Effect of Designed Educational Program on Nurses' Performance regarding Prevention of Aspiration Pneumonia for Patients with Stroke

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Abstract

Background: Nurses are pivotal in the management of patients with stroke, particularly in the prevention of aspiration pneumonia, a common and serious complication resulting from dysphagia. The knowledge and performance of nursing staff are crucial for optimizing patient outcomes in these vulnerable patients. **Aim**: This study aimed to evaluate the effect of a designed educational program on nurses' performance regarding prevention of aspiration pneumonia for patients with stroke. **Methods**: A quasi-experimental design was employed at Stroke Unit of Beni-Suef University Hospital, engaging a cohort of 40 nurses. **Data collection** involved a self-administered questionnaire, a knowledge assessment, and an observational checklist, administered before and after the targeted educational program. **Results**: Initial assessments revealed that nurses exhibited inadequate clinical performance related to aspiration pneumonia management. However, following the implementation of the educational program, there was a marked improvement in both knowledge and practice with p value (0.004, 0.005 respectively. **Conclusion & Recommendations**: The results underscore the profound impact that designed educational initiatives can have on augmenting nurses' knowledge and performance in preventing aspiration pneumonia among stroke patients. Healthcare institutions are encouraged to establish continuous education and training programs centered on stroke care and aspiration pneumonia prevention, thereby ensuring high-quality care for at-risk patients.

Keywords: Aspiration Pneumonia, Dysphagia, Educational Program, Nurses, Performance, Stroke.

Introduction

Stroke occurs approximately every five minutes and is characterized by the disruption of cerebral blood flow due to either vascular occlusion or hemorrhage, leading to ischemic or hemorrhagic stroke, respectively. This interruption results in neuronal injury, permanent brain damage, long-term disability, or mortality. Ischemic strokes—caused by emboli or thrombotic occlusion of cerebral arteries—constitute most stroke cases. Conversely, hemorrhagic strokes result from vascular rupture or leakage, causing intracranial bleeding and increased intracranial pressure that further damages brain tissue **(Centers for Disease Control and Prevention CDC, 2024).**

A significant post-stroke complication is aspiration pneumonia—an acute pulmonary infection resulting from the inhalation of oropharyngeal or gastric contents, often due to impaired swallowing mechanisms. This condition is notably prevalent in stroke patients and is exacerbated by advanced age, gender, dysarthria, denture use, and cerebral atrophy. The occurrence of post-stroke pneumonia is associated with increased morbidity and mortality, despite medical advancements **(Getie et al., 2024).**

Dysphagia, a frequent neurological manifestation in stroke patients, significantly heightens the risk of aspiration and subsequent pneumonia due to impaired cough reflexes and reduced immune function. Dysphagia is defined as difficulty in transporting food or liquid from the oral cavity to the stomach and may present as odynophagia (pain during swallowing) or globus sensation (a persistent feeling of a lump in the throat) **(Dziewas et al., 2021).**

Stroke-associated pneumonia (SAP), typically occurring within the first seven days post-stroke, has a reported incidence ranging from 6.7% to 37.98%. It represents a critical determinant of post-stroke mortality, largely due to the high prevalence of dysphagia in this patient population. Neurological injury from stroke can impair the motor functions responsible for safe swallowing. Additionally, factors such as reduced consciousness, improper patient positioning (e.g., supine posture), and diminished muscular strength associated with aging contribute to increased aspiration risk **(Guo et al., 2022; Lidetu et al., 2023).**

The diagnostic criteria for aspiration pneumonia in stroke patients include the presence of at least three of the following: febrile state (>38°C),

productive cough with purulent sputum, abnormal respiratory examination (e.g., tachypnea >22 breaths/min, tachycardia, crackles, bronchial breath sounds), chest radiographic abnormalities, hypoxemia on arterial blood gas analysis, leukocytosis, and clinical indicators of aspiration as confirmed by swallowing assessments **(Sluis et al., 2024)**.

Proactive identification of aspiration risk is a cornerstone of effective prevention strategies. Nurses, as frontline providers, are instrumental in recognizing early signs of aspiration and implementing timely interventions. Their continuous monitoring and clinical judgment are vital in mitigating the onset of aspiration-related complications **(Urden, et al., 2022).**

Evidence-based preventive measures include thorough swallowing assessments, adherence to rigorous oral hygiene protocols, safe practices for feeding and enteral nutrition, and appropriate patient positioning. Notably, postural modifications—such as reclining the patient—may leverage gravity to aid bolus movement, thereby reducing aspiration risk. Research highlights that specific head and neck positions can significantly influence swallowing efficacy and should be incorporated into clinical protocols **(Liu, et al., 2022).**

Nurses play an essential role in multidisciplinary stroke care, particularly in monitoring secondary complications. Without standardized, evidence-informed guidelines, stroke patients face a greater likelihood of clinical deterioration, hospital readmission, and extended hospital stays. Given the complex rehabilitation needs of stroke survivors, it is imperative to equip nurses with specialized training. However, current literature indicates a limited availability of structured educational programs specifically designed to enhance nursing competencies in stroke management and aspiration pneumonia prevention **(Zhao, et al., 2024).**

Aim of the study:

This study aimed to evaluate the effect of a designed educational program on nurses' performance regarding prevention of aspiration pneumonia for patients with stroke.

Research Hypotheses

The present study hypothesizes that the implementation of a designed educational program will lead to significant improvements in nurses' mean score of knowledge and clinical practice related to the prevention of aspiration pneumonia among patients with stroke.

Subjects and Methods

Research Design

A quasi-experimental design (pretest and posttest) was utilized to achieve the aim of the current study.

Setting

The study was conducted at Stroke Unit of Beni-Suef University Hospital. It is located on the 4th floor; 1st room containing 8 beds intensive care unit and 2nd room contains 8 beds for intermediate care.

Subjects

Convenience sampling of all available nurses (40 nurses) were working at the previous setting and caring for stroke patients. They were both genders and willing to participate in the study.

Data Collection Tools

Tool I: Nurses' Self-Administered Knowledge Questionnaire

This tool was adapted from **Aitken et al. (2023) and Morton (2023)** and comprised two main sections.

Part I: Collected Demographic data of Participating Nurses, including age, gender, educational background, years of experience, and prior participation in relevant training programs.

Part II: Assessed nurses' knowledge related to aspiration pneumonia prevention among stroke patients. The questionnaire covered key domains such as the definition, types, and complications of stroke; and the etiology, risk factors, diagnostic criteria, complications, and preventive strategies for aspiration pneumonia.

Scoring System:

Each correct response was scored as 1, and incorrect responses were scored as 0. The questionnaire consisted of 38 items. The total scoring system of nurses' knowledge was based on statistical review as the following: A score of ≥90% (i.e., ≥34.2 points) was categorized as satisfactory level of knowledge, while a score of <90% was deemed unsatisfactory.

Tool II: Nurses' Observational Checklist

Adapted from **Renton et al. (2019); Perry et al. (2020); and Wilkins (2022)**, this tool assessed the practical skills of nurses in four key domains: oral hygiene, oropharyngeal suctioning, enteral feeding, and adherence to nursing precautions aimed at minimizing aspiration risk.

Scoring System:

The total scoring system of nurses' practices was based on statistical review as the following: A score of ≥90% (≥68.4 points) was considered competent practice; scores below this threshold were classified as incompetent practice.

Tool Validity and Reliability

The content validity of the data collection instruments was reviewed and confirmed by a panel of five experts in medical-surgical and critical care nursing, who assessed the tools for clarity, relevance, and comprehensiveness.

Reliability was evaluated using Cronbach's alpha, yielding acceptable internal consistency:

Knowledge questionnaire: $\alpha = 0.71$

Practice checklist: $\alpha = 0.79$

Pilot Study

A pilot study involving four nurses (excluded from the final sample) was conducted to evaluate the feasibility, clarity, and applicability of the instruments. The results confirmed that the tools were user-friendly, relevant, and appropriate for the target population.

Data Collection Procedure

The study was conducted over three months (November 2024 – February 2025) and followed a structured three-phase design. Prior to implementation, official approvals were obtained from the medical and nursing administration at Beni-Suef University. Informed consent was secured from all participating nurses after a full explanation of the study's purpose. Data collection occurred during alternating morning and afternoon shifts, at least three days per week.

Phase One: Baseline Assessment and Program Design

A comprehensive needs assessment was conducted using the study tools to identify baseline knowledge and performance levels. The research team conducted indirect observations of nurses while caring for post-stroke patients, ensuring realistic and unbiased assessments. Nurses then completed the self-administered questionnaire, which took approximately 20–30 minutes.

Findings from this phase informed the development of a competency-based educational program, tailored to address the specific knowledge deficits and practice gaps identified. The curriculum design was also supported by a review of recent, evidence-based literature.

Phase Two: Educational Program Implementation

The intervention consisted of a structured, interactive educational program delivered in six sessions:

-Two sessions focused on theoretical content

-Three sessions emphasized practical skills

-One final session provided a summary and reinforcement of key concepts

Each session lasted 30–45 minutes and included a review of prior content, stated objectives, and interactive discussion based on

participant feedback. Researchers conducted 2–3 sessions per day.

An Arabic-language educational booklet was distributed to enhance understanding and retention. The booklet addressed stroke pathophysiology, dysphagia, aspiration pneumonia, and relevant nursing interventions, including oral care, suctioning, enteral feeding, and aspiration precautions.

A total of 40 nurses participated, divided into eight subgroups of 4–6 members. Training sessions were held within the nursing department in collaboration with the head nurse and conducted during regular working hours to accommodate staff schedules.

Instructional Methods: Multiple educational techniques were employed to maximize engagement and learning, including:

-Illustrated booklets and audiovisual materials (photos, videos, PowerPoint slides)

-Mini-lectures and small-group discussions

-Demonstrations and return demonstrations

-Role-playing scenarios

Motivational strategies such as verbal praise and positive reinforcement were used to sustain participant motivation throughout the program.

Phase Three: Post-Intervention Evaluation

Immediately following program completion, nurses were re-evaluated using the same knowledge and practice tools employed in the pre-intervention phase. This allowed for direct comparison and assessment of program effectiveness. The analysis focused on identifying improvements in knowledge acquisition and clinical practice competence in relation to aspiration pneumonia prevention in stroke patients.

Statistical Analysis

The data collected were analyzed using IBM SPSS software version 26.0. Following data entry, a thorough examination and verification were undertaken to ensure accuracy. Descriptive statistics including means (M), standard deviations (SD), and frequencies/percentages were computed to summarize demographic data and pre- and post-test results. Paired t-tests were conducted to compare pretest and posttest results for knowledge, clinical performance, and reality shock. Statistical significance was determined at the 5% ($p<0.05$).

Ethical Considerations:

Ethical approval for the study was secured from the Ethics Committee of the Faculty of Nursing at Beni-Suef

University and Beni-Suef University Hospital prior to the commencement of data collection (ApprovalNo:FNBSURECP/2811202412). Written informed consent was obtained from all participants, confirming their voluntary participation in the study. Rigorous ethical protocols were adhered to throughout the research process to safeguard participant confidentiality. The participating nurses were fully informed of their right to withdraw from the study at any point without any repercussions. All personal data collected were treated as confidential and accessible exclusively to the research team. The protection of participants' privacy and the maintenance of anonymity were prioritized as fundamental ethical principles throughout the study.

Result

Table 1: Demographic characteristics of Nurses

-Age and gender: All nurses (100%) were predominantly young (mean age 27.1±5.7 years), with 77.5% aged 20–30. Females slightly outnumbered males (55% vs. 45%)

-Education: Most nurses held diploma-level training (67.5% had a technical nursing institute certificate), only 25% had a bachelor's degree and 2.5% higher degrees.

-Experience: Nearly half (47.5%) had <3 years of stroke-unit experience; 30% had ≥5 years.

-Prior training: Very few had prior relevant training – only 3 nurses (7.5%) had attended an aspiration-pneumonia prevention course.

Table 2. Comparison between nurses' level of knowledge regarding Prevention of Aspiration Pneumonia for Patients with Stroke pre and immediately post-implementation of the educational program

-Dysphagia and aspiration pneumonia knowledge: nurses' knowledge regarding dysphagia rose from 20% pre-program to 72.5% post-program (p=0.001), similarly aspiration-pneumonia knowledge improved from 25% to 75% (p=0.003).

-Basic knowledge about stroke increased from 30% to 67.5%, and knowledge of prevention rose from 32.5% to 85%. However, these changes did not reach statistical significance (p=0.436 and p=0.479, respectively).

-Overall knowledge jumped markedly from 22.5% before the program to 87.5% after. This overall increase was highly significant (p=0.004).

Table 3. Total Mean knowledge scores pre and post educational program

-Subscale scores: Mean scores improved significantly in every knowledge domain. All these within-subject comparisons were highly significant ($p \leq 0.001$).

-Total score: The overall mean knowledge score rose from 21.57±10.82 pre-program to 35.55±2.84 post-program ($p<0.001$).

Table 4. Comparison between nurses' level of practice regarding Prevention of Aspiration Pneumonia for Patients with Stroke pre and immediately post-implementation of the educational program

-Nurse proficiency improved in all practice areas, though statistical significance varied. The percentage with oropharyngeal suction practice rose from 15% to 70% ($p=0.003$). Similarly, practices related to preventive precautions increased from 20% to 82.5% ($p=0.001$). These gains were statistically significant.

-Oral care practice increased from 20% to 75% and **enteral feeding** from 25% to 90%. Although these absolute improvements were large, they did not reach significance in this sample ($p=0.495$ and $p=0.700$, respectively).

Total practice rose from 20% pre-program to 85% post-program. This overall increase was highly significant ($p<0.001$).

Table 5. Comparison between mean practice score differences between pre, and post implementation of educational program

Mean practice scores increased significantly across all domains. For **oral care**, the mean scores increased from 14.60±5.47 to 21.80±1.74. **Oro-pharyngeal suction** improved from 12.35±4.25 to 17.83±1.45 **enteral feeding** went from 11.15±4.10 to 16.05±2.04 and **precaution** score from 13.00±4.40 to 17.73±0.96 after program implementation. All p-values were ≤0.001, indicating robust improvements.

-The total practice score significantly increased from 51.13±17.33 pre educational program to 73.40±3.96 post educational program ($t=9.379$, $p<0.001$).

Figure 3. Comparison between total satisfactory level of knowledge and practice pre- and immediately post-implementation of the educational program. Figure 3 highlights that both cognitive and skill outcomes improved dramatically. Before the program, only ~22.5% of nurses had satisfactory overall knowledge and ~20% had competent practice; after the program implementation, these

proportions rose to ~87.5% and ~85%, respectively.

Table 6. Correlation between nurses' knowledge and practice regarding prevention of aspiration pneumonia and demographic data

Nurses' educational level showed strong positive correlations with performance. For example, pre-program knowledge score correlated with education (r=0.500, p=0.001) and post-program knowledge (r=0.407, p=0.009). Similarly, post-program practice was higher among better-educated nurses (r=0.502, p=0.001). These findings imply that nurses with higher formal qualifications tended to achieve higher knowledge and practice scores.

Table 7. Correlations between nurses' total level of knowledge and total level of practices through two phases of the study Shows that; there was positive and significant statistical correlation between total knowledge and practice scores of studied nurses pre and post educational program implementation with p value=(0.003&0.000,respectively)

Part I: Demographic characteristics of the study nurses.

Table (1): Percentage distribution of the studied nurses' characteristics (n=40).

Items	N	%
Age group 20<30 years	31	77.5%
30<40 years	6	15%
≥ 40 years	3	7.5%
Mean ±SD=27.125±5.72		
Gender Male.	18	45%
Female.	22	55%
Educational level Diploma.	2	5%
Technical institute.	27	67.5%
Bachelor.	10	25%
Higher degrees.	1	2.5%
Years of experience in stroke Unit Less than 3 years.	19	47.5%
3 less than 5years.	9	22.5%
≥5.	12	30%
Mean ±SD=	1.8250±0.87376	
Attendance training courses regarding the Prevention of Aspiration Pneumonia Yes	3	7.5%
No	37	92.5%

Part II: Nurses' Knowledge Regarding the Prevention of Aspiration Pneumonia for Patients with Stroke Pre and Immediately Post -Implementation of the Educational Program.

Table (2): Comparison between nurses' level of knowledge regarding Prevention of Aspiration Pneumonia for Patients with Stroke pre and immediately post-implementation of the educational program (n=40).

Item	Level of knowledge				Chi-square	P value
	Pre-program		Immediately Post			
	N	%	N	%		
First: Nurses' basic knowledge about stroke	12	30%	27	67.5%	15.212	0.436
Second: knowledge regarding dysphagia (definition, causes, diagnosis, prevention and nursing care).	8	20%	29	72.5%	33.598	0.001
Third: knowledge regarding aspiration pneumonia (definition-diagnosis, causes, complication and prevention)	10	25%	30	75%	93.499	0.003
Fourth: knowledge regarding prevention of aspiration pneumonia for stroke patients.	13	32.5%	34	85%	17.6647	0.479
Total level of knowledge	9	22.5%	35	87.5%	139.170	0.004

Significant at p value ≤0.05

Table 3. Comparison between mean knowledge score differences between pre, and post implementation of educational program.

Item	Knowledge			
	Pre	Post		
	Mean ±SD	Mean ±SD	*T test*	*P value*
Basic knowledge about stroke	2.275±2.24	4.500±0.82	-6.801	0.000**
Knowledge regarding dysphagia	4.225±2.57	7.550±0.88	-8.499	0.000**
Aspiration pneumonia	9.725±5.72	15.775±1.86	-7.078	0.000**
Prevention of aspiration pneumonia for stroke patients.	5.250±2.57	7.725±0.72	-6.621	0.000**
Total	21.57±10.82	35.550±2.84	-8.76	0.000**
T Paired samples t-test, ** Statistically significant at p ≤0.001				

Part III: Nurses' Level of Practice regarding Prevention of Aspiration Pneumonia for Patients with Stroke pre and immediately post implementation of the educational program (n= 40)

Table (4): Comparison between nurses' level of practice regarding Prevention of Aspiration Pneumonia for Patients with Stroke pre and immediately post-implementation of the educational program (N=40).

Item	Level of practice				X2 test	P value
	Pre-program		Immediately Post			
	N	%	N	%		
1- oral care	8	20%	30	75%	51.450	0.495
2-oro-pharygneal suction.	6	15%	28	70%	84.126	0.003
3-enteral feeding	10	25%	36	90%	49.046	0.700
4-precaution for prevention of aspiration pneumonia	8	20%	33	82.5	88.00	0.001
Total level of practice	8	20%	34	85%	360.556	00.005

Significant at p value ≤0.05

Table 5. Comparison between mean practice score differences between pre, and post implementation of educational program.

Item	Practice			
	Pre	Post		
	Mean±SD	**Mean±SD**	**T test**	**P value**
Oral care	14.6±5.47	21.8±. 1.74	-8.692	0.000**
Oro-pharyngeal suction	12.35±4.25	17.83±1.45	-9.238	0.001**
Enteral feeding	11.15±4.10	16.05±2.04	-7.904	0.000**
Precaution	13.0± 4.397	17.73±.96	-7.519	0.000**
Total	51.13 ±17.328	73.4±3.96	-9.379	0.000**
T Paired samples t-test,	** Statistically significant at p ≤0.001			

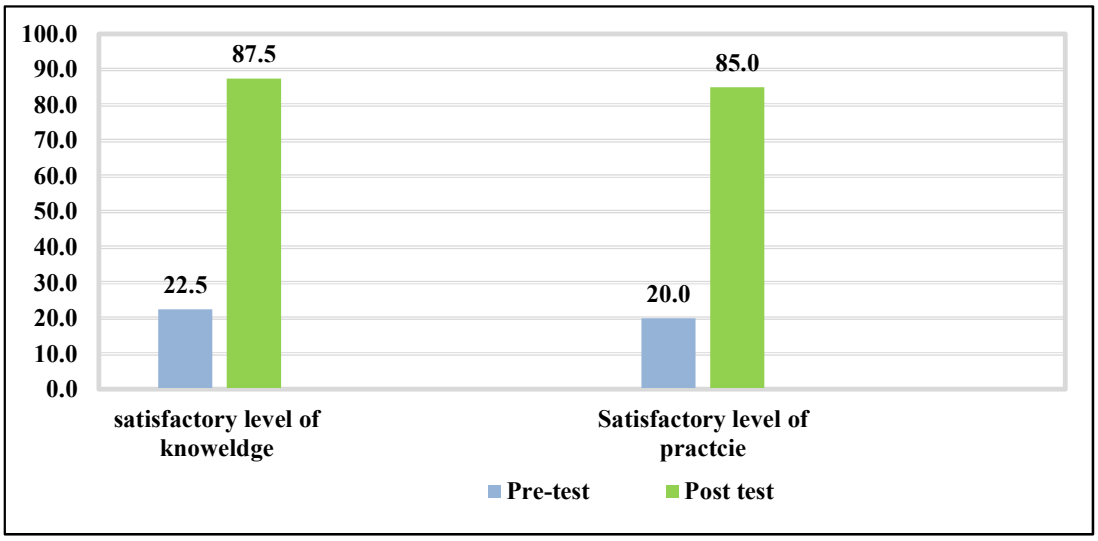

Figure (3): Comparison between total satisfactory level of knowledge and practice pre- and immediately post-implementation of the educational program n=40

Part IV: Correlations between study variables.

Table (6): Correlation between nurses' knowledge and practice regarding prevention of aspiration pneumonia and demographic data (n=40).

Items	Knowledge				Practice			
	Pre		Immediately post		Pre		Immediately post	
	r	P	r	P	r	P	r	P
Age	.063	.700	.098	.547	.072	.657	.101	.535
Gender	.182	.262	.052	.750	.164	.310	.205	.205
Educational level	.500**	.001	.407**	.009	.374*	.017	.502**	.001
Years of experience	.013	.934	.033	.842	.006	.971	.039	.812
Previous training course	.246	.126	.046	.779	.053	.743	.168	.299

r Pearson Correlation Statistically significant at P ≤ 0.005

Table (7): Correlations between nurses' total level of knowledge and total level of practices through two phases of the study (n=40).

Periods	Variables		
		r	P
Pre –program	Knowledge &Practice	0.457*	.003*
Post –program	Knowledge &Practice	.658	.000**

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Discussion

This study aimed to evaluate the effectiveness of a structured educational program on enhancing nurses' knowledge and clinical performance in preventing aspiration pneumonia among patients with stroke. The discussion is structured into four primary areas: demographic characteristics of the study sample, knowledge levels, clinical practice performance, and the correlation between knowledge and practice.

1. Demographic Characteristics of the Studied Nurses

The study included 40 nurses, with the majority (over two-thirds) aged between 20 and 30 years. This demographic distribution aligns with findings from **Ismail et al. (2022),** who also reported a predominance of younger nurses in similar educational interventions. The high representation of newly graduated nurses may be attributed to the demanding nature of intensive care unit (ICU) work, which tends to be assigned to younger personnel due to their physical endurance and recent training. Additionally, most participants were graduates of technical nursing institutes.

In terms of gender, slightly more than half of the nurses were female. This result is consistent with Abd **El-Hamid et al. (2021),** reflecting the ongoing gender distribution trends within the nursing profession.

Regarding educational qualifications, approximately two-thirds of the participants held diplomas from technical institutes, a finding differing from **Ismail et al. (2022),** who reported a majority with nursing diplomas. This discrepancy may be influenced by institutional policies at Beni-Suef University Hospital, where graduates from local

technical institutes are often appointed directly and restricted from working in other healthcare sectors.

Most of the nurses had fewer than five years of experience in stroke care, which is in agreement with **Abd-Alla et al. (2016)**. This could be due to high staff turnover in critical care environments, as well as the recruitment of recently graduated nurses to manage staffing shortages.

The vast majority of participants had not attended prior training programs on aspiration pneumonia prevention, highlighting a critical gap in ongoing professional development. This lack of training underscores the necessity of structured educational interventions and reflects similar findings by **Ebraheim et al. (2024)**, who identified insufficient access to training on cerebrovascular care among nursing staff.

2. Nurses' Knowledge Before and After Program Implementation

The study demonstrated significant improvements in nurses' knowledge following the educational intervention. Prior to the program, fewer than one-third of the participants exhibited satisfactory knowledge related to stroke and aspiration pneumonia prevention. This percentage rose to over two-thirds immediately after program completion.

These findings support those of **Abd-Alla et al. (2016)** and **Ebraheim et al. (2024)**, both of whom documented similar gains in knowledge post-intervention. The improvement is likely due to the appropriateness of the educational content, the use of engaging and accessible teaching strategies, and the availability of an Arabic-language educational booklet that reinforced learning.

Knowledge gains were particularly notable in areas related to dysphagia and aspiration pneumonia, with the proportion of nurses demonstrating satisfactory knowledge increasing from less than one-third to approximately two-thirds. These results are in alignment with **Behairy et al. (2022)**, who also reported significant improvements in post-intervention knowledge of dysphagia and associated complications.

3. Clinical Practice Performance

Significant improvements were also observed in nurses' clinical practice post-program. prior to the intervention, fewer than one-quarter of participants demonstrated competent practice in essential procedures such as oral care and aspiration prevention. Post-intervention, this percentage increased to more than two-thirds,

indicating marked improvement in clinical competency.

These results are consistent with those reported by **Seedat and Penn (2016)**, as well as **Behairy et al. (2022)**, both of whom highlighted the effectiveness of educational programs in improving nurses' procedural competencies.

A substantial improvement was also noted in enteral feeding practices, where performance improved from one-quarter to over two-thirds post-intervention. This suggests that hands-on training, particularly through demonstration and re-demonstration, was effective in translating knowledge into practice. Moreover, the lack of previous training and procedural guidelines may have contributed to the pronounced learning gains.

Overall, the study revealed a statistically significant enhancement in total clinical practice performance corroborating the findings of **Abd-Alla et al. (2016)**, who similarly reported improved practice scores following educational interventions.

4. Correlation Between Knowledge and Practice

Post-intervention analysis revealed a statistically significant positive correlation between knowledge acquisition and clinical practice performance. This finding aligns with Syahrun et al. (2022), who also identified a direct association between increased nursing knowledge and improved clinical application.

The results of this study support the initial hypothesis that structured, simulation-based educational programs are effective in enhancing both the knowledge and clinical practice of nurses in aspiration pneumonia prevention.

Conclusion

The implementation of a structured educational program had a significant positive impact on nurses' performance—both in terms of knowledge and clinical practice—regarding the prevention of aspiration pneumonia among stroke patients. The findings affirm the study hypothesis and demonstrate that targeted educational interventions are effective in bridging knowledge-practice gaps in critical care nursing.

Recommendations

-Expansion and Scaling: Reapplication of the study on a larger and more diverse sample is recommended to validate and generalize the findings.

-Institutional Integration: Hospitals, particularly those with stroke units, should integrate similar educational programs into their continuing professional development strategies.

-Development of Resources: Establishment of procedural manuals and readily accessible educational materials in the local language could further support sustainable learning and improve care outcomes.

-Regular Training: Periodic refresher courses and simulation-based workshops should be implemented to ensure sustained competency among nursing staff.

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The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Author Contribution

The author expresses gratitude to GS for their contributions to the research study, and data collection. NM. conducted the literature review, WK performed statistical analysis, AS helped design the study, contributed to data acquisition, and all authors approved the final version, agreeing to be accountable for all aspects of the work.

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