 years, acute stroke admitted to a stroke unit or ICU within 48 hours with a Glasgow Coma Scale (GCS) score greater than 13, no facial or tongue weakness, and those who had given informed consent to be part of the study. Those who had a nasogastric tube inserted while in the emergency room were excluded.

### Tools:

**Three tools were used in this study:**

#### **Tool I: Dysphagia Assessment Questionnaire**

This tool was developed by the researcher after reviewing the related literature (Knight et al., 2020; Deng et al., 2022). It is used to assess nurses' knowledge regarding dysphagia in patients with acute stroke. This tool included fifteen questions of multiple choice, true, and false types. These questions cover the theoretical aspects of dysphagia in patients with acute stroke and focus on definition, signs, symptoms, assessment of dysphagia, nursing interventions to prevent aspiration, and complications of dysphagia in patients with acute stroke.

The score of each question was assigned as follows:

Correct answer = score one Incorrect answer = score zero

The cut point for "Good" is  $\geq 75\%$  of the total score, "fair" is between 60% to less than 74% of the total score, and "poor" is less than 60% of the total score.

- In addition to nurses' characteristics, which include demographic data such as age, sex, qualification, work place, experience, and previous training and education about the assessment of dysphagia.

#### **Tool two: Acute stroke dysphagia screen**

This tool was adopted from the Barnes-Jewish Hospital Stroke Centre (Brumm, 2020). It was used to assess the nurses' skills regarding acute stroke dysphagia assessment. It consists of four items, namely, the acute stroke Glasgow coma scale, patient facial asymmetry or weakness, tongue asymmetry or weakness, and patient palatal asymmetry or weakness. If the nurse assesses the four

signs and symptoms and all patient findings are negative, proceed to the 3-ounce water test and assess the acute stroke patient for signs of aspiration during the water test (WST).

The score was assigned as correct steps score one and score zero for incorrect steps

### **Tool three: Patient assessment outcomes**

This tool was developed by researchers after reviewing related literature (**Ouyang et al., 2019; Boaden et al., 2017**): It was used to assess the effect of an education programme for nurses on the early detection of aspiration in acute stroke patients. It consists of six items to assess patient signs and symptoms of dysphagia, such as loss of liquid from the mouth, dyspraxia or poor coordination of muscles, cough, breathlessness, change in voice quality after swallowing, and early detection of patient aspiration.

### **Method**

1. Permission to conduct the study was obtained from the Menoufia University Hospital after an explanation of the aim of the study.
2. Tool I, "Dysphagia Assessment Questionnaire," and Tool III, "Patient Assessment Outcomes," "were developed by the researcher based on reviewing the related literature (**Knight et al., 2020; Deng et al., 2022; Ouyang et al., 2019; Boaden et al., 2017**).
3. Tool II, "Acute stroke dysphagia screening," was adopted from the Barnes-Jewish Hospital Stroke Centre (**Brumm, 2020**).
4. The dysphagia assessment education programme (lecture and performance checklist about acute stroke dysphagia screening) was developed by the researcher based on reviewing the related literature (**Kiekens & Tognonato, 2022; Flood, 2020; Dean, 2022; Barkmeier, Leonard & Kendall, 2018**).
5. Tools used in the study and a dysphagia education programme were tested for content validity by three experts in the fields of critical care and medical surgical nursing, and the necessary modifications were made accordingly.
6. A pilot study was done on four nurses to test the tools used in the study and assess education programmes for clarity, objectivity, and feasibility. Then, necessary modifications were made and the results were excluded from the study.
7. Tool I and Tool III were examined for reliability by using Cronbach's coefficient alpha ( $r = 83, 80$ , respectively), which is acceptable.

### **Data Collection:**

- The current study was done on four stages: assessment, preparation, implementation and evaluation.

### **Assessment :**

- Assessment of the nurses' knowledge was done using tool I "Dysphagia Assessment Questioner"
- Assessment of the nurse's skills was done using tool II "Acute stroke dysphagia screening"

### **Preparation phase:**

- The dysphagia assessment education programme (lecture and performance checklist about acute stroke dysphagia screening) was developed by the researcher based on reviewing the related literature (Kiekens & Tognonato, 2022; Flood, 2020; Dean, 2022; Barkmeier, Leonard & Kendall, 2018) and based on the assessment stage. It includes the following items:

#### **1 - General objective: -**

- By the end of the education programme, the nurses' knowledge and skills had improved regarding the assessment of dysphagia and the early detection and prevention of aspiration in patients with acute stroke.

#### **2- Intended Learning Outcomes (ILOS):-**

- By the end of the education programme, the nurses were able to acquire:

Knowledge and understanding related to the following:

- Definition of dysphagia
- Signs and symptoms of dysphagia and aspiration
- The nursing intervention for prevention of aspiration in stroke patients
- the associated complications of dysphagia for stroke patients

Professional and practical skills to perform the following:

- Assessment of dysphagia in stroke patients
- Apply the stroke dysphagia screening checklist.
- Early detection of aspiration in stroke patients

#### **3- The contents of the programme:**

- The theoretical contents were focused on lectures implemented through presentations about definitions, assessment, signs and symptoms, nursing, medical intervention, and complications of dysphagia.
- The practical contents focused on the assessment of dysphagia and prevention of aspiration in patients with acute stroke.

### **Implementation phase:**

- **For the theoretical content**, the study education programme was done four times for the four subgroups of nurses. All nurses were classified into small groups of ten each. All groups were given lectures through PowerPoint presentations about dysphagia.
- **For practical contents**, the study education programme was implemented five times for the five subgroups of nurses. All nurses were separated into eight small groups. All groups were trained to perform stroke dysphagia screening. Through the assessment of patients with stroke, answer the following four questions: Is the patient's Glasgow coma scale score less than 13, is there facial asymmetry or weakness, is there tongue asymmetry or weakness, and is there patient palatal asymmetry or weakness? If all findings are negative, proceed to administer 3 oz of water for a sequential drink and note any throat clearing, coughing, or change in vocal quality immediately after and one minute following swallowing.

### **Evaluation phase:**

- The researcher reassesses nurses' knowledge after implementation of the education programme using tool I (the dysphagia assessment questionnaire) and nurses' skills using tool II ("stroke dysphagia screening").
- The researcher assesses the ability of nurses to assess signs and symptoms of dysphagia and the early identification of aspiration in patients with acute stroke using Tool III after the application of the dysphagia assessment education programme.

### **Ethical considerations**

This study (Approval No. 749) was approved by the Menoufia University Faculty of Nursing's ethics committee. All participants provided written responses to questions after the purpose of the study was explained. They agreed to take part in the study, and they received assurances that all information acquired would be kept totally confidential and utilized only for the study's objectives. According to the researchers, participation in the study was completely voluntary and anonymous. Additionally, participants were informed that declining to take part in the study would not have any effects on their treatment and, consequently, their health.

### **Statistical analysis of the data**

Data were fed to the computer and analysed using IBM SPSS software package version 20.0. (Armonk, NY: IBM Corp.) Qualitative data were described using numbers and percents. The **Shapiro-Wilk** test was used to verify the normality of the distribution. Quantitative data were described using range (minimum and maximum), mean, standard deviation, and median. The significance of the obtained results was judged at the 5% level.

The tests used were

### **1: McNemar and Marginal Homogeneity Test**

Used to analyse the significance between the different stages

### **2: Kruskal-Wallis test**

For abnormally distributed quantitative variables, to compare between more than two studied groups

### **3: Wilcoxon signed ranks test**

For abnormally distributed quantitative variables to compare between two periods

### **4: Mann-Whitney test**

For abnormally distributed quantitative variables to compare between two studied groups

### **5: Spearman coefficient**

To correlate between two abnormally distributed quantitative variables

## **Results**

The aim of this study is to assess the effect of a dysphagia assessment education programme on nurses' knowledge and skills regarding early detection and preventing aspiration for patients with stroke.

To fulfil this, the current study results are presented in the following order:

### **Part I: studied nurses' characteristics**

**Table 1** shows the distribution of the studied nurses according to their characteristics. This table indicates that more than half (57.5%) of nurses aged between 30 and less than 39 years old, the majority of them female nurses, didn't attend an education programme regarding assessment and early detection of dysphagia in patients with acute stroke. 80%, 82.5 %, respectively; more than two thirds (77.5% of them) have a bachelor's degree, and two thirds (60% of them) work in intensive care units and have work experience ranging from 6 to 10 years.

### **Part II: studied nurses' level of knowledge**

**Table 2** demonstrates the distribution of the nurses' level of knowledge before and after the application of an education programme about dysphagia for stroke patients (n = 40). It was found that all nurses had a poor level of knowledge before the application of the education programme,

and the majority of them had a good level of knowledge after the application of an education programme about dysphagia. 100%, 87.5% respectively. The same table noted that there are statistically significant differences between the nurses' pretest and posttest levels of knowledge after the application education programme about dysphagia.

**Table 3** Shows the mean score percentage of nurses knowledge before and immediately after the implementation of an education programme regarding dysphagia. It was observed that there are statistically significant differences between the nurses' knowledge before and after the implementation of the education programme regarding definition, signs and symptoms, assessment of dysphagia, nursing, medical management, patient complications, and overall nurses' knowledge.  $P < 0.001$ \*

### **Part III: studied nurses' level of performance for their skills before and after training about acute stroke dysphagia screen (n=40)**

**Table 4** shows the distribution of the nurses' skills before and after training about acute stroke dysphagia screening (n = 40). It was found that the majority of nurses (87.5%) had poor skills before the implementation of the training programme about assessment and early detection of dysphagia in patients with acute stroke. Moreover, the majority of nurses (92.5%) had a good level of skills after the implementation of the training programme. It was observed that there are statistically significant differences between the nurses' skill levels before and after the implementation of an education programme about assessment and early detection of dysphagia for patients with stroke.

**Table 5:** Explain the distribution of studied acute stroke patients' outcomes according to their nurses' assessment after the application of an education programme. It was found that the majority of patients had loss of liquid from the mouth, coughing, and changes in voice quality after swallowing (80%, 82.5%, and 80%, respectively). The same table noted that the majority of nurses (82.5%) have the ability to detect aspiration in acute stroke patients suffering from dysphagia after the application of an education programme.

**Table 6** Explain the relation between overall nurses' knowledge about acute stroke dysphagia assessment and their demographic and job data =40. It was observed that statistically significant difference between nurses' knowledge after implementation of education program and their qualification and ICU work place

**Table 7** describe the relation between overall nurses' level of performance in their skills about assessment of dysphagia for acute stroke patients and their sociodemographic data (n = 40). It was found that there was a statistically significant difference between nurses' levels of performance and their qualifications, experience, and work place.

**Table 8** Shows the relation between overall nurses' knowledge about assessment and early detection of dysphagia and patients' outcomes (n = 40). It was found that there was a statistically

significant difference between overall nurses' knowledge before the application of the education programme and patient assessment for loss of liquid from the mouth. The same table noted a statistically significant difference between overall nurses' knowledge after the education programme and patient assessment of dyspraxia and breathlessness.

## Discussion:

Dysphagia is a common and potentially life-threatening complication in people suffering from an acute stroke. Dysphagia complications can result in aspiration pneumonia, morbidity, and death. As a result, early detection of dysphagia is critical for improving patient outcomes and minimising negative health implications. Nurses have a great opportunity to improve patient care by raising awareness about evidence-based dysphagia therapy for patients with acute ischemic stroke. (Liu et al., 2016). Therefore, the study was carried out in order to assess the effect of a dysphagia assessment education programme on nurses' knowledge and skills regarding early detection and prevention of aspiration in patients with stroke.

The majority of respondents to this study were under the age of 39, with female nurses predominating in terms of gender. This conclusion corresponds to the results of Hussain et al. (2021), who discovered that the bulk of their participants were female between the ages of 25 and 35. Also, Jones & Porterfield's (2019) research revealed that the majority of their participants were females. They evaluated nursing students' knowledge of the nursing role regarding dysphagia management. This was in contrast to previous findings by Knight et al. (2020), who stated that the majority of their sample was between the ages of 51 and 60.

The findings of the current study showed that the majority of participants didn't attend educational programs regarding assessment and early detection of dysphagia in patients with acute stroke. However, the majority of them have a bachelor's degree and are employed in an intensive care unit with six to ten years of work experience. This conclusion is in line with that of Rhoda and Pickel-Voight (2015), who discovered that while caring for stroke patients, most of their participants didn't attend any official training about dysphagia.

In relation to nurses' knowledge regarding assessment and early detection of dysphagia, the current study revealed that nurses had a poor level of knowledge prior to the implementation of an education programme and a good level of knowledge after the programme. There were statistically significant differences between the pretest and posttest levels of knowledge. This result is consistent with those of Jones and Porterfield (2019), who discovered that nursing students' understanding of PSD was poor and that there were statistically significant variations between their pretest and posttest scores.

The previous results are inconsistent with the findings of Knight et al. (2020), who found that nurses at all levels of health care had only moderate knowledge regarding the detection and

management of PSD. Similarly, **Behera et al. (2018)** and **Palli et al. (2017)** mentioned that nurses should have good knowledge regarding PSD for early detection and avoidance of complications. In the current study, poor baseline knowledge might be explained by the fact that nurses did not attend any courses or training about PSD.

The present study revealed that there are statistically significant differences between the nurses' level of knowledge pre- and post-implementation of the education programme in relation to definition, signs and symptoms, assessment of dysphagia, nursing, medical management, and patient complications. This conclusion is consistent with that of **Robertson (2017)**, who discovered a comparable outcome in her study and discovered that the participants were less aware of consequences among patients with dysphagia. Similar to **Sue Eisenstadt (2010)**, who found that it is crucial for nurses to recognise dysphagia and manage it because of the potential complications brought on by aspiration. Additionally, **Rhoda and Pickel-Voight (2015)**, who discovered that their participants had inadequate awareness of the management of dysphagia and a moderate understanding of its signs and symptoms, observed that their findings were congruent with the current study's findings.

The current study found that the majority of nurses had significantly poor levels of nursing performance prior to the implementation of the education programme and a good level of performance after the education programme. This finding was reinforced by **Liu et al. (2016)**, who stated that changes in nursing performance were related to dysphagia screening and management following the implementation of their education programme.

According to the findings of the current study, the introduction of an education programme enabled the majority of nurses to identify and detect aspiration in patients with stroke. The earlier studies are consistent with **Wangen et al. (2019)**, who discovered that the installation of a nursing-directed aspiration led to an improvement in nursing practice linked to risk screening with critically ill patients, lowering patient mortality from acquired aspiration.

The current study indicated that there is a substantial difference related to the degree of experience and certification of nurses and their level of knowledge and skills with regard to the connection between demographic characteristics and participants' knowledge and level of performance in dysphagia. The earlier findings are in line with those of several studies by **Ilott et al. (2013)** in England, **Cichero et al. (2016)** in Australia, and **Bernardes (2022)** in the USA, which have demonstrated that training may considerably increase understanding of dysphagia. Additionally, according to **Harper (2007)** and **Yeganeh et al. (2019)**, nurses with more experience score statistically significantly higher on knowledge tests than those with less experience. This is supported by a recent study, which demonstrates that experience caring for patients with stroke also plays a significant role in understanding complications and that nurses with training in the care of patients with stroke have a better degree of knowledge of problems. Dysphagia is a prevalent stroke consequence that raises the risk of aspiration pneumonia (Smith et al., 2019). As

a result, evidence-based guidelines advocate early dysphagia screening prior to oral ingestion of food, liquids, or medicines in patients with stroke (Donovan et al., 2013). Nurses play a vital role in the assessment and early detection of dysphagia in patients with stroke, so nursing education increases their level of knowledge and skills for dysphagia screening.

Finally, the current research supports the use of a dysphagia assessment education programme for nurses in order to detect and avoid aspiration and its associated consequences in patients with stroke.

## Conclusion

The current study focuses on nurses' knowledge and skills regarding dysphagia in patients with stroke. Based on the findings of this study, it could be reasonable to infer that the level of knowledge and skills of nurses were generally improved after the application of an education programme about dysphagia, aspiration, and other problems that might also be avoided with early identification.

## Recommendations:

The following recommendations can be made based on the current study's findings:

- Consider carrying out more research about the effect of dysphagia assessment education programmes on nurses' knowledge and skills regarding early detection and prevention of aspiration for patients with stroke.
- Prevention, assessment, and early identification of patients with acute stroke should be included in undergraduate courses to provide students with the essential information and competencies to recognise dysphagia in the ICUs and stroke units.
- Using a larger sample size and including a control group will improve the efficacy of this topic's research.
- Expanding the scope of knowledge in nursing regarding the evaluation and treatment of patients with neurological disorders.

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**Table (1): Distribution of the studied nurses according to their demographic and job data (n = 40)**

<b>Nurses' demographic and job data</b>	<b>No.</b>	<b>%</b>
<b>Age (years)</b>		
18–29	11	27.5
30–39	23	57.5
40–49	6	15.0
<b>Sex</b>		
Male	8	20.0
Female	32	80.0
<b>Qualification</b>		
Diploma	1	2.5
Technical nursing institution	8	20.0
Bachaoral	31	77.5
<b>Position</b>		
Bedside nurse	29	72.5
Head nurse	11	27.5
<b>Training program</b>		
Yes	7	17.5
No	33	82.5
<b>Experience</b>		
< 5 years	11	27.5
6-10 years	24	60.0
> 10 years	5	12.5
<b>Work place</b>		
ICU	24	60.0
Stroke ward	16	40.0

**Table (2): Distribution of the nurses' knowledge before and after implementation of education program about dysphagia for patients with acute stroke patients (n = 40)**

Nurses' knowledge about dysphagia	Before		After		Test of sig.	p
	No.	%	No.	%		
<b>Definition, signs and symptoms</b>						
Poor (<60%)	37	92.5	9	22.5	McN= 26.036*	<0.001*
Fair (60%-74%)	0	0.0	0	0.0		
Good (≥75%)	3	7.5	31	77.5		
<b>Questions about assessment of dysphagia</b>						
Poor (<60%)	37	92.5	1	2.5	MH= 74.50*	<0.001*
Fair (60%-74%)	2	5.0	5	12.5		
Good (≥75%)	1	2.5	34	85.0		
<b>Questions about nursing and medical management</b>						
Poor (<60%)	33	82.5	5	12.5	McN= 26.036*	<0.001*
Fair (60%-74%)	0	0.0	0	0.0		
Good (≥75%)	7	17.5	35	87.5		
<b>Questions about complication</b>						
Poor (<60%)	27	67.5	3	7.5	MH= 70.0*	<0.001*
Fair (60%-74%)	9	22.5	1	2.5		
Good (≥75%)	4	10.0	36	90.0		
<b>Overall Knowledge</b>						
Poor (<60%)	40	100.0	1	2.5	MH= 76.0*	<0.001*
Fair (60%-74%)	0	0.0	4	10.0		
Good (≥75%)	0	0.0	35	87.5		

**McN: McNemar test      MH: Marginal Homogeneity Test**

p: p value for comparing between pre and post

\*: Statistically significant at  $p \leq 0.05$

**Table (3):Presents the mean score percentage of nurses' knowledge before and immediately after implementation of education program about dysphagia**

Mean score percentage of nurses' level of knowledge	Before	After	Z	p
<b>Definition, signs and symptoms</b>				
<b>Total score</b>				
Min. – Max	0.0 – 4.0	0.0 – 4.0		
Mean ± SD.	0.98 ± 1.0	3.08 ± 1.02	5.197*	<0.001*
Median	1.0	3.0		
<b>Percent score</b>	24.38 ± 24.99	76.87 ± 25.56		
<b>Questions about assessment of dysphagia</b>				
<b>Total score</b>				
Min. – Max	0.0 – 5.0	2.0 – 5.0		
Mean ± SD.	0.88 ± 1.02	4.30 ± 0.79	5.571*	<0.001*
Median	1.0	4.0		
<b>Percent score</b>	17.50 ± 20.35	86.0 ± 15.82		
<b>Questions about nursing and medical management</b>				
<b>Total score</b>				
Min. – Max	0.0 – 4.0	1.0 – 4.0		
Mean ± SD.	1.23 ± 1.23	3.58 ± 0.78	5.415*	<0.001*
Median	1.0	4.0		
<b>Percent score</b>	30.63 ± 30.74	89.38 ± 19.52		
<b>Questions about complication</b>				
<b>Total score</b>				
Min. – Max	0.0 – 3.0	1.0 – 3.0		
Mean ± SD.	0.95 ± 1.06	2.83 ± 0.55	5.311*	<0.001*
Median	1.0	3.0		
<b>Percent score</b>	31.67 ± 35.37	94.17 ± 18.32		
<b>Overall Knowledge</b>				
<b>Total score</b>				
Min. – Max	0.0 – 8.0	9.0 – 16.0		
Mean ± SD.	4.03 ± 2.44	13.78 ± 1.73	5.522*	<0.001*
Median	4.0	14.0		
<b>Percent score</b>	<b>25.16 ± 15.28</b>	<b>86.09 ± 10.82</b>		

Z: Wilcoxon signed ranks test

p: p value for comparing between pre and post

\*: Statistically significant at  $p \leq 0.05$

**Table (4): Distribution of the nurses' skills level before and after education about acute stroke dysphagia screen (n=40)**

Nurses' level of performance about acute stroke dysphagia screen	Before		After		Test of sig.	p
	No.	%	No.	%		
Poor (<60%)	35	87.5	0	0.0	MH=76.0*	<0.001*
Fair (60%-74%)	3	7.5	3	7.5		
Good (≥75%)	2	5.0	37	92.5		
<b>Total score</b>					Z=5.599*	<0.001*
Min. – Max	0.0 – 4.0		3.0 – 5.0			
Mean ± SD.	1.35 ± 1.10		4.60 ± 0.63			
Median	1.0		5.0			
<b>Percent score</b>	27.0 ± 21.98		92.0 ± 12.65			

**MH: Marginal Homogeneity Test**

**Z: Wilcoxon signed ranks test**

p: p value for comparing between pre and post

\*: Statistically significant at  $p \leq 0.05$

**Table (5): Distribution of studied patients with acute stroke outcomes according to their nurses' assessment after implementation of education program**

Patient assessment outcomes	No.	%
Loss of liquid from the mouth	32	80.0
Dyspraxia or poor coordination of muscles	14	35.0
Cough	33	82.5
Breathlessness	13	32.5
Changes in voice quality after swallow	32	80.0
Early detection of patient aspiration	33	82.5

**Table (6): Relation between overall nurses' knowledge about acute stroke dysphagia assessment and their characteristics (n=40)**

Nurses' characteristics	N	Overall Knowledge (% score)			
		Before		After	
		Mean ± SD.	Median	Mean ± SD.	Median
<b>Age (years)</b>					
18–29	11	22.16 ± 16.38	18.75	84.09 ± 11.98	87.50
30–39	23	29.08 ± 15.15	31.25	88.86 ± 9.78	87.50
40–49	6	15.63 ± 8.62	15.63	79.17 ± 10.21	78.13
<b>H(p)</b>		<b>4.209 (0.122)</b>		<b>4.144 (0.126)</b>	
<b>Sex</b>					
Male	8	25.0 ± 13.77	18.75	83.59 ± 9.41	81.25
Female	32	25.20 ± 15.83	25.0	86.72 ± 11.20	87.50
<b>U(p)</b>		<b>127.50 (0.987)</b>		<b>98.500 (0.325)</b>	
<b>Qualification</b>					
Diploma	1	6.25		56.25	
Technical nursing institution	8	13.28 ± 12.69	12.50	92.97 ± 7.04	93.75
Bachaoral	31	28.83 ± 14.22	31.25	85.28 ± 9.89	87.50
<b>H(p)</b>		<b>8.300* (0.016*)</b>		<b>6.622* (0.036*)</b>	
<b>Position</b>					
Bedside nurse	29	25.86 ± 16.17	25.0	87.50 ± 10.70	87.50
Head nurse	11	23.30 ± 13.14	25.0	82.39 ± 10.76	81.25
<b>U(p)</b>		<b>146.0 (0.698)</b>		<b>113.00 (0.166)</b>	
<b>Training program</b>					
Yes	7	16.96 ± 8.63	18.75	81.25 ± 10.83	81.25
No	33	26.89 ± 15.89	31.25	87.12 ± 10.71	87.50
<b>U(p)</b>		<b>74.0 (0.147)</b>		<b>78.50 (0.192)</b>	
<b>Experience</b>					
< 5 years	11	22.16 ± 16.38	16.38	83.52 ± 11.62	87.50
6-10 years	24	28.12 ± 15.53	31.25	88.28 ± 10.48	87.50
> 10 years	5	17.50 ± 8.15	18.75	81.25 ± 9.88	81.25
<b>H(p)</b>		<b>2.466 (0.291)</b>		<b>2.659 (0.265)</b>	
<b>Work place</b>					
ICU	24	25.26 ± 14.68	25.0	81.51 ± 9.84	81.25
Stroke ward	16	25.00 ± 16.61	25.0	92.97 ± 8.50	93.75
<b>H(p)</b>		<b>190.00 (0.967)</b>		<b>66.500* (&lt;0.001*)</b>	

U: Mann Whitney test

H: H for Kruskal Wallis test

p: p value for comparison between the studied categories \* : Statistically significant at  $p \leq 0.05$

**Table (7): Relation between overall nurses' skills level of performance in their skills about assessment of dysphagia for patients with acute stroke and their socio demographic data (n = 40).**

Nurses' characteristics	N	Nurses' level of performance in their skills (% score)			
		Before		After	
		Mean ± SD.	Median	Mean ± SD.	Median
<b>Age (years)</b>					
18–29	11	29.09 ± 22.56	20.0	85.45 ± 12.93	80.0
30–39	23	28.70 ± 21.60	20.0	98.26 ± 5.76	100.0
40–49	6	16.67 ± 23.38	10.0	80.0 ± 17.89	80.0
<b>H(p)</b>		<b>1.959 (0.375)</b>		<b>14.189* (0.001*)</b>	
<b>Sex</b>					
Male	8	15.0 ± 14.14	20.0	97.50 ± 7.07	100.0
Female	32	30.0 ± 22.72	30.0	90.63 ± 13.43	100.0
<b>U(p)</b>		<b>78.00 (0.095)</b>		<b>94.50 (0.263)</b>	
<b>Qualification</b>					
Diploma	1	20.0		60.0	
Technical nursing institution	8	32.50 ± 18.32	40.0	100.0 ± 0.0	100.0
Bachaoral	31	25.81 ± 23.21	20.0	90.97 ± 12.48	100.0
<b>H(p)</b>		<b>1.205 (0.547)</b>		<b>7.745* (0.021*)</b>	
<b>Position</b>					
Bedside nurse	29	29.66 ± 22.44	20.0	93.10 ± 11.05	100.0
Head nurse	11	20.0 ± 20.0	20.0	89.09 ± 16.40	100.0
<b>U(p)</b>		<b>120.0 (0.241)</b>		<b>144.0 (0.654)</b>	
<b>Training program</b>					
Yes	7	17.14 ± 21.38	20.0	82.86 ± 17.99	80.0
No	33	29.09 ± 21.85	20.0	93.94 ± 10.59	100.0
<b>U(p)</b>		<b>76.50 (0.169)</b>		<b>74.0 (0.147)</b>	
<b>Experience</b>					
< 5 years	11	30.91 ± 22.56	40.00	85.45 ± 12.93	80.0
6-10 years	24	27.50 ± 21.11	20.00	97.50 ± 6.76	100.0
> 10 years	5	16.00 ± 26.08	0.0	80.0 ± 20.0	80.0
<b>H(p)</b>		<b>2.045 (0.360)</b>		<b>11.441* (0.003*)</b>	
<b>Work place</b>					
ICU	24	20.0 ± 18.65	20.0	87.50 ± 14.22	90.0
Stroke ward	16	37.50 ± 22.95	40.0	98.75 ± 5.0	100.0
<b>H(p)</b>		<b>100.0* (0.010*)</b>		<b>106.500-*(0.017*)</b>	

U: Mann Whitney test

H: H for Kruskal Wallis test

p: p value for comparison between the studied categories

\*: Statistically significant at  $p \leq 0.05$

**Table (8): Relation between overall nurses' knowledge about assessment and early detection of dysphagia and patients with acute stroke outcomes (n=40)**

Patient assessment outcomes	N	Overall Knowledge (% score)			
		Before		After	
		Mean $\pm$ SD.	Median	Mean $\pm$ SD.	Median
<b>Loss of liquid from the mouth</b>					
No	8	13.28 $\pm$ 10.26	12.50	82.03 $\pm$ 13.54	84.38
Yes	32	28.13 $\pm$ 14.98	28.13	87.11 $\pm$ 10.03	87.50
<b>U(p)</b>		<b>55.50* (0.012*)</b>		<b>100.0 (0.359)</b>	
<b>Dyspraxia or poor coordination of muscles</b>					
No	26	26.44 $\pm$ 14.72	28.13	88.70 $\pm$ 10.61	87.50
Yes	14	22.77 $\pm$ 16.56	18.75	81.25 $\pm$ 9.81	81.25
<b>U(p)</b>		<b>155.500 (0.457)</b>		<b>104.0* (0.027*)</b>	
<b>Cough</b>					
No	7	17.86 $\pm$ 15.49	18.75	83.04 $\pm$ 14.30	87.50
Yes	33	26.70 $\pm$ 15.01	25.00	86.74 $\pm$ 10.10	87.50
<b>U(p)</b>		<b>76.50 (0.169)</b>		<b>100.500 (0.601)</b>	
<b>Breathlessness</b>					
No	27	26.39 $\pm$ 14.43	25.00	88.43 $\pm$ 10.50	87.50
Yes	13	22.60 $\pm$ 17.22	18.75	81.25 $\pm$ 10.21	81.25
<b>U(p)</b>		<b>148.0 (0.441)</b>		<b>105.50* (0.042*)</b>	
<b>Changes in voice quality after swallow</b>					
No	8	18.75 $\pm$ 14.56	18.75	82.81 $\pm$ 13.26	84.38
Yes	32	26.76 $\pm$ 15.25	25.00	86.91 $\pm$ 10.21	87.50
<b>U(p)</b>		<b>90.0 (0.209)</b>		<b>105.000 (0.454)</b>	
<b>Early detection of patient aspiration</b>					
No	7	17.86 $\pm$ 15.49	18.75	83.04 $\pm$ 14.30	87.50
Yes	33	26.70 $\pm$ 15.01	25.00	86.74 $\pm$ 10.10	87.50
<b>U(p)</b>		<b>76.50 (0.169)</b>		<b>100.50 (0.601)</b>	

U: Mann Whitney test

p: p value for comparison between the studied categories

\*: Statistically significant at  $p \leq 0.05$