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Cerebrovascular Accident: Impact of Educational Intervention Program on Patients' Knowledge and Practice Regarding Shoulder Care

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Abstract:

Background: Cerebrovascular accident is a leading cause of long-term disability, often resulting in shoulder complications like subluxation and pain, which hinder rehabilitation and reduce quality of life. Despite the importance of proper shoulder care, many patients lack the knowledge and skills to manage these issues effectively. **Aim:** To evaluate the impact of an educational intervention program on patients' knowledge and practices regarding cerebrovascular accident shoulder care. **Research Design:** A quasi-experimental research design was utilized. **Setting:** The study was conducted in the neurology department at Assiut Neurology, Psychiatry, and Neurosurgery University Hospital. **Sample:** Sixty stroke patients with shoulder complications were randomly assigned to a study group which received an educational intervention with a booklet, or a control group which received routine care. **Tools:** Three tools were used for data collection; **Tool I:** Patient Assessment Sheet. **Tool II:** Knowledge and Practice Evaluation Form. **Tool III:** Shoulder Care Educational Intervention Program (Teaching Booklet). **Results:** No significant differences were found between groups at baseline. Post-intervention, knowledge improved from 30.1% to 85.3% and practice from 28.7% to 81.5% in the study group ($p < 0.001$), with gains sustained at three-month follow-up. **Conclusion:** The educational intervention program effectively improved patients' knowledge and practices related to shoulder care. **Recommendations:** Educational intervention programs should be incorporated into stroke rehabilitation protocols. Booklets should be distributed, and further research is needed to explore scalability and long-term effects.

Keywords: Cerebrovascular accident, Educational Intervention & Shoulder Care.

Introduction

Cerebrovascular accident (CVA) is a serious global health concern, recognized as the main cause of long-term impairment and the second largest cause of mortality globally. According to the World Health Organization **(WHO, 2021),** it estimates that 15 million people experience CVA annually. In Egypt, the burden is particularly high, with a crude prevalence rate of 963 per 100,000 people **(Mohammed et al., 2022).**

The WHO defines CVA as the sudden rapid onset of clinical signs of focal or global disruption in brain function that lasts more than twenty-four hours or results in death and has no discernible cause other than a vascular origin. The Global Stroke Factsheet (2022) highlights a concerning trend: one in four persons are now predicted to have a cerebrovascular accident (CVA) in their lifetime, and the lifetime risk of stroke has grown by 50% during the previous 17 years **(Meneci et al., 2021).**

A stroke, also known as a cerebrovascular accident, happens when the brain's blood supply is cut off or interrupted. About 85% of all strokes are ischemic strokes, which are usually brought on by big artery atherosclerosis, cerebral small vessel disease, or cardio-embolism. Although they are less frequent, hemorrhagic strokes are caused by blood vessels rupturing and leaking into the brain. Both kinds have the potential to cause fatalities, permanent incapacity, or serious brain damage. Clinical symptoms include sensory deficiencies, visual problems, verbal impairments, and mild weakness to severe paralysis **(Murphy & Werring, 2020).**

Shoulder dysfunction, including pain, subluxation, and spasticity, is one of the most common and incapacitating side effects after a cerebrovascular accident. Between 16% and 72% of CVA survivors experience hemiplegic shoulder pain (HSP), which can significantly impede their ability to recover. HSP has a complex etiology that includes joint instability, muscular weakness, and altered tone. One of the most prevalent causes of pain and functional restrictions is subluxation, or partial dislocation of the shoulder joint **(Arya et al., 2021).**

Effective prevention and management of post- CVA shoulder complications are essential for optimizing

recovery. Early intervention, particularly through education and awareness, plays a critical role. Nurses are essential in early detection, preventing complications, and rehabilitation since they frequently have the first interactions with patients who have had a cerebrovascular accident. They provide patient education, emotional support, and coordination with multidisciplinary teams in addition to clinical care **(Abd El-Hady et al., 2022).**

Despite the importance of nursing care, research conducted in Egypt has revealed that a lack of nursing practice and understanding is the root cause of many CVA-related issues. This gap directly impacts the quality of care and patient outcomes. The WHO emphasizes the significance of evidence-based nursing practice and ongoing professional development to ensure high-quality care **(Sherief et al., 2022).**

Educational interventions have gained attention as a critical component of stroke rehabilitation. Programs that combine verbal instruction, printed materials, and demonstration techniques cater to different learning styles and improve knowledge retention. **(Sjattar et al., 2022).** highlighted that patients who received structured education showed significant improvements in both knowledge and adherence to rehabilitation exercises. These findings suggest that knowledge directly influences practice, especially in long-term stroke care.

There is an urgent need for organized educational interventions because of the high incidence of CVA and its related consequences, especially shoulder dysfunction. These programs can improve therapeutic results, lessen the burden of disability, and empower both nurses and patients. The quality of life for CVA survivors can be greatly enhanced by including such strategies into standard care **(Greenberg et al., 2022).**

Significance of the study

Cerebrovascular accident is a leading cause of long-term disability, with shoulder complications such as subluxation, spasticity, and muscle weakness being among the most common and debilitating outcomes. These impair functional recovery, prolong hospitalization, and increase healthcare costs and mortality risk.

Clinical experience gained over 15 years across leading institutions including Kasr Al-Ainy Hospital, Al Salam International Hospital, and Hamad Medical Corporation has consistently shown that many stroke patients lack awareness of proper rehabilitation techniques, particularly in shoulder care, leading to poor self-care and delayed recovery. Prior to data collection, field visits and discussions with patients and staff at Assiut University Hospital confirmed these gaps in knowledge and practice. This study evaluates the effectiveness of a structured educational intervention aimed at improving patients' knowledge and practices regarding shoulder care post-CVA

Findings are expected to support the integration of evidence-based educational programs into standard rehabilitation protocols, empowering nurses to deliver more effective, patient-centered care and enhancing long-term outcomes for stroke survivors.

The aim of the current study:

To evaluate the impact of an educational program on patients' knowledge and practices regarding cerebrovascular accident shoulder care.

Research hypothesis:

- Patients with cerebrovascular accident who receive the educational program will exhibit significantly higher knowledge scores regarding shoulder care compared to those in the control group.
- Patients with cerebrovascular accident who receive the structured educational intervention will demonstrate significantly improved shoulder care practices compared to those in the control group.

Methods:

Research design:

Quasi-experimental (study – control) research design was utilized to conduct this study.

Setting:

This study was carried out in the neurology department at Assiut Neurology,

Psychiatry and Neurosurgery University Hospital.

Duration

Data collection took place From July 2023 to February 2024, with an additional three-month follow-up period ending in May 2024.

Sample

A purposive sample of 60 male and female patients diagnosed with CVA and admitted to the neurology department was selected for the study. Patients ranged in age from 18 to 65 years. Inclusion criteria required that patients be adults and conscious. Patients with prior physical disabilities affecting the shoulder were excluded.

Participants were randomly assigned to either the study or control group using a shuffled deck of cards, with even numbers allocated to the control group and odd numbers to the intervention group. The study group received a structured shoulder care educational intervention in addition to routine hospital care, while the control group received routine care only.

Sample size:

According to **Thompson, (2012)**, the study sample was selected 60 cases selected using a purposive sampling technique and determined with a 95% confidence level.

The total population included patients hospitalized

with stroke at Assiut Neurology, Psychiatry, and Neurosurgery University Hospital during the study period. The calculation was based on the following equation:

$$n = \frac{N \times p(1-p)}{\left[N-1 \times \left(d^2 \div z^2\right)\right] + p(1-p)}$$

N is the total number of patients (60 cases) who during the study period. Z = confidence levels (0.95, corresponding to 1.96).
D = error ratio equals 0.05.
P = property availability ratio, and neutral equals 0.50.

Study Tools

Tool I: Patient Assessment Sheet This tool was developed by the researcher after reviewing relevant literature to assess the conditions of stroke patients. It consisted of two parts :

Part (1): Demographic Data: Includes information such as age, gender, educational level, occupation, and marital status.

Part (2): Medical Data: Covers medical diagnosis, stroke duration and onset, comorbidities, and causes.

Tool II: Knowledge and Practice Evaluation Form This tool was used to evaluated patients' knowledge and practices related to stroke and shoulder care. The **knowledge component** comprised eight items covering the definition, causes, risk factors, signs and symptoms, complications, prevention, management, and diagnosis of stroke. Each response was scored as completely correct (2), partially correct (1), or incorrect (0), with a total possible score of 0–16. Knowledge levels were classified as satisfactory (≥12 points, 75%) or unsatisfactory (<12 points).

The **practice component** assessed performance of 10 shoulder care exercises aimed at improving flexibility, strength, and mobility. Exercises included shoulder shrug, adduction, clock and turn exercises, flexion, back scratch, wall pushups, child position, external rotation, and reaching up. Each exercise was rated as completely correct (2), partially correct (1), or not done/incorrect (0), yielding a total score from 0–20. Practice levels were categorized as adequate (≥15 points, 75%) or inadequate (<15 points).

Tool III: Shoulder Care Educational Intervention (Teaching Booklet) A structured teaching booklet was developed in simple Arabic to enhance patient understanding and promote active engagement in shoulder care post-stroke. The content was grounded in current evidence-based guidelines and included an overview of stroke and its implications, shoulder joint protection and positioning techniques to prevent complications such as subluxation and pain, illustrated rehabilitation exercises designed to improve mobility and function, and pain management strategies. To ensure accuracy, clarity, and cultural relevance, the content was reviewed and validated by a panel of five experts comprising neurologists, clinical nurse specialists, and physiotherapists.

Validity

To ensure content validity, all study tools were reviewed by a panel of five experts in the fields of neurology, nursing, and physiotherapy. Their feedback was used to improve clarity, relevance, and cultural appropriateness. Internal consistency and reliability of the knowledge and practice components were evaluated during the pilot phase and found to be acceptable.

Reliability

The internal consistency and reliability of the tools were assessed during a pilot study. Expert validation confirmed content appropriateness, and reliability coefficients indicated acceptable consistency for both the knowledge and practice components with a Cronbach's alpha coefficient of ($\alpha = 0.75$).

Pilot Study

A pilot study was conducted on 6 patients, representing 10% of the total sample, to assess the clarity, feasibility, and applicability of the data collection tools and educational intervention. As no significant modifications were necessary, pilot study were included in the main study.

Ethical consideration

Ethical approval for this study was obtained from the Ethics Committee of the Faculty of Nursing, Assiut University (Approval No. 1120230580, Date: 26-02-2023). Additional administrative permissions were granted by the hospital. Informed consent, either written or verbal was obtained from all participants after a thorough explanation of the study's purpose, procedures, and their rights. Participants were assured of the confidentiality and anonymity of their data, and they were informed of their right to withdraw from the study at any time without any consequences to their medical care.

Procedure

The study was conducted in three main phases:

Preparatory Phase: Development of study tools and educational materials.

Implementation Phase:

The researcher began by introducing himself to each patient, explaining the study's purpose, and establishing rapport. Individual communication was conducted to obtain verbal consent for participation.

Baseline data, including demographic and clinical characteristics, were collected using Tool I.

The control group received routine hospital care and routine nursing care for the affected shoulder.

The study group received the same routine care in addition to shoulder care educational program,

supported by a patient booklet in simple Arabic. The booklet included clear visual illustrations and evidence-based content covering CVA awareness, shoulder joint protection, rehabilitation exercises, and pain management strategies.

The educational program was delivered in three structured sessions, each lasting 30–45 minutes during the morning and evening shifts, and held on three separate days during hospitalization:

First Session (Initial Assessment): Provided early during admission. Covered stroke definition, causes, complications, and general shoulder care instructions including arm positioning, subluxation prevention, and pain control. Ended with a Q&A segment.

Second Session (Day 4–7 post-stroke): Reinforced previous content. Focused on practical demonstration and supervised practice of rehabilitation exercises to enhance shoulder mobility and strength. Included education on daily living activities, hygiene, nutrition, and rest.

Third Session (Before Discharge): Reviewed all content and emphasized home self-care. Covered safe mobility, daily activities, long-term pain management, and complication awareness. Family members were also included to ensure proper support post-discharge.

Follow-up was conducted through scheduled outpatient visits and regular phone calls to monitor progress, reinforce education, and support adherence to home rehabilitation.

Evaluation Phase: Post-intervention assessments of knowledge and shoulder care practices were conducted immediately after the sessions and again at a three-month follow-up, Tool II: Knowledge and Practice Evaluation Form was used to measure changes in patients' understanding and application of shoulder care techniques. Data were collected through face-to-face interviews and observation during hospital visits and follow-up appointments. Phone interviews were also conducted for patients who could not attend in person.

Statistical Analysis

Data were analyzed using SPSS version 26. Descriptive statistics summarized the sample, while chi-square and independent t-tests compared groups. A significance level of $p < 0.05$ was used. Pearson's correlation assessed associations between variables.

Results

Table (1): Demographic Data Distribution among Study and Control Groups (n= 60)

Variables	Study group (n=30)		Control group (n=30)		X2	P.value
	N	%	N	%		
Age						
20 < 28 years	0	0.0	1	3.3	4.800	.308 **Ns**
28 < 38 years	0	0.0	2	3.3		
38 < 48 years	4	6.7	1	3.3		
48 < 58 years	10	16.7	10	16.7		
58 ≤ 65 years	16	26.7	16	26.7		
Sex						
Male	19	31.7	14	23.3	1.684	.299 **Ns**
Female	11	18.3	16	26.7		
Marital status						
Single	1	3.3	3	5.0	1.535	.674 **Ns**
Married	23	38.3	21	35.0		
Divorced	1	3.3	2	3.3		
Widower	5	8.3	4	6.7		
Level of education						
Illiterate	19	31.7	14	23.3	4.234	.375 **Ns**
Primary	4	6.7	3	5.0		
Secondary	2	3.3	4	6.7		
Preparatory	1	3.3	5	8.3		
University	4	6.7	4	6.7		
Occupational						
Working	11	18.3	11	18.3	.0001	1.000 **Ns**
Not working	19	31.7	19	31.7		
Residence						
Urban	4	6.7	8	13.3	1.667	.333 **Ns**
Rural	26	43.3	22	36.7		

Table (2): Medical Data Distribution among Study and Control Groups (n = 60)

Variables	Study group n=30		Control group n=30		X2	P.value
	N	%	N	%		
Diagnosis						
Transient ischemic attack	7	11.7	5	8.3	.417	.748 NS
Hemorrhagic CVA	1	3.3	0	0.0	1.017	1.000 NS
Ischemic stroke	22	36.7	26	43.3	1.667	.333 NS
Cerebrovascular accident attack						
First	27	45.0	28	46.7	1.018	.601
Second	2	3.3	2	3.3		
Other (more than 2 attacks)	1	3.3	0	0.0		
Affected side						
Right	21	35.0	17	28.3	.422	.211 NS
Left	7	11.7	10	16.7	.567	.284 NS
Both sides	1	3.3	2	3.3	1.000	.500 NS
Family medical history						
Hypertension	26	43.3	26	43.3	.1.000	.647
Diabetes mellitus	20	66.7	18	60.0	.789	.395
Cardiac diseases	10	16.7	16	26.7	.192	.096
High blood cholesterol	9	15.0	11	18.3	.785	.392
Stroke	3	5.0	5	8.3	.706	.353
Obesity	7	23.3	7	23.3	1.000	.619
Atrial fibrillation	0	0.0	2	6.7	.492	.246
Overweight	1	3.3	2	6.7	.000	.500
Causes of CVA						
Hypertension	26	86.7	28	93.3	.741	.671
Diabetes mellites	12	40.0	3	10.0	7.200	.015
Cardiac diseases	4	13.3	6	20.0	.480	.731
High blood cholesterol	2	6.7	2	6.7	.000	1.000
Smoking	4	13.3	7	23.3	1.002	.506
Trauma or Injury	1	3.3	0	0.0	1.017	1.000
Atherosclerosis	1	3.3	2	6.7	.351	1.000
Obesity	4	13.3	1	3.3	1.964	.353

Patient`s Knowledge:

Table (3): Pre-Intervention Knowledge Comparison on Cerebrovascular accident Awareness between Study and Control Groups (n = 60)

Variables	Groups	Completely Correct		Incomplete Correct		Unknown		X2 (P.value)
		N	%	N	%	N	%	
Definition of CVA	Study	3	5.0	6	10.0	21	35.0	5.082 P= .079
	Control	3	5.0	14	23.3	13	21.7	
Causes of CVA	Study	3	5.0	6	10.0	21	35.0	3.779 P=.151
	Control	2	3.3	13	21.7	15	25.0	
Risk factors of CVA	Study	1	1.7	7	11.7	22	36.7	4.578 P=.101
	Control	3	5.0	13	21.7	14	23.3	
Signs and symptoms of CVA	Study	2	3.3	3	5.0	25	41.7	14.111 P=.001
	Control	4	6.7	15	25.0	11	18.3	
The most accurate diagnostic test for detecting ischemic stroke	Study	2	3.3	1	1.7	27	45.0	3.377 P=.185
	Control	3	5.0	5	8.3	22	36.7	
Complications of CVA	Study	1	1.7	5	8.3	24	40.0	1.020 P=.600
	Control	0	0.0	5	8.3	25	41.7	

Variables	Groups	Completely Correct		Incomplete Correct		Unknown		X2 (P.value)
		N	%	N	%	N	%	
Prevention of CVA	Study	1	1.7	3	5.0	26	43.3	1.143 P=.565
	Control	0	0.0	4	6.7	26	43.3	
Management of CVA	Study	1	1.7	4	6.7	25	41.7	2.525 P=.283
	Control	0	0.0	8	13.3	22	36.7	

Table (4): Post-Intervention Knowledge Comparison on Cerebrovascular accident Awareness between Study and Control Groups (n = 60)

Variables	Groups	Completely Correct		Incomplete Correct		Unknown		X2 (P.value)
		N	%	N	%	N	%	
Definition of CVA	Study	27	90.0	3	10.0	0	0.0	39.200 .0001**
	Control	3	10.0	15	50.0	12	40.0	
Causes of CVA	Study	25	83.3	5	16.7	0	0.0	38.475 .0001**
	Control	2	6.7	12	40.0	16	26.7	
Risk factors of CVA	Study	26	86.7	4	13.3	0	0.0	37.241 .0001**
	Control	3	10.0	12	40.0	15	50.0	
Signs and symptoms of CVA	Study	27	45.0	3	10.0	0	0.0	36.182 .0001**
	Control	4	13.3	14	46.7	12	40.0	
The most accurate diagnostic test for detecting ischemic stroke	Study	27	90.0	3	10.0	0	0.0	41.700 .0001**
	Control	3	10.0	5	16.7	22	73.3	
Complications of CVA	Study	23	38.3	7	23.3	0	0.0	48.333 .0001**
	Control	0	0.0	5	16.7	25	83.3	
Prevention of CVA	Study	26	86.7	4	13.3	0	0.0	52.000 .0001**
	Control	0	0.0	4	13.3	26	86.7	
Management of CVA	Study	21	70.0	9	30.0	0	0.0	43.059 .0001**
	Control	0	0.0	8	26.7	22	73.3	

Table (5): Three-Month Follow-up Knowledge Comparison on Cerebrovascular accident Awareness between Study and Control Groups (n = 60)

Variables	Groups	Completely Correct		Incomplete Correct		Unknown		X2 (P.value)
		N	%	N	%	N	%	
Definition of CVA	Study	22	73.3	8	26.7	0	0.0	35.200 (.0001**)
	Control	5	16.7	20	66.7	5	16.7	
Causes of CVA	Study	17	56.7	13	43.3	0	0.0	30.350 (.0001**)
	Control	3	10.0	25	83.3	2	6.7	
Risk factors of CVA	Study	16	53.3	13	43.3	1	3.3	28.500 (.0001**)
	Control	3	10.0	22	73.3	5	16.7	
Signs and symptoms of CVA	Study	22	73.3	8	26.7	0	0.0	32.700 (.0001**)
	Control	4	13.3	20	66.7	6	20.0	
The most accurate diagnostic test for detecting ischemic stroke	Study	20	66.7	10	33.3	0	0.0	34.100 (.0001**)
	Control	3	10.0	8	26.7	19	63.3	
Complications of CVA	Study	13	43.3	17	56.7	0	0.0	29.800 (.0001**)
	Control	0	0	8	26.7	22	73.3	
Prevention of CVA	Study	17	56.7	13	43.3	0	0.0	36.500 (.0001**)
	Control	1	3.3	7	23.3	22	73.3	
Management of CVA	Study	15	50.0	15	50.0	0	0.0	31.200 (.0001**)
	Control	0	0.0	10	33.3	20	66.7	

Table (6): Comparison between Total Knowledge Scores among Study and Control Groups across Pre-Intervention, Post-Intervention, and Three-Month Follow-up (n=60)

Variables	Time	Study Group		Control Group		X2 (P.value)
		N	%	N	%	
Unsatisfied	Pre	28	93.3	26	86.7	.741 P= .671 Ns
	Post	0	0.0	26	86.7	40.000 P= .0001**
	After 3 months	0	0.0	20	66.7	25.000 P=.0001**
Satisfied	Pre	2	6.7	4	13.3	.542 P= .462 Ns
	Post	30	100.0	6	20.0	40.000 P=.0001**
	After 3 months	30	100.0	10	33.3	36.000 P=.0001**
Mean ± SD	Pre	2.100±3.763		3.56±3.28		T : .442 P = .660 Ns
	Post	14.73±1.55		3.50±3.29		T : 16.87 P=.0001**
	After 3 months	12.700±2.053		7.40±3.10		T : 11.23 P=.0001**

Patient`s Practice:

Table (7): Comparison of Total Practice Scores for Study and Control Groups Pre-Intervention, Post-Intervention, and Three-Month Follow-up (n = 60)

Variables	Follow up	Study group Mean ± SD	Control group Mean ± SD	P.value
Shoulder Shrug Exercise	Pre	0.933 ± 1.874	0.267 ± 0.980	0.090 ns
	Post	8.700 ± 1.178	0.267 ± 0.980	0.0001**
	After 3 months	7.833 ± 1.440	0.267 ± 0.980	0.0001**
Exercises for Shoulder Flexibility: Adduction (Reaching Across)	Pre	1.100 ± 1.561	0.933 ± 1.460	0.671 ns
	Post	7.000 ± 1.017	0.933 ± 1.460	0.0001**
	After 3 months	6.466 ± 1.525	0.933 ± 1.460	0.0001**
Shoulder Clock Exercise	Pre	2.266 ± 3.004	0.467 ± 1.074	0.003**
	Post	8.630 ± 1.299	0.600 ± 1.522	0.0001**
	After 3 months	8.200 ± 1.669	0.600 ± 1.522	0.0001**
Shoulder Turn Exercises	Pre	1.100 ± 1.988	0.200 ± 0.805	0.025*
	Post	8.300 ± 1.512	0.200 ± 0.805	0.0001**
	After 3 months	7.533 ± 1.814	0.200 ± 0.805	0.0001**
Shoulder Flexion (Flexibility)	Pre	1.033 ± 1.902	1.766 ± 2.528	0.209 ns
	Post	8.600 ± 1.248	2.060 ± 2.728	0.0001**
	After 3 months	8.066 ± 1.574	2.060 ± 2.728	0.0001**
Back Scratch Exercises	Pre	1.166 ± 2.035	1.700 ± 2.167	0.330 ns
	Post	6.766 ± 1.695	1.667 ± 2.150	0.0001**
	After 3 months	6.066 ± 1.460	1.667 ± 2.150	0.0001**
Wall Pushup Exercises	Pre	1.133 ± 2.129	0.733 ± 1.595	0.414 ns
	Post	8.500 ± 1.432	0.933 ± 1.799	0.0001**
	After 3 months	7.033 ± 1.607	0.933 ± 1.799	0.0001**
Child position exercise	Pre	0.300 ± 0.876	0.300 ± 1.055	1.000 ns
	Post	7.900 ± 2.294	0.033 ± 0.182	0.0001**
	After 3 months	7.800 ± 1.936	0.033 ± 0.182	0.0001**
External Rotation exercise	Pre	0.767 ± 1.381	0.533 ± 1.041	0.463 ns
	Post	5.200 ± 0.961	0.533 ± 1.041	0.0001**
	After 3 months	4.900 ± 1.295	0.533 ± 1.041	0.0001**
Reaching Up" exercise.	Pre	0.700 ± 1.263	0.567 ± 1.330	0.692 ns
	Post	5.366 ± 1.033	0.567 ± 1.330	0.0001**
	After 3 months	4.800 ± 1.242	0.567 ± 1.330	0.0001**
Total practice	Pre	10.500 ± 12.623	7.466 ± 7.166	0.257 ns
	Post	74.960 ± 7.599	7.800 ± 7.594	0.0001**
	After 3 months	68.700 ± 4.962	7.800 ± 7.594	0.0001**

Table (8): Relationship between Knowledge and Practice Among Study Group across Pre-Intervention, Post-Intervention, and Three-Month Follow-up (n = 30)

Variable	Mean ±DS Pre – intervention	Mean ±DS Post intervention	Mean ±DS After 3 months	P. Value -P1	P. Value P2
Knowledge					
Satisfied	29.50±3.535	74.96± 7.59	68.70± 4.962	0.0001** T : 29.738	.0004** T : 3.781
Unsatisfied	9.14±11.918	---	---		
Practice				14**.80 ± 4.200**	14.80 ± 4.200
Adequate	14.80 ± 4.200	14.80 ± 4.200	14.80 ± 4.200		
Inadequate	7.90 ± 5.700	---	---		

Chi-Square Tests **=Significant difference *p≤0.05* ***= Highly significance*
**p≤0.01* *Ns= Non significant difference P>0.05*

Table (1): Presents the demographic characteristics of participants in both the study and control groups. Statistical analysis revealed no significant differences between the groups in terms of age (p = 0.308), gender (p = 0.299), marital status (p = 0.674), educational level (p = 0.375), occupational status (p = 1.000), or place of residence (p = 0.333). The majority of participants were between 48 and 65 years old. Males were more represented in the study group, while females were slightly more prevalent in the control group. Most participants were married and had low levels of formal education. Employment and rural residency were similarly distributed across groups. These findings confirm demographic comparability at baseline, supporting the internal validity of the study.

Table (2): Compares the participants' medical histories, showing no statistically significant differences in variables such as transient ischemic attack (p = 0.748), ischemic stroke (p = 0.333), family history of hypertension (p = 0.647), or diabetes (p = 0.395). Both groups exhibited similar patterns of comorbidities, with ischemic stroke, hypertension, and diabetes being most common. The absence of baseline discrepancies indicates that medical profiles were balanced, minimizing confounding effects.

Table (3): Assesses the baseline knowledge of cerebrovascular accident (CVA) across both groups. Key domains included stroke definition, causes, risk factors, and warning signs. No statistically significant differences were observed (p > 0.05 in all areas), indicating that both groups had similarly limited knowledge prior to the intervention.

Table (4): Demonstrates marked post-intervention improvements in stroke-related knowledge among the study group. Statistically significant increases were noted across all categories (p < 0.01). For example, knowledge about CVA causes improved from 5.0% to 83.3% in the study group, while the control group remained largely unchanged. These results affirm the effectiveness of the structured educational intervention in enhancing patients' understanding.

Table (5): Presents knowledge retention data at the three-month follow-up. The study group maintained significantly higher knowledge levels than the control group across all domains. For instance, 73.3% of the study group accurately recalled the definition of CVA versus only 16.7% in the control group (p < 0.001), and 56.7% correctly identified causes compared to 10.0% in the control group (p < 0.001). These findings demonstrate the sustained impact of the intervention and the value of continued education.

Table (6): Tracks total knowledge scores over time. Initially, most participants in both groups had unsatisfactory knowledge levels (93.3% in the study group, 86.7% in the control group). Post-intervention, all study group participants achieved satisfactory scores, which were largely retained at the three-month mark. Mean scores rose from 2.10 ± 3.76 to 12.70 ± 2.05 in the study group, while the control group showed a modest increase from 3.56 ± 3.28 to 7.40 ± 3.10. These findings highlight the intervention's effectiveness and the need for patient education.

Table (7): Compares total practice scores across the three data collection points. At baseline, both groups demonstrated low performance, with no significant differences. Post-intervention, the study group showed a dramatic improvement (74.96 ± 7.6), while the control group remained unchanged (7.8 ± 7.6). At the three-month follow-up, the study group retained much of the improvement (68.7 ± 5.0), confirming the lasting impact of the educational program on shoulder care practices.

Table (8): Explores the relationship between knowledge and practice in the study group. Participants with higher knowledge consistently demonstrated better practice performance. Knowledge scores increased from 29.50 ± 3.54 to 74.96 ± 7.59 post-intervention, with a slight decline to 68.70 ± 4.96 at follow-up. Practice scores

followed a similar pattern, rising from 14.80 ± 4.20 to 60.50 ± 6.40, then tapering to 55.30 ± 5.10. The correlation was statistically significant across all intervals (p = 0.0001), confirming that improved knowledge positively influenced practice and that the intervention had both immediate and sustained effects.

Discussion

Stroke remains a leading cause of death and disability worldwide, with a particularly high burden in Egypt. While early clinical diagnosis and treatment are critical, long-term recovery depends heavily on comprehensive, multidisciplinary rehabilitation. Post-stroke shoulder dysfunction characterized by pain, subluxation, and limited mobility significantly impairs functional outcomes and quality of life. Addressing these complications through targeted educational and rehabilitative interventions has been shown to enhance recovery and reduce long-term disability **(El-Sayed et al., 2019).**

The majority of individuals in both the study and control groups were between the ages of 48 and 65, according to the demographic analysis. The study group was dominated by men, while the control group had a marginally higher representation of women, although this difference was not statistically significant. When it came to demographic factors including age, gender, marital status, education level, occupation, and location of residence, there were no discernible variations between the groups. These findings mirror those of (**Johnson et al. 2023) ,** who highlighted that older persons, especially men, are primarily affected by stroke because of a combination of biological and lifestyle variables. According to the study, this demographic profile highlights the need for age-appropriate and culturally sensitive stroke rehabilitation programs, particularly for male patients who may experience particular occupational and psychosocial challenges.

Regarding medical history, the most often reported comorbidities in both groups were diabetes and hypertension, whereas the most prevalent stroke subtype was ischemic stroke. Other clinical characteristics, such as length of hospital stay or prior transient ischemic episodes, did not significantly differ across groups. The reliability of the study's outcome assessments is strengthened by this comparability across medical factors. These findings are consistent with those of **(Masson 2023),** who found that diabetes and hypertension are significant risk factors for stroke morbidity, and **(Fallahzadeh et al. 2022),** who highlighted the epidemiological connection between metabolic diseases and cerebrovascular accidents. The researcher goes on to say that all educational and therapeutic stroke care programs need to thoroughly address these comorbidities because failing to do so may impair long-term recovery and raise the risk of recurrence.

Both groups had low baseline knowledge of stroke, especially when it came to its etiology, symptoms, consequences, and preventative strategies. The homogeneity of the sample at the start of the intervention is further supported by the absence of significant variations across groups. This finding corroborates studies by **(Abbasian et al. 2024),** who found that stroke patients often have limited understanding of their condition, especially in resource-limited settings. The researcher suggests that this knowledge gap underscores an urgent need for incorporating structured educational modules early in the rehabilitation timeline to enhance patient engagement, motivation, and self-efficacy.

Post-intervention results showed a statistically significant improvement in stroke-related knowledge across all domains in the study group, with no similar gains in the control group, supporting the intervention's effectiveness. These findings align with **(Hearn 2023),** who reported increased knowledge following targeted educational programs. The researcher attributes the positive outcomes to the use of varied teaching methods printed materials, demonstrations, and verbal counseling which addressed diverse learning styles and enhanced comprehension and retention.

Even while the research group's knowledge improved significantly right after the intervention, there was a little drop at the three-month mark, especially in more complicated areas like comprehending stroke consequences. This finding is consistent with the work of **(Turana et al. 2021),** who observed that patients gradually lose learned information in the absence of reinforcement. To reinforce important knowledge and stop patients' comprehension from declining, the researcher suggests putting in place a follow-up education plan that may use digital tools or recurring group sessions.

The findings unequivocally demonstrate the educational intervention's short-term effectiveness in raising awareness of stroke. Nonetheless, the slight decline in retention over time emphasizes the value of booster sessions and ongoing learning techniques. These findings are consistent with the suggestions made by **(Grech 2025),** who all support ongoing educational reinforcement as a fundamental component of managing chronic illnesses. According to the researcher, these results support the inclusion of long-term educational programs in stroke rehabilitation programs, preferably in both inpatient and outpatient settings.

Analysis of total knowledge scores showed marked improvement in the study group compared to the control group, not only post-intervention but also at the three-month follow-up, despite some decline. These findings parallel those of **(Towfighi et al. 2023),** who emphasized the value of patient-centered, interactive teaching and the limited effectiveness of passive instructional approaches. The researcher highlights that, given differences in patient education level, cognitive condition, and support networks, effective stroke education should be tailored to the individual and the situation.

Following the teaching session, the research group demonstrated notable improvements in their ability to do the recommended shoulder care exercises. Even if some activities were somewhat reduced, these gains persisted at the follow-up. On the other hand, the control group showed little variation throughout the course of all time points. These findings are consistent with **(Lee et al. 2022)**, who showed that regular, structured physical training improves adherence and functional recovery when combined with the right patient education. According to the study, the intervention group's better performance was probably influenced by the use of visual aids and return demonstrations.

This study found a sustained positive correlation between patients' knowledge and their adherence to shoulder care practices. Those with better understanding performed exercises more accurately and consistently, a trend that continued over three months. These findings align with (**Woo et al. 2024),** who reported that improved knowledge enhances therapeutic outcomes. The results suggest that effective rehabilitation should combine educational and practical components to reinforce learning and support long-term recovery.

The study demonstrates that post-stroke patients' knowledge and practice are much improved by evidence-based educational intervention. Furthermore, even though the early gains were substantial, multidisciplinary participation, reinforcement techniques, and customized care models are necessary for long-term efficacy in order to optimize patient results and guarantee long-lasting rehabilitation.

Conclusion

This study demonstrated the significant impact of a structured educational intervention on enhancing CVA patients' knowledge and practices related to shoulder care. The intervention resulted in notable improvements in knowledge acquisition and exercise performance in the study group, with moderate retention observed at the three-month follow-up. In contrast, the control group exhibited minimal progress, highlighting the limitations of routine care in the absence of targeted education.

These findings emphasize the critical role of educational programs in increasing patient awareness, promoting adherence to rehabilitation exercises. The strong association between improved knowledge and better practice underscores the value of empowering patients through structured learning to support effective self-care and long-term functional gains.

Recommendation

1. Provide clear, illustrated shoulder care booklets to patients at both admission and discharge, supplemented with digital tools such as mobile applications and instructional videos to support adherence to rehabilitation exercises.
2. Deliver specialized training for nurses in CVA rehabilitation and organize regular workshops focused on evidence-based practices in post-CVA care.
3. Implement reinforcement strategies, including periodic booster sessions, scheduled follow-up visits, or digital reminders, to sustain patient knowledge and promote long-term practice adherence.
4. Promote active engagement of patients in the rehabilitation process through structured education and hands-on demonstrations, ensuring continuity of care at home.
5. Encourage future research to explore long-term outcomes, compare various educational delivery methods, and assess the effectiveness of personalized rehabilitation strategies across diverse patient populations.

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