Effect of Early Dysphagia screening, Feeding Strategies and Oral Care on Occurrence of Stroke Associated Pneumonia among Critically Ill Patients with Acute Stroke

Shaimaa Magdy Abd El-Hamid, Clinical Instructor
Critical Care and Emergency Nursing, Faculty of Nursing, Damanhour University

Nadia Taha Ahmed, Professor
Critical Care and Emergency Nursing, Faculty of Nursing, Alexandria University

Intessar Mohamed Ahmed, Assistant Professor
Critical Care and Emergency Nursing, Faculty of Nursing, Damanhour University

Fatma Refaat Abd El-Fattah, Assistant Professor
Critical Care and Emergency Nursing, Faculty of Nursing, Alexandria University

Abstract

Background: *Stroke-Associated Pneumonia (SAP) is a serious complication of post stroke dysphagia. It is one of the most common post-stroke infections, affecting approximately 37.3% of stroke patients and is associated with an increased risk of hospital mortality, prolonged ICU stay.* ***Objective:*** *To determine the effect of early dysphagia screening, feeding strategies and oral care on occurrence of stroke associated pneumonia among critically ill patients with acute stroke.* ***Settings:*** *The study was carried out at the general ICUs at two different hospitals namely: The general ICU "I","II" at Damanhur Medical National Institute, The general ICU and stroke ICU at kafr El-dawar Hospital.* ***Subjects:*** *A convenience sample of 60 adults newly admitted critically ill patients with a diagnosis of acute stroke were included in the study.* ***Tools:*** *Four tools were used for data collection.* ***Tool(I)*** *was "Early dysphagia screening tool" Gugging Swallowing Screen (GUSS) in addition to patient's socio-demographic and clinical data.* ***Tool (II)*** *was feeding strategies intervention tool.* ***Tool (III)*** *was oral care checklist.* ***Tool (IV)*** *was" assessment of Stroke Associated Pneumonia" tool.* ***Results:*** *Findings of the present study revealed that 13.3% of the study group developed SAP compared to 40% of the control group with a statistically significant difference between the two groups (p=0.02).****Conclusion:*** *Combination of early dysphagia screening, feeding strategies and oral care practices significantly decrease SAP occurrence among patients in the study group compared to those patients in the control group with routine hospital care.* ***Recommendations:*** *Combination of early dysphagia screening, feeding strategies and oral care practices should be applied to critically ill patients with post stroke dysphagia.*

Keywords: Dysphagia screening, feeding strategies, Oral care, Stroke associated pneumonia, critically ill patients with acute stroke.

Introduction

Post stroke dysphagia (PSD)is a common comorbidity after acute stroke affecting 37 to 78% of all acute stroke patients. Critically ill patients with PSD are high risk for developing complications such as malnutrition, dehydration and stroke associated pneumonia(SAP)which is one of the most common post-stroke infections, affecting 10.1 and 37.3% of stroke patients and is associated with an increased risk of mortality, prolonged ICU stay (Daniels, Huckabee &

Gozdzikowska,2019;Smith, Kishore& Vail, 2015).

The accurate identification of PSD is the key for prevention of SAP. Post stroke dysphagia can be diagnosed instrumentally or non-instrumentally by bedside clinical swallow evaluation. Critical care nurses play an important role in the prevention of SAP. They are responsible for early dysphagia screening which should be accomplished as soon as possible within the first 24 hours after admission and before oral intake. The Gugging Swallowing Screen is a reliable clinical method for detection of dysphagia and aspiration risk in patients with acute stroke. It has been validated against fiber-optic endoscopy (Suiter, Daniels& Barkmeierr et al.,2020; Trapl et al., 2007).

The provision of certain feeding strategies is a corner stone for PSD management. Texture modified diet is generally provided to reduce the risk for aspiration. Providing texture modified diet or enteral feeding must be based on severity of dysphagia (Sukkar, Maggi & Travalca Cupillo et al., 2018).

Post stroke dysphagia creates an environment in the oral cavity that is prone to bacterial overgrowth, which greatly increases the risk of infection. for this reason, oral care for critically ill patients with PSD must be fundamental and a care priority. Effective oral care improves cleanliness, removing debris and plaque and prevents complications such as aspiration pneumonia (Brewer, 2019).

Early screening for post stroke dysphagia in acute stroke patients is recommended because it foster prophylactic strategies against SAP. Researches study the effect of early dysphagia screening, feeding strategies and oral care on occurrence of SAP among critically ill patients with acute stroke are needed. Therefore, this study was conducted.

Aims of the Study

This study aims to Determine the effect of early dysphagia screening, feeding strategies and oral care on occurrence of stroke associated pneumonia among critically ill patients with acute stroke.

Research hypotheses

Patients who are subjected to early dysphagia screening, feeding strategies and oral care exhibit low incidence of SAP than those who are not subjected.

Materials and Method

Materials

Research design*:*

A quasi experimental research design was used to conduct this study.

Settings:

This study was carried out in the general ICUs at two different hospitals namely: The general ICU "I","II" at Damanhur Medical National Institute, The general ICU and stroke ICU at kafr El-dawar Hospital.

Subjects:

- A convenience sample of 60 adults newly admitted critically ill patients with a acute stroke were included in the study based on Epi-Info program according to the following parameter: confidence coefficient 95%, expected frequency 50%, margin of error 5%, the final sample size was 60, they were divided randomly into two groups 30 study patients, 30 control patients.

Inclusion criteria:

- Patients who were diagnosed with acute stroke.
- Patients with moderate or severe dysphagia.
- Patients who were more than 18 years old.

- Patients admitted within the first 24hours after stroke symptom onset.
- Patients who had Modified National Institute of Health Stroke Scale (NIHSS) grade more than 3.

Tools: In order to collect the necessary data for the study, four tools were used:

Tool(I):"Early dysphagia screening tool" Gugging Swallowing Screen (GUSS). This tool was adopted from (Trapl et al., 2007). It was used by the researcher to assess the severity of dysphagia. It is composed of two tests:

Test one (indirect swallowing test) was used to evaluate the ability to maintain vigilance for 15 min, produce a voluntary cough and successfully swallow saliva without voice change or drooling. The scoring system of each subset is pathologic items (0 point) and physiologic items (1 point). The maximum score (5) must be attained to continue to the next test.

Test two (direct swallowing screening test) was used to evaluate swallowing performance; it consists of three subtests, starting with semisolid test followed by liquid test then solid test. In each subset the following was assessed

1. Deglutition and it was scored using a numerical scale (swallowing not possible "0", swallowing delayed "1", swallowing successful"2").
2. Involuntary coughing, drooling, voice change during swallowing and was scored using a dichotomous scale of (Yes "0"and No"1").

The score of each subset of this test maximum 5 points and the total score of this test = 15. The GUSS is designed as a scoring system from 0 to 20 that classifies levels of dysphagia severity.

In addition to patient's socio-demographic and clinical data. It included patient's age, gender, date of ICU admission, date, time of dysphagia screening. clinical data such as admission medical diagnosis (stroke type), stroke site, stroke severity using modified NIHSS etc.,

Tool (II): "feeding strategies intervention tool", This tool was adopted from (Trapl et al.,2007; IDDSI,2016). It was used to apply the suitable feeding strategies based on dysphagia severity.

Tool (III): " oral care checklist ", This tool was adapted from (Sheffler, 2014). It was used to perform and observe oral care.

Tool (IV): " Assessment of stroke Associated Pneumonia" This tool was adopted from the diagnostic criteria formulated by the Chinese Expert Consensus on Diagnosis and Treatment of SAP 2010; it was used to assess the occurrence of SAP.

Method:

- Approval from the ethical committee, Faculty of Nursing Alexandria University was obtained.
- An official letter was obtained from the Faculty of Nursing and was sent to hospital administrative authorities to conduct the study with explanation of the aim of the study.
- An official approval to carry out the study was obtained from the hospital administrative authorities to collect the necessary data from the selected settings.
- Tool (I, III) was developed by the researcher after reviewing the related literature.
  - The study tools were submitted to 5 jury of experts in the field of study to assess content validity. The necessary modifications were done accordingly.
  - Pilot study was carried out on patients (10% of the sample) in order to assess feasibility of the study and applicability of the tools. The necessary modifications were done accordingly.
  - Reliability of the tool was measured using Cronbach alpha, the reliability coefficient values was (r =0.89).
  - Patients who met the inclusion criteria were assigned randomly into two equal groups, control and study, 30 patients in each.

- All patients included in the study were assessed for pneumonia in admission by chest X-ray. Absence of pneumonia on admission was a necessary baseline in order to accurately determine the impact of the intervention.
- The **Control group** was subjected to early dysphagia screening using the GUSS then routine care used in the study settings (feeding strategies, oral care) was observed for the seven consecutive days after admission.
- The **intervention group** was screened using the GUSS (tool I) to assess severity of dysphagia. Based on the level of dysphagia severity different feeding strategies were given according to the diet recommendations of the GUSS using tool II, patients with moderate dysphagia were given feeding via nasogastric tube and given supplementation (pureed food). Patients with severe dysphagia were NPO and supplementation was given via nasogastric tube. Oral care procedure was performed by the researcher using tool III. It was done twice daily by the researcher.
- The study and control patients were assessed for seven consecutive days for the occurrence of stroke associated pneumonia by using tool four.

Statistical analysis:

After data were collected, they were coded and transferred into specially designed formats so as to be suitable for computer feeding. Following data entry, checking and verification processes were carried out to avoid any errors during data entry, frequency analysis, cross tabulation and manual revision were all used to detect any errors. The statistical package for social sciences (SPSS version 20) was utilized for both data presentation and statistical analysis of the results. The level of significance selected for this study was P equal to or less than 0.05.

Ethical considerations:

- Witness informed written consent was obtained from head nurses for observation and intervention in this study after appropriate explanation of the study purpose.
- Written informed consent was obtained from patients' family for their participation and right to refuse of their patients' participation in the study was assured. Patients' privacy was respected.
- Anonymity and data confidentiality were assured during implementation of the study

Results

Table (I) represents the distribution of the studied groups as regard age, gender and clinical data. The table shows that more than half of the study group (53.3%) were females compared to 56.7% of the control group. In relation to age, most of the study and control groups (90, 83.3%) were ranged between 51 and less than 60 years old. As regards stroke type, most of patients in the studied groups were diagnosed as ischemic stroke; representing 76.7% of the study group and 83.3% of the control group with no significant difference between the two groups (P=0.52).

Concerning stroke severity using modified NIHSS, it can be notice that 40% of the study group had severe stroke compared to 56.7% of the control group. There was no significant discrepancy between the two groups (P=0.43). As regards duration between admission and dysphagia screening, more than two third of the study group (73.3%) were screened for dysphagia during the first four hours of admission. While, 43.3% of the control group of patients were screened between (15–19) hours of admission. There was a statistically significant difference between the two groups in this regard (p=<0.001).

Table (II) illustrates the distribution of the studied groups as regard dysphagia screening (GUSS score).Concerning indirect swallowing test, the table reveals that the Mean ± SD score was 5.0 ± 0.0 for study group and 4.80 ± 0.55 for the control group with no statistically significant difference between the two groups (p=0.06). As regards direct swallowing test, the table shows that the Mean ± SD score for semisolid test was 3.37± 1.27 for study group and 3.40± 3.40 for the control group and the Mean ± SD score for liquid test was1.63 ± 0.74 for study group and 2.22 ± 0.97 for the control group with no statistically significant difference between the two groups (p=0.94, 0.173). Regarding sum of indirect and direct swallowing test, the Mean ± SD score was 8.90 ± 2.01 for patients in the study group compared to7.73 ± 3.34 for patients in the control group with no statistically significant difference between the two groups (p=0.14).Regarding dysphagia severity, the table shows that 26.7% of the study group had moderate dysphagia compared to 30% of the control group. It can be noticed from the table that more than two third of the study and control group (73.3%, 70%) respectively had severe dysphagia with no significant difference between the two groups (P=0.77) in this regard.

Table (**III**) shows the distribution of the studied patients with severe dysphagia regarding nasogastric tube feeding. It can be noticed that all the studied patients with severe dysphagia in both groups took nasogastric tube feeding during the study.

Table (IV) shows distribution of the studied patients with moderate dysphagia regarding\ feeding strategies and reassessment by GUSS before feeding. It can be noticed that all the studied patients with moderate dysphagia in both groups took nasogastric tube feeding during the study period. The table reveals that the entire study group with moderate dysphagia were reassessed by initial part of GUSS before each meal during the study period compared to 0% of the control group with a significant difference between the two groups in this regard (p<0.001).

The table also reveals that 100% of the patients with moderate dysphagia in the study group took supplementary food (Puree food) compared to 22.2% of the control group who took (only yogurt) with a statistically significant difference between the two groups (p =0.002). The table also shows that all the patients with moderate dysphagia in the study group took(thickened liquid, crushed pills mixed with puree food).While all the patients in the control group didn't take thickened liquids, crushed pills mixed with puree food during the study period with a statistically significant difference between the two groups in these regards (p <0.001,<0.001) respectively. It can be also noticed that 100% of the study group took no liquid (Medications, water) compared to 77.8% of the control group with no statistically significant difference between the two groups (p= 0.47).

Table (V) illustrates the distribution of the studied groups as regard oral care. It shows that the entire study group were undergone all the steps of oral care. It can be noticed that upright positioning, Inspection of mouth and brushing with 0.12% chlorhexidine were performed for 16.7 % of the control group. Concerning brushing the teeth with toothpaste, suctioning as needed and rinsing the mouth, it was not performed for 100% of the control group. As regards using lips moisturizer, it was performed for only 3.3% of the control group. The table reveals a significant difference between the two groups (p <0.001) in all the steps of oral care.

Table (VI)shows the distribution of the studied groups regarding signs, symptoms and occurrence of stroke associated pneumonia through assessment of the diagnostic criteria formulated by the Chinese Expert Consensus on diagnosis of SAP at the seven days of the study. Regarding fever, 26.7% of the study group developed fever compared to 56.7% of the control group. The difference was statistically significant (p <0.018). Concerning cough, 13.3% of the study group developed cough compared to 46.7% of the control group with a statistically

significant difference between the two groups (p <0.005).As regards Pulmonary consolidation, 13.3% of the study group developed pulmonary consolidation compared to 50% of the control group with a statistically significant difference between the two groups (p <0.002). Regarding elevated WBCs count, 33.3% of the study group had elevated WBCs count compared to 63.3% of the control group with a statistically significant difference between the two groups (p <0.020).Concerning newly emerging lesions or progressively infiltrating lesions in post-stroke chest images,13.3% of the study group developed infiltration in chest x ray compared to 40% of the control group with a statistically significant difference between the two groups (p <0.020).Regarding SAP occurrence, the table shows that 13.3% of the study group developed stroke associated pneumonia compared to 40% of the control group with a statistically significant difference between the two groups in relation to occurrence of SAP (p=0.020).

Discussion

Critically ill patients with post stroke dysphagia are at risk for SAP. Preventing of SAP is one of the essential care elements of post stroke care. There for, appropriate PSD diagnosis and management by the ICU team is the recommended standard of care for SAP prevention (Patel, et al., 2020)

The current study reveal that more than half of the study and control group were females This may be because female patients especially after menopause are more likely to have stroke risk factors than male patients .so that they have a greater risk for PSD. This finding is in agreement with a study done by Ebrahim et al., (2018). They found that more than half of the study sample were females with no statistically significant difference.

Finding of the recent study shows that most of the study and control group were ranged between 51 and less than 60 years old with Mean ± SD (55.75±6.08). This could be explained by the fact that stroke event rates increase substantially in the oldest age groups.This finding is in the same line with a published study done by Titsworth et al., (2013), who concluded that there was no significant difference between the studied patients regarding age.

Finding of the current study reveal that the most encountered stroke type among critically ill patients with acute stroke was ischemic stroke. This is in accordance with the published information from the American Heart Association about stroke types that ischemic strokes comprise the highest percent (87%) among stroke patients. This finding is in the same line with a published study done by Rohweder et al., (2015) who concluded that majority of patients had an ischemic stroke.

Regarding dysphagia severity, finding of the current study reveal that more than two third of the study and control groups of patients had severe dysphagia with no significant difference between both groups. These findings are because of the increased severity of stroke among acute stroke patients included in the study which is associated with increased dysphagia severity in addition exclusion of patients with mild dysphagia. Similar finding was documented by Teuschl, et al., (2018) who found there was no significant difference between the studied groups regarding severity of dysphagia.

The current study revealed the occurrence of SAP decreased significantly among patients in the study group after application the intervention. These findings may be attributed the combination of early dysphagia screening, feeding strategies and oral care in the management of acute stroke patients with post stroke dysphagia.

Regarding early dysphagia screening, finding of the current study show that there was a statistically significant relation between EDS and prevention of SAP. This may be because early detection of PSD fosters prophylactic strategies against aspiration such as a nil-per-os status, nasogastric tube feeding, dietary modifications thereby can reduce aspiration and hence the rate of SAP. These findings are supported by a study done Palli et al., (2017). who found that the training of nurses

to perform GUSS in acute stroke patients lead to a significant lower rate of SAP compared with standard dysphagia testing by speech language therapist during routine working hours only. On the other side, there are controversial results reported by a study conducted by Hoffmeister et al., (2013) who found that EDS is not significantly associated with SAP reduction.

Concerning, feeding strategies, the current study findings reveal that the occurrence of SAP decreased significantly among study group patients after application of the intervention. This suggest that application of certain feeding strategies is effective in prevention of SAP. This may be attributed to the effect of texture modified diet (TMD) for patients with moderate dysphagia in reducing the risk of aspiration as a result reduction SAP occurrence. As swallowing TMD elicits a longer period of longer bolus transit times, improves timelines of swallow reflex initiation relative to the bolus arriving in the pharynx and improves airway protection, also providing enteral feeding for patients with severe dysphagia reduce the risk of aspiration.

Findings of the current study are in agreement with li et al., (2015) who reported that the incidence of pneumonia decreased significantly after application of feeding management on patients with dysphagia. These findings are not in the same line with the findings of Teuschl et al., (2018) who found that the rate of SAP was not lower significantly in the group of patients fed with GUSS dietary recommendations.

Regarding, oral care practices, the current study reveals that the occurrence of SAP decreased significantly among study group patients after application of the intervention. This suggested that oral care (tooth brushing and the use of 0.12% chlorhexidine mouth wash) prevented build-up of oral bacteria. Regular cleaning ensured good clearance of gram-negative bacteria among patients.

Results of the current study are in the same line with Wagner et al., (2015). They conducted a study in USA to examine the relation between oral care and risk of SAP. They compared the proportion of SAP in acute stroke patients before and after implementation of a systematic oral health care program. They showed that an oral hygiene care program that involved nursing-assisted brushing in addition to mouthwash caused a significant reduction in the incidence of SAP in the intervention group assigned to oral hygiene care program compared to controls. On the other side, there are controversial results reported by Prasad et al., (2019) who conducted a study to evaluate the effect of daily manual tooth brushing with 0.12% chlorhexidine on pneumonia in adults living with profound neural disability. They concluded that no significant changes in pneumonia.

Conclusion

Based upon the findings of the current study, it could be concluded that combination of EDS, feeding strategies and oral care practices significantly decrease SAP occurrence among patients in the study group compared to those patients in the control group with routine hospital care. There was a statistically significant relation between dysphagia severity, stroke severity and occurrence of SAP.

Recommendations

In line with the findings of the study, the following recommendations are made:

1. Screen critically ill patients with acute stroke for PSD by CCNs using GUSS as early as possible within the first 24 hours after admission.
2. Tailor the combination of early dysphagia screening (EDS), feeding strategies and oral care practices based on the nature of critically ill patients with PSD illness, resources and available policies and procedures in the clinical settings.

Table I: Distribution of the studied groups as regard age, sex and clinical data

Age, gender and clinical data	Study group (n=30)		Control group (n=30)		Total (n = 60)		Test of sig. χ^2	P
	No.	%	No.	%	No.	%		
Gender Female Male	16 14	53.3 46.7	17 13	56.7 43.3	33 27	55 45	0.07	0.79
Age (years) 41–50 51–60+	3 27	10 90	5 25	16.7 83.3	8 52	13.3 86.7	0.58	0.70
Mean ± SD.	56.63±5.42		54.87±6.66		55.75±6.08		t=1.13	0.26
Stroke type Ischemic stroke Hemorrhagic stroke	23 7	76.7 23.3	25 5	83.3 16.7	----		0.42	0.52
Stroke severity (NIHSS) Moderate Moderate – Severe Severe	6 12 12	20 40 40	4 9 17	13.3 30 56.7	------		1.69	0.43
Duration between admission & dysphagia screening (hrs.) 0– 4 5–9 10–14 15–19 20–24	22 4 0 0 4	73.3 13.3 0 0 13.3	0 1 10 13 6	0 3.3 33.3 43.3 20	-----		64.57*	^{MC}p <0.001*

χ^2: Chi square test SD: standard deviation t**:** student t test*: Statistically significant at $p \leq 0.05$

Table (II): Distribution of the studied groups as regard dysphagia screening (GUSS score) and dysphagia severity

Gugging swallow screening	Study group (n=30)		Control group (n=30)		Test of sig.	P
	Mean ± SD.		Mean ± SD.			
Indirect swallowing test	5.0 ± 0.0		4.80 ± 0.55		t= 1.99	0.06
Direct swallowing test						
Semisolid test	3.37± 1.27		3.40± 3.40		t= 0.075	0.94
Liquid test	1.63 ± 0.74		2.22 ± 0.97		t= 1.431	0.173
Sum of indirect and direct swallowing test	8.90 ± 2.01		7.73 ± 3.34		t=1.520	0.14
Dysphagia severity	**NO**	**%**	**NO**	**%**		
Moderate dysphagia Severe dysphagia	8 22	26.7 73.3	9 21	30 70	χ^2 0.08	0.77

t: Student t-test SD: standard deviation χ^2: Chi square test p: p *: Statistically significant at $p \leq 0.05$

Table (III): distribution of the studied patients with severe dysphagia regarding feeding strategies

Feeding strategies	Severe dysphagia			
	Study group (n=22)		Control group (n=21)	
	No.	%	No.	%
NPO + Nasogastric tube feeding				
Yes	22	100	21	100
No	0	0	0	0

Table (IV): distribution of the studied patients with moderate dysphagia regarding feeding strategies and reassessment by GUSS before feeding

feeding strategies	Patients with moderate dysphagia				Test of Sig. χ^2	$^{p}_{FE}$p for the 7 days
	Study group		Control group			
	No (n = 8)		No (n = 9)			
	No.	%	No.	%		
NGT feeding						
Yes	9	100	8	100		
No	0	0	0	0	-	-
Reassessment by GUSS before each meal						
Yes	8	100	0	0	17.0*	<0.001*
No	0	0	9	100		
supplementary food						
Puree food (or yogurt)						
Yes	8	100	2	22.2	10.58*	0.002*
No	0	0	7	77.8		
Thickened liquids						
Yes	8	100	0	0	17.0*	<0.001*
No	0	0	9	100		
Crushed pills mixed with puree						
Yes	8	100	0	0	17.0*	<0.001*
No	0	0	9	100		
No liquid (Medications, water)						
Yes	8	100	7	77.8	2.01	0.47
No	0	0	2	22.2		

t: Student t-test SD: standard deviation χ^2: **Chi square test** p: p value for comparing between the studied groups *: Statistically significant at $p \leq 0.05$

Table (V): distribution of the studied groups as regard oral care

Oral care steps	Study (n=30)		Control (n=30)				Test of Sig. χ^2	^{FE}p for the 7 days
	Done		Done		Not done			
	No.	%	No.	%	No.	%		
1.Upright positioning	30	100	5	16.7	25	83.3	42.86*	<0.001*
2.Inspection of mouth	30	100	5	16.7	25	83.3	42.86*	<0.001*
3.Using water to moisten toothbrush	30	100	0	0	30	100	60*	<0.001*
4.Applying toothpaste to toothbrush	30	100	0	0	30	100	60*	<0.001*
5. Brushing the teeth with toothpaste	30	100	0	0	30	100	60*	<0.001*
6.Angle brush at 45 to gingival margins	30	100	0	0	30	100	60*	<0.001*
7.Suctioning accumulated secretion	30	100	0	0	30	100	60*	<0.001*
8.Rinsing the mouth	30	100	0	0	30	100	60*	<0.001*
9. Brushing with 0.12% Chlorhexidine	30	100	5	16.7	25	83.3	42.86*	<0.001*
10.Applying lip moisturizer	30	100	1	3.3	29	96.7	56.13*	<0.001*

χ^2: **Chi square test** FE**: Fisher Exact**

p: p value for comparing between the studied groups *: Statistically significant at $p \leq 0.05$

Table (VI) Distribution of the studied groups regarding signs, symptoms and occurrence of stroke associated pneumonia

signs, symptoms and occurrence of stroke associated pneumonia	Study (n=30)		Control (n=30)		Test of sig.	P
	No.	%	No.	%		
Fever						
Yes	8	26.7	17	56.7	χ^2= 5.554*	0.018*
No	22	73.3	13	43.3		
Mean ± SD.	37.47± 0.19		38.33± 0.28		t=13.973*	<0.001*
Cough						
Yes	4	13.3	14	46.7	χ^2= 7.937*	FEp= 0.005*
No	26	86.7	16	53.3		
Pulmonary consolidation						
Yes	4	13.3	15	50	χ^2= 9.320*	FEp= 0.002*
No	26	86.7	15	50		
WBC ≥ 10×109/L or ≤ 4×109/L						
Yes	10	33.3	19	63.3	χ^2= 5.406*	FEp= 0.020*
No	20	66.7	11	36.7		
Mean ± SD.	8725.00± 794.24		10566.67± 978.06		t=8.006*	<0.001*
infiltrating lesions in chest x ray						
Yes	4	13.3	12	40	χ^2= 5.455*	0.020*
No	26	86.7	18	60		
SAP occurrence						
Yes	4	13.3	12	40	χ^2= 5.455*	0.020*
No	26	86.7	18	60		

t: Student t-test χ^2: Chi square test FE: Fisher Exact *: Statistically significant at p ≤ 0.05

SAP: stroke associated pneumonia

References

- Brewer, W. (2019). Nursing Staff Approaches to Providing Oral Hygiene in Stroke Survivors with Dysphagia: A Grounded Theory Study (Doctoral dissertation, The University of Alabama at Birmingham).

- Chinese Expert Consensus Group on Diagnosis and Treatment of stroke-associated pneumonia (2010). Chinese expert consensus on diagnosis and treatment of stroke-associated pneumonia, Chin J, 49, 1075–1077.

- Daniels, S. K., Huckabee, M. L., & Gozdzikowska, K. (2019). *Dysphagia following stroke*. Plural Publishing.

- EBRAHIM, A. & Mohamed, Y. W (2018). Dysphagia Related Health Consequences among Patients with Acute Stroke in Cairo, Egypt. The Medical Journal of Cairo University, 86(December), 4159-4167.

- Hoffmeister L, Lavados PM, Comas M, Vidal C, Cabello R, Castells X. (2013). Performance measures for in-hospital care of acute ischemic stroke in public hospitals in Chile. BMC Neurol; 13:23.

- International Dysphagia Diet Standardization Initiative. (2016). Complete IDDSI framework: Detailed definitions.

- Li, M., Wang, Z., Han, W. J., Lu, S. Y., & Fang, Y. Z. (2015). Effect of feeding management on aspiration pneumonia in elderly patients with dysphagia. Chinese Nursing Research, 2(2-3), 40-44.

- Palli, C., Fandler, S., Doppelhofer, K., Niederkorn, K., Enzinger, C., Vetta, C., & Gattringer, T. (2017). Early dysphagia screening by trained nurses reduces pneumonia rate in stroke patients: a clinical intervention study. Stroke, 48(9), 2583-2585.

- Patel, U. K., Kodumuri, N., Dave, M., Lekshminarayanan, A., Khan, N., Kavi, T., ... & Jani, V. (2020). Stroke-associated pneumonia: a retrospective study of risk factors and outcomes. The neurologist, 25(3), 39-48.

- Prasad, R., Daly, B., & Manley, G. (2019). Effect of daily manual toothbrushing with 0.2% chlorhexidine gel on pneumonia-associated pathogens in adults living with profound neuro-disability. Access Microbiology, 1(10).

- Rohweder, G., Ellekjær, H., Salvesen, Ø., Naalsund, E., & Indredavik, B. (2015). Functional outcome after common poststroke complications occurring in the first 90 days. Stroke, 46(1), 65-70.

- Sheffler, K. (2014). Oral Care Procedures for the Dependent Patient.https://www.swallowstudy.com/oral-care-aspiration-pneumonia-prevention/

- Smith, C. J., Kishore, A. K., Vail, A., Chamorro, A., Garau, J., Hopkins, S. J., & Roffe, C. (2015). Diagnosis of stroke-associated pneumonia: recommendations from the pneumonia in stroke consensus group. Stroke, 46(8), 2335-2340.

- Suiter, D. M., Daniels, S. K., Barkmeier-Kraemer, J. M., & Silverman, A. H. (2020). Swallowing Screening: Purposefully Different from an Assessment Sensitivity and Specificity Related to Clinical Yield, Interprofessional Roles, and Patient Selection. American Journal of Speech-Language Pathology, 29(2S), 979-991.

- Sukkar, S. G., Maggi, N., Travalca Cupillo, B., & Ruggiero, C. (2018). Optimizing texture modified foods for oro-pharyngeal dysphagia: a difficult but possible target? Frontiers in nutrition, 5, 68.

- Teuschl, Y., Trapl, M., Ratajczak, P., Matz, K., Dachenhausen, A., & Brainin, M. (2018). Systematic dysphagia screening and dietary modifications to reduce stroke-associated pneumonia

rates in a stroke-unit. PloS one, 13(2), e0192142.

- Titsworth, W. L., Abram, J., Fullerton, A., Hester, J., Guin, P., Waters, M. F., & Mocco, J. (2013). Prospective quality initiative to maximize dysphagia screening reduces hospital-acquired pneumonia prevalence in patients with stroke. Stroke, 44(11), 3154-3160.

- Trapl, M, Enderle,P, Nowotny, M, Teuschl,Y , Matz,K,Dachenhausen, A& Brainin, M, (2007).Dysphagia bedside screening for acute-stroke patients: the Gugging Swallowing Screen. Stroke, 38, 2948–2952.

- Wagner, C., Marchina, S., Deveau, J. A., Frayne, C., Sulmonte, K., & Kumar, S. (2016). Risk of stroke-associated pneumonia and oral hygiene. Cerebrovascular diseases, 41(1-2), 35-39.