Empowering Caregivers in Hemiplegia Care: A Quasi-Experimental Study for Enhancing Care-Competency Through Structured Educational Development Approach

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ABSTRACT

Background: Caregiver competency for hemiplegic patients would be enhanced and sustained with structured educational approach with step-by-step competence confirmation and telehealth communication for follow-up. **Aim:** Evaluate the effectiveness of a structured educational development approach in enhancing the care competency among caregivers for patients with hemiplegia. **Research Design:** Quasi-experimental (one group pretest-posttest). **Sample & Setting:** 70 caregivers, purposively sampled, at neuropsychiatric and neurosurgery inpatient and outpatient units in Minia University Hospital, Egypt. **Study Tools:** 1) Structured interview questionnaire 2) Knowledge and practice competency tools ($\geq$ 80% is cutoff competency score). **Method:** Pretest data was collected. Three educational sessions administered, each requiring competency before proceeding. A fourth session tested the third one, followed by two months of telehealth support, then a post-test. **Results:** Caregivers were mostly aged 30-39, female, married, housewives, with basic education, and reside in rural areas. Post-intervention, caregiver competency improved significantly: overall care competency rose from 11.4% to 75.7%; knowledge from 18.5% to 72.9%; practice from 21.4% to 81.4%. Knowledge scores increased from 13.5 $\pm$ 5.48 to 20.6 $\pm$ 2.75, practice scores from 37.4 $\pm$ 9.30 to 66.8 $\pm$ 4.5, and total care competency from 50.9 $\pm$ 14.78 to 86.4 $\pm$ 7.25. Effectiveness was 36.5% $\pm$ 16.46, with significant t-test values (p <0.001). **Conclusion:** The structured educational approach significantly increased the caregiver care competency for hemiplegic patients. **Recommendations:** Implement structured educational programs with telehealth follow-up for sustainable caregiver competency in inpatient discharge plans and outpatient services.

Keywords: Caregiver, Care competency, Hemiplegia, Quasi-experimental**, S**tructured educational development approach.

Introduction

Hemiplegia, characterized by paralysis of muscles on one side of the body, often results from damage to the brain's motor centers due to ischemia or hemorrhage. Stroke, the leading cause of hemiplegia, stands as the most common cause of permanent disability globally, severely impacting the lives of patients and their families **(Kawahira et al., 2022)**. Annually, 15 million people worldwide suffer from stroke, with 5 million deaths and another 5 million left

permanently disabled, placing significant burdens on caregivers and communities. Hemiplegia can also result from other neurological conditions, such as traumatic brain injury, brain infections, brain tumors, and spinal cord injuries **(Swikriti et al., 2024).**

Hemiplegic paralysis exacerbates postural instability and impairs balance control, significantly affecting mobility, daily functioning, and overall quality of life. Patients often experience a range of physical, cognitive, and emotional changes, necessitating a comprehensive and compassionate approach to care. Caregivers, including family members, friends, or professional healthcare workers, play a vital role in the rehabilitation process and in ensuring optimal patient outcomes **(Kawahira et al., 2022).**

Caring for hemiplegic patients is both profound and challenging. The family caregiver is crucial to the patient's recovery and daily well-being, as their responsibilities vary based on the patient's needs and level of dependency **(Dharma et al., 2021)**. Effective caregiving requires understanding the physical, emotional, and psychological needs of hemiplegic individuals. Caregivers must be knowledgeable about proper handling techniques, exercise regimens, medication management, and strategies for preventing complications such as pressure sores and contractures **(Sheha et al., 2020)**. In addition to physical care, caregivers must provide emotional support, create a positive environment, and encourage patient independence. However, there is often a gap in caregiver knowledge and

training, particularly among informal or unpaid caregivers, which can lead to suboptimal care, increased caregiver burden, and poorer patient outcomes **(Predebon et al., 2021)**.

Telehealth has emerged as a vital tool in modern healthcare, offering significant benefits for caregivers of hemiplegic patients. By utilizing telecommunication technologies, healthcare professionals can provide continuous support, education, and monitoring to caregivers, regardless of their geographic location. Telehealth facilitates real-time consultations, enabling caregivers to seek advice and assistance promptly, which is crucial for managing acute issues and ensuring adherence to care plans. Moreover, telehealth platforms can offer virtual assistance, reinforcing caregivers' skills and knowledge through interactive and accessible means. This approach not only enhances the competency of caregivers but also promotes a sense of confidence and autonomy in managing the complex needs of hemiplegic patients **(Haleem et al., 2021).**

Meanwhile, it would be highly beneficial for caregivers of hemiplegic patients to be well-prepared in care-competency through a structured educational development approach. This approach should begin with background knowledge, followed by hands-on training, and conclude with telehealth follow-up. Beyond education and training, nurses can provide support to build trust in the care they provide, connect them with the community resources they may need **(Rico-Blázquez et al., 2022)**. This may help decrease the stress and emotional burden associated with

caregiving **(Magwood et al., 2020)**. Consequently, biopsychosocial competencies, effective and safe care for hemiplegic patients can be emphasized. This comprehensive approach enhances the quality of care for hemiplegic patients and improves the well-being and resilience of caregivers.

Significance of the study

Supporting individuals with disabilities, including those with hemiplegia, is a critical goal globally and within Egypt. The United Nations' Sustainable Development Goals emphasize reducing inequality. In Egypt, the high prevalence of stroke and resulting hemiplegia underscores the urgent need for comprehensive support systems for both patients and caregivers. The Egyptian census estimates that around 1.4 million Egyptians have disabilities. Egypt, the most populated nation in the Middle East, has a high stroke prevalence rate of 963 per 100,000 inhabitants **(Mohamed et al., 2023)**. Hemiplegia occurs in 88% of stroke survivors, with an annual stroke incidence in Al Quseir estimated at 181 per 100,000 **(El-Tallawy et al., 2013)**. **Shehata et al., (2016)** reported an annual stroke incidence in Egypt of 150,000-210,000, with a crude prevalence of 922 per 100,000. At El Minia University Hospital, approximately 450 patients visit the stroke clinic annually. Caregivers' awareness is critical to the well-being of hemiplegic patients.

Hemiplegic patients require specialized care to manage daily activities, prevent complications, and support rehabilitation. Caregivers' knowledge and practices directly influence patient outcomes. Studies indicate that caregivers often lack the necessary

knowledge and skills for home care post-discharge **(Lam et al., 2022)**. Additionally, caregivers of hemiplegic patients face numerous challenges, including depression, anxiety, exhaustion, hopelessness, fatigue, decreased physical health, social isolation, and economic problems **(Tawfik et al., 2022)**. They need a proper understanding of the disease and comprehensive support during patient care post-discharge. Thereby, empowering caregivers of hemiplegic patients through a structured educational development approach on enhancing their care-competency aligns with these global and national objectives, ensuring that those with disabilities receive the necessary support to lead fulfilling lives.

Aim of the study

The purpose of the study was to evaluate the effectiveness of a structured educational development approach in enhancing the care competency among caregivers for patients with hemiplegia.

Research Hypotheses

- Caregivers are expected to have greater care competency of the hemiplegic patients after implementing the structured educational development approach.

Operational definition:

Care competency: caregiver is competent if achieved 80% of the required points in both knowledge and practice based on the guidelines of evidence-based quality indicators for the programs of nursing education **(Spector et al.,2020)** and the recommendation of Ethical Care Competence in

Basic Nursing Education (**Yoshioka and Kaneko, 2020)**

Subjects and Methods
A) Subjects
Study design: A quasi-experimental research design was used to fulfil the study's aim.

Setting: The study was conducted at Minia University Hospital, Egypt, within the neuropsychiatric and neurosurgery units, encompassing caregivers who were in in patient (prior to patient discharge) or outpatient clinics.

Sample size calculation: For a paired t-test (pre-post design), the sample size can be calculated using the following formula (**Williams et al.,2020**):

$n= [(Z_{\alpha/2}+Z_{\beta})/Effect\ Size)]^2$ Where:

- $Z_{\alpha/2}$: (1.96) is the Z-score for (alpha = 0.05\) (two-tailed).

- Z_{β}: (0.84) is the Z-score for 80% power.

- Effect size = 0.34 based on study conducted by **Gurjar, (2019).**

Thus, the calculated sample size was approximately 67.8 participants. To ensure robustness and account for potential dropouts, the sample size was rounded up to 70 participants.

Inclusion criteria:
Caregivers who were willing to participate in the study, both sexes, able to read and write, living in the same housing area of their patient.

Exclusion criteria:
Caregivers who were health care professionals, have a previous experience of being caregiver for hemiplegic patients, less than 18 years, and patients attending hospital without their potential caregivers were excluded from the study. To ensure the training exposure was primarily from the structured educational development program, the study focused on caregivers whose patients were either inpatients or attending their first visit post-discharge.

B) Study tools:
Data collection was compiled using three tools:
Tool I: Structured interviewing questionnaire:
It was developed based on the review of currently related literature and used by the researchers to collect the data needed. It included socio-demographic data of the participants (Age, gender, degree of kinship, marital status, educational level, occupation, type of family, monthly income and residence).

Care Competency Tools:
These tools were developed by the researchers. Care competency contains two tools: A) Caregivers' knowledge tool: consists of 25 points, B) Caregivers' practice tool: consists of 75 points. Cumulatively, care competency includes 100 points.

(A) Caregivers' knowledge tool regarding hemiplegia:
It was developed by the researchers based on the review of currently related literature. The questionnaire evaluates caregivers' knowledge of

hemiplegia through 25 multiple-choice questions. It covers essential domains such as the causes and symptoms of hemiplegia, recognizing complications, and appropriate handling and mobility techniques. The questions also assess medication management, prevention of pressure sores and contractures, and maintaining a safe environment. Additionally, it includes emotional and psychological support strategies to ensure holistic care.

Scoring system

Each correct answer is awarded one point, with a maximum possible score of 25 points.

This score was graded into 3 levels as follows: a) a caregiver scoring 20 points or more (80% or above) is considered "competent." B) caregivers scoring between 15 and 19 points (60-79%) are deemed "near competency" and may benefit from additional training. C) those scoring below 15 points (less than 60%) are considered "not competent" and require intensive training to enhance their cognitive domain competence in caregiving for hemiplegic patients.

(B) Caregivers' practices tool regarding hemiplegia:

This tool was developed by the current study' researchers. It is composed of a structured checklist to evaluate the hands-on competence of caregivers of hemiplegic patients. It contains checklists that cover 15 procedures in 4 progressive packages of procedures: 1) basic patient care: includes bed bath, oral hygiene, measuring blood pressure with digital one, and

monitoring vital signs (temperature, pulse, and respiration). 2) mobility and safety include body mechanics, turning and moving, transferring to and from chair, positioning techniques, use of assistive devices. 3) daily monitoring and health maintenance: range of motion exercises, feeding assistance, catheter care, and handling and monitoring wounds. 4) enteral procedures and medication administration includes nasogastric feeding, enema administration, and oral medication administration.

Scoring system

Every procedure of each package scored from 0 to 5 for the included items and competent participant means scored 80% (4 out of 5 points). The scoring was as following: Zero: Unable to perform the procedure, 1: Performs the 10-30 % only of procedure steps, 2: Performs > 30 to 60% of the procedure steps, 3: Performs > 60% to 80 of all procedure steps, 4: Performs the procedure correctly and in order but lacks confidence and/or speed, and 5: Performs the procedure with confidence and precision.

All scores of the procedures summed-up with the maximum score is 75 then converted into a percentage score. A caregiver is considered competent if they achieve at least 80% of the total possible points (60 from 75).

Total care-competency Scoring system:

For care competency, a caregiver should achieve ≥ 80 of the points of both knowledge and practices.

Achieving a score of 80% or higher is frequently regarded as a critical benchmark in nursing education, reflecting that the learner has sufficiently mastered the necessary content and can apply it effectively in practice. The 80th percentile for knowledge and practice competence is embedded in the guidelines of evidence-based quality indicators used in nursing education programs **(Spector et al.,2020).**

This threshold is also recognized as a Benchmark for Ethical Care Competence in Basic Nursing Education, ensuring high-quality, ethically sound care **(Yoshioka and Kaneko, 2020).**

Thus, by this approach, caregivers can meet the demands of their role with minimal risk of error while ensuring patient safety and quality of care.

Validity and Reliability

The tools of the study were given to a group of three experts in medical surgical nursing and two experts in the community health nursing community field. The tools were examined for content coverage, clarity, relevance, applicability, wording, length, format, and overall appearance. Based on experts` comments and recommendations; minor modifications had been made such as rephrasing and rearrangements of some sentences.

Reliability: Internal consistency of interview questionnaire was assessed with the Cronbach's alpha coefficient. Cronbach's alpha coefficient of 0.00 indicates no reliability and a coefficient of 1.00 indicates perfect reliability. However, a reliability coefficient of 0.70 is acceptable **(Tavakol & Dennick, 2011).** The reliability test findings were 0.879 and 0. 832 for Caregivers' knowledge regarding hemiplegia and Caregivers' practices regarding hemiplegia, respectively.

C) Administrative and Ethical consideration:

Research proposal was approved from ethical committee of the Faculty of Nursing at Minia University, Egypt (Approval No: REC2024311). Oral informed consent was obtained from the caregivers who are willing to participate in the study after explaining the nature and purpose of the study. Participants were assured that their participation was voluntary, and they had the right to withdraw from the study at any time. To ensure confidentiality and anonymity, all data were coded appropriately.

D) Pilot study:

The study was conducted among ten caregivers, who were excluded from the study sample to test the feasibility, clarity and applicability of the study tool also to test relevancy and clarity of the content, to calculate the time needed for conducting the study and to estimate the needed time to be filled in the tool. Each sheet took from 30:45 minute according to the response of the caregivers. The pilot study revealed that some items needed to be added which help in achieving the study aim and some items needed to be omitted. So, the needed modifications were carried out.

E) Fieldwork:

An official permission to conduct the study

was obtained from the director of Minia university hospital. The researchers explained to the patient and the caregivers their ethical rights and got their consent. The study was conducted over a period of nearly five months starting from the first of March 2024 (caregivers' enrollment, follow-up).

The Present study was conducting in four phases:

I.   Preparatory phase:

A review of recent current national and international related literature on various aspects of the hemiplegia was applied at this phase to design the study tool and to be acquainted with various aspects of the hemiplegia.

II.   Assessment phase:

In the first meeting with caregivers, the researchers introduced themselves to the participants, and clarified the nature and the purpose of this study. Participations' approval was obtained. Each caregiver was interviewed individually by the researchers to collect the sociodemographic characteristics (Tool I) and caregivers' knowledge and practices regarding hemiplegia (Toll II & III).

III.   Planning and implementation phase:

A plan was formulated for each caregiver based on assessment phase and literature review, the researchers prepared the training places, teaching aids and media (picture, and handouts). An Arabic educational training booklet has been developed by researchers based on determined needs, baseline assessment and relevant literature. It was written in a simple Arabic language and

supplied with photos and illustrations and provided at the end of each session to help the caregivers to understand the content, and then revised by a group of expertise in community health nursing for the content validity.

The intervention, conducted by the researcher over 4 subsequent sessions, varied in start dates based on hospital discharge and follow-up appointments at the Neurology units. Sessions were held either individually or in groups. **Each caregiver should achieve ≥ 80 for the previous session before beginning the subsequent one.** If competency was not achieved, another attendance and evaluation was conducted. A variety of teaching methods were employed, including brainstorming, discussion, demonstration, and re-demonstration. Caregivers were informed about the content and duration of the upcoming session at the end of each meeting.

Session 1:

a) **Knowledge: Understanding Hemiplegia and Its Implication:** It provided caregivers with a foundational understanding of hemiplegia, including its definition, causes, and effects on daily life. It covers the condition's impact on motor and sensory functions, the resulting challenges in mobility, communication, and self-care, and the emotional and psychological toll on individuals. This knowledge is essential for caregivers to effectively support and empathize with those affected.

b) Practice: Basic Patient Care & mobility and safety

This contains two packages: 1) basic patient care: that contains bed bath, oral hygiene, measuring blood pressure and monitoring vital signs procedures. 2) mobility and safety: that includes transferring to and from chairs, body mechanics, positioning techniques and use of assistive devices.

Session 2:
a) Knowledge: Practical Care Skills and Safety:

It focused on practical care skills and safety measures. Caregivers learn techniques for positioning, transferring, and assisting with mobility and personal care, such as hygiene and dressing. The session also covers safety precautions to prevent falls and injuries and includes emergency protocols for recognizing complications and administering basic first aid.

b) Practice: Daily Monitoring and health maintenance: It included catheter care, wound care, range of motion exercises and feeding assistance

Session 3:
a) Knowledge: Cognitive and Emotional Support: It was to learn strategies for managing cognitive issues and emotional challenges, effective communication techniques, and creating a supportive environment that promotes independence. The session also highlights the importance of caregiver self-care and stress management to maintain their own well-being.

Practice: Enteral procedures and medication administration: It included enema administration, nasogastric feeding, administering the prescribed medication.

Session 4:

Theory: Providing a booklet to each caregiver.

Practice: Evaluation of the last session and setting up the telehealth communication means for follow-up and Support: To ensure continuous learning and support, accessible tele-health communication means were established either telephone-based or web-based. Caregivers could regularly consult with healthcare professionals, ensuring they had ongoing guidance and could address any emerging concerns promptly.

IV. Evaluation phase:

It was conducted at neuropsychiatric diseases and neurosurgery units in Minia University hospital for caregivers after arrangement with them through phone for follow up, this phase was performed after 2 months of the fourth session of the structured educational development approach. Caregivers were evaluated by using study tool II and tool III to measure the competency of caregivers in the care of hemiplegic patients.

Statistical design:

The collected data were tabulated, analyzed, and computerized by using SPSS (statistical package for the social science version 28). Descriptive statistics included numbers, percentages, mean, and standard deviation. Analytical statistics were applied as follows:

1. **Chi-square:** To compare categorical competencies before and after intervention and to assess associations between qualitative variables.

2. **Paired T-test:** To evaluate the effectiveness of treatment methods pre- and post-intervention within the same group.

A p-value < 0.05 was considered statistically significant.

Limitations of the study:

There is no limitation in conducting the study but the study's small sample size and purposive sampling limit generalizability. Conducted in a single hospital, the findings may not apply broadly. Additionally, the lack of a control group and focus on specific skills may overlook broader caregiving aspects.

Results

Table (1) indicates a predominance of individuals aged 30-39 years (65.7%) with mean ± standard deviation equals 27.72± 7.99. Gender distribution shows a higher proportion of female caregivers (57.1%). The relationship to the patient reveals that daughters (41.43%) and sons (37.14%) are the primary caregivers. Most caregivers are married (78.6%). Educational levels show a great percentage with basic (30%) and university education (20%). The high percentage of housewives (47.1%) among caregivers is notable and split between extended (51.4%) and nuclear families (48.6%). All caregivers reported insufficient monthly income. The majority reside in rural areas (62.9%). The majority live in rural

areas (62.9%). Almost equal caregivers living with patients (51.4%) or nearby (48.6%).

Table (2) shows that, in pre-intervention, 18.5% were competent in knowledge and 21.4% competent in practice, with only 11.4% were care-competent totally (knowledge and practice). Caregivers achieved 75.7% care-competency after intervention with 72.9% competent in knowledge and 81.4% competent in practice. The chi-square tests and p-values (< 0.001) indicate statistically significant changes.

Table (3) shows that knowledge scores increased after intervention from 13.5 ± 5.48 to 20.6 ± 2.75, practice scores from 37.4 ± 9.30 to 66.8 ± 4.5, and total care-competency from 50.9 ± 14.78 to 86.4 ± 7.25. The study intervention achieved 36.5% (± 16.46) effectiveness in increasing total care competency with significant t-test values (p <0.001).

Table (4) shows that there is no significant correlation between knowledge and practice levels among caregivers (p=0.653) in pre-intervention while it was significant (p=0.0084). after intervention.

Table (5) displays that some rates of care-competent participants were higher for some variables' response options in caregiver's characteristics, however, they didn't achieve any significant. relation Between Care-Competency and Caregiver's Characteristics before and after intervention. Age and gender do not show significant associations with care-competency both pre- and post-intervention. Educational levels

reveal that caregivers with university education show higher competency rates post-intervention. Occupation shows varying levels of competency, with vocational workers and housewives being notable. The type of family and place of residence do not show significant differences.

Table (1) Distribution of caregivers of the hemiplegic patients according to their socio-demographic characteristics (N =70):

Caregiver's Characteristics	No	%
Age / years		
20≤29	24	34.3
30≤39	46	65.7
Mean ± SD =	27.72 ± 7.99	
Gender		
Male	30	42.9
Female	40	57.1
Degree of Kinship		
The wife	4	5.7
Father / husband	11	15.7
The daughter	29	41.4
The son	26	37.1
Marital Status		
Single	15	21.4
Married	55	78.6
Educational Level		
Read and write	23	32.9
Basic education	21	30
Secondary education	12	17.1
University education	14	20
Occupation		
Vocational	23	32.9
Work clerk	2	2.9
Housewife	33	47.1
Employee	5	7.1
Student	7	10
Type of Family		
Extended	36	51.4
Nuclear	34	48.6
Monthly Income		
Sufficient	0	0.0
Insufficient	70	100
Residence		
Urban	26	37.1
Rural	44	62.9
Place of Living		
With the patient	36	51.4
Close to him	34	48.6

Table 2: Distribution of caregivers pre and post - the structured educational development approach according to care-competency for patient with hemiplegia (N=70):

	Pre-intervention		Post-intervention		χ^2	*P*-value
Knowledge	**No**	**%**	**No**	**%**		
Not competent	35	50	7	10.0		
Near competent	22	31.5	12	17.1	41.57	< 0.001*
Competent	13	18.5	51	72.9		
Practice						
Not competent	55	78.6	13	18.6	50.44	
Competent	15	21.4	57	81.4		< 0.001*
Total care-competency						
Not competent	62	88.6	17	24.3	45.61	< 0.001*
Competent	8	11.4	53	75.7		

** P- value is highly statistically significant.

Table 3: Comparison between pre-intervention and postintervention care-competence scores and effectiveness among care givers for patient with hemiplegia (N=70):

	Maximum score	Pre-intervention	Post-intervention	Effectiveness	t test	*P*-value
Items		Mean ± SD	Mean ± SD	Mean ± SD		
Knowledge	25	13.5 ± 5.48	20.6 ± 2.75	7.1 ± 6.13	8.98	<0.001
Practice	75	37.4± 9.30	66.8 ± 4.5	24.4 ± 10.33	16.59	<0.001
Total care-competency	100	50.9 ± 14.78	86.4 ± 7.25	36.5 ± 16.46	16.75	<0.001

Table 4: correlation between Knowledge and practice before and after the structured educational development approach(n=70):

	Practice Level				χ^2	*P*-value
	Incompetent (n= 55)		Competent (n= 15)			
Level of knowledge	No	%	No	%		
Pre-interventional						
Not competent	28	50.9	7	46.6		
Near competency	18	32.7	4	26.7	0.854	٠.653
Competent	9	16.4	4	26.7		
Post-interventional						
Not competent	3	4.3	4	5.8		
Near competency	5	7.1	7	10	9.55	٠.0084*
Competent	5	7.1	46	65.7		

* P -value is statistically significant.

Table 5: Relation between the care-competency for hemiplegic patients and caregiver's characteristics pre and post Intervention (N=70):

Caregiver's Characteristics	Pre-intervention				Post-intervention			
	Not competent (n=62)	Competent (n=8)	X^2	*P*	*Not competent (n=17)*	Competent (n=53)	X^2	*P*
	N (%)	*N (%)*			*N (%)*	*N (%)*		
Age / years								
20≤29	23 (37.1%)	1 (12.5%)	0.72	0.396	4 (23.5%)	20 (37.7%)	0.72	0.396
30≤39	39 (62.9%)	7 (87.5%)			13 (76.5%)	33 (62.3%)		
Gender								
Male	27 (43.5%)	3 (37.5%)	0.66	0.42	9 (52.9%)	21 (39.6%)	0.31	0.579
Female	35 (56.5%)	5 (62.5%)			8 (47.1%)	32 (60.4%)		
Degree of Kinship								
The wife	4 (6.5%)	0 (0%)	2.08	0.56	1 (5.9%)	3 (5.7%)	1.46	0.691
Father / husband	10 (16.1%)	1 (12.5%)			4 (23.5%)	7 (13.2%)		
The daughter	25 (40.3%)	4 (50%)			6 (35.3%)	23 (43.4%)		
The son	23 (37.1%)	3 (37.5%)			6 (35.3%)	20 (37.7%)		
Marital Status								
Single	13 (21%)	2 (25%)	0.07	0.79	4 (23.5%)	11 (20.8%)	0.11	0.739
Married	49 (79%)	6 (75%)			13 (76.5%)	42 (79.2%)		
Educational Level								
Read and write	21 (33.9%)	2 (25%)	2.23	0.527	5 (29.4%)	18 (34%)	0.88	0.83
Basic	20 (32.3%)	1 (12.5%)			6 (35.3%)	15 (28.3%)		
Secondary	10 (16.1%)	2 (25%)			1 (5.9%)	11 (20.8%)		
University	9 (14.5%)	5 (62.5%)			5 (29.4%)	9 (17%)		
Occupation								
Vocational	19 (30.6%)	4 (50%)	6.88	0.143	7 (41.2%)	16 (30.2%)	0.65	0.958
Work clerk	2 (3.2%)	0 (0%)			0 (0%)	2 (3.8%)		
Housewife	30 (48.4%)	3 (37.5%)			7 (41.2%)	26 (49.1%)		
Employee	4 (6.5%)	1 (12.5%)			2 (11.8%)	3 (5.7%)		
Student	7 (11.3%)	0 (0%)			1 (5.9%)	6 (11.3%)		
Type of Family								
Extended	33 (53.2%)	3 (37.5%)	1.06	0.304	9 (52.9%)	27 (50.9%)	0.02	0.891
Nuclear	29 (46.8%)	5 (62.5%)			8 (47.1%)	26 (49.1%)		
Monthly Income								
Sufficient	0 (0%)	0 (0%)	N/A	N/A	0 (0%)	0 (0%)	N/A	N/A
Insufficient	62 (100%)	8 (100%)			17 (100%)	53 (100%)		
Residence								
Urban	23 (37.1%)	3 (37.5%)	0.0003	0.956	7 (41.2%)	19 (35.8%)	0.46	0.499
Rural	39 (62.9%)	5 (62.5%)			10 (58.8%)	34 (64.2%)		
Place of Living								
With the patient	33 (53.2%)	3 (37.5%)	1.06	0.304	9 (52.9%)	27 (50.9%)	0.02	0.891
Close to him	29 (46.8%)	5 (62.5%)			8 (47.1%)	26 (49.1%)		

Discussion

Hemiplegia is increasingly prevalent (**Gundo et al., 2022**) and caregiver is a cornerstone for success of the important aspects of care (**Avci & Gözüm, 2023**).This study represents a pioneering effort in the field of caregiver education for hemiplegic patients, offering a comprehensive and structured educational development program that has demonstrably enhanced sustained caregiver competency. Unlike previous studies, which often focused on either knowledge or practice or both without fostering development and sustainability. The current study approach integrated both elements through a systematic and iterative training process.

As for the socio-demographic profile of caregivers in the current study, more than two thirds of individuals aged 30-39 years, which could suggest a demographic trend where middle-aged individuals are more likely to assume caregiving responsibilities (**Zwar, König, & Hajek, 2024**). Gender distribution shows a higher proportion of female caregivers, aligning with broader caregiving trends where women typically assume such roles more frequently than men (**Pacheco, Schnyder, and Zanini, 2024**).

The relationship to the patient reveals that more than two-fifths were daughters and more than one third were sons, daughters and sons were the primary caregivers, reflecting traditional family dynamics where offspring are the primary support for elderly or ill family members (**Shu et al., 2021**).

Most caregivers were married, possibly indicating the support structure needed for effective caregiving is more commonly found among married

individuals which aligns with previous studies (**Freedman et al., 2024**)

Caregivers come from diverse educational backgrounds with nearly thirty percent having basic education and twenty having a university education. Housewives rated the highest percentage among caregivers which highlights the role of non-working family members in caregiving duties. The split between extended and nuclear families points to caregiving occurring in both traditional and more modern family structures. All caregivers reported insufficient monthly income which underscored the financial challenges associated with caregiving. The majority reside in rural areas, which might suggest limited access to professional healthcare support in these regions. Lastly, an almost equal distribution of caregivers living with the patient or nearby reflects the close proximity often required for effective caregiving.

Concerning studied caregivers' Care-Competency in Hemiplegia before the intervention, the present study showed that about one in each ten was competent. Post-intervention, there is a marked improvement with more than three quarters of caregivers becoming competent, suggesting the intervention was highly effective. Additionally, from the aspect of mean scores, mean scores increased about thirty percent in knowledge, about forty percent in practice, and about thirty-seven in total care-competency. This dramatic improvement highlights the value of structured educational programs in enhancing caregiver competency. The substantial increase in both knowledge and practice competencies post-intervention underscores the

efficacy of the training provided.

To the best knowledge of the study researchers, there is no study with a similar approach, however, it can be supported by nearer ones. The current study shows a surpassing result. These results come in the same line with **(Abdel-Mageed, et al., 2022)** who studied "Informal caregivers' awareness regarding patients with hemiplegia" and reported that half of caregivers had average total knowledge, less than one third of them had poor knowledge, and one fifth of them had good total knowledge regarding Hemiplegia. In addition this result supported by **(Moukhtar et al., 2021)** who studied "Effect of Caregivers Training Program on Stroke Patients' Self-Efficacy" and reported that the majority of caregiver's have unsatisfactory knowledge about stroke in pre-program, compared to the most of them have satisfactory knowledge at post program and follow up with statistically significant differences among knowledge of caregivers about stroke disease in pre, post-program, and follow-up.

The same was reported by **(Gurjar, 2019)** who studied "Effectiveness of Educational Program on Knowledge and Competence of Home Care Of Stroke Patients among Care Givers" and showed that less than three quarter of caregivers had an inadequate knowledge, less than fifth had moderate knowledge and the minority of them had adequate knowledge regarding home care of stroke patients. Whereas in post-test, more than half of caregivers had adequate knowledge, two fifth had moderate knowledge and the minority of them had inadequate knowledge regarding home care of stroke patients. Moreover **(Bhatia et al., 2015)**, reported that, the

structured teaching program was effective in improving the knowledge of the care givers of stroke patients.

This result come in accordance with **(Saucedo-Pahua et al., 2024)** who studied "Home-based educational interventions for family caregivers of older adults after stroke: a scoping review" and reported educational interventions strengthen participants' knowledge and skills in areas such as education, care, communication, self-management, rehabilitation and nutrition as well as self-care to safely assist older adults in their activities of daily living.

In addition this results confirmed by **(Moukhtar Ibrahim et al., 2021)** who found that there were statistically significant differences between the practice level for caregivers in pre, post training program application training program application and follow up.

The same was reported by **(Gurjar, 2019)** who showed that less than three quarter of the caregivers had poor competence, one fifth of them had average competence and the minority had good competence of home care of stroke patients whereas in posttest more than half of the caregivers had average competence, one third of them had good competence and one tenth of them had poor competence of home care of stroke patients.

As for the relationship between caregivers' practices and their level of knowledge among the caregivers in hemiplegia, the correlation was not significant before the intervention. These results may be that, in pre-intervention, the theoretical

knowledge alone does not necessarily translate into caregiving practices. Several factors can contribute to this disconnect. Firstly, caregivers may possess a basic understanding of hemiplegia but lack the practical skills and confidence to implement this knowledge effectively in real-life situations. These results come in agree with **(Tan et al., 2020)** who studied "Caregiving Self-efficacy and Knowledge Regarding Patient Positioning Among Malaysian Caregivers of Stroke Patients" and reported that there was no significant association between knowledge on positioning and practices

While these results differ with **(Abdel-Mageed, et al., 2022)** who reported that there was positive relation between informal caregivers' total knowledge and total reported practice regarding hemiplegia with statistical significance difference between caregivers' knowledge and practice regarding to hemiplegia. In addition this result disagree with **(Tharu et al., 2022)** who reported a positive correlation existed between caregivers' knowledge and attitude, as well as between knowledge and practice.

Importantly, the relationship became significant after intervention between caregivers' practices and knowledge in hemiplegia care-competency. This correlation suggests that educational interventions not only enhance knowledge but also translate into better practical application in caregiving. Also, when caregivers acquire more knowledge about hemiplegia; they are likely to apply this knowledge in their daily caregiving practices.

This results come in agree with **(Moreira et al., 2018)** who studied "Effectiveness of an educational intervention on knowledge-attitude-practice of older adults' caregivers" and reported that the educational intervention led to improvements in knowledge, attitude and practice, with statistical significance of attitude and practice. also this results was confirmed by **(Sheha et al., 2020)** who studied "effect of a planned health teaching on improving knowledge and competence of home care practice of post stroke patient among caregivers achievement" and found that educational programs significantly improved caregivers' knowledge and practices related to stroke management, including hemiplegia.

Moreover this results come in the same line with **(Abdel-Mageed et al., 2022)** who studied " Informal caregivers' awareness regarding patients with hemiplegia" and reported there were a highly statistically significant relation between total knowledge score and total reported practices score for their caregivers.

Analyzing the relationship between caregivers' characteristics and their competency levels, however there were no significant differences, it reveals interesting patterns. With a closer look at educational levels reveals that caregivers with university education show higher change in competency rates post-intervention. Similarly, **(Cho et al., 2016)** found that educational attainment significantly influenced the quality of care provided by caregivers in long-term care settings . This finding could suggest that higher education levels may facilitate better understanding and implementation of the training received.

Additionally, in terms of occupation, vocational workers and housewives show varying levels of competency, indicating that employment status and type may influence the ability to absorb and apply caregiving training. This is consistent with **(Zygouri et al., 2021)** who found that occupational roles significantly impact the acquisition of caregiving skills, with those in caregiving-related professions or with prior caregiving experience showing better outcomes post-training. Moreover, the flexibility of housewives' schedules might afford them more time to engage with and apply the training materials, as suggested by the findings of **(Bijnsdorp et al., 2022)** which highlighted that non-working caregivers often had better outcomes due to their ability to dedicate more time to caregiving tasks.

Interestingly, our study found no significant differences in competency improvements related to age, gender, type of family, and place of residence. This suggests that structured educational intervention can be equally effective regardless of these demographic variables of the of the caregivers. The current study results are in line with some previous studies; a study by **(Pucciarelli et al., 2021)**, which found no significant differences in caregiving outcomes across different age groups, a study by **(Seok & Lee, 2024)**, which found minimal gender differences in caregiving outcomes when both males and females received equivalent training and a meta-analysis by **(Ploeg et al., 2017)**, which reported that structured caregiver interventions were equally effective across different residential settings and family compositions. However, this finding contrasts

with some prior research, such as that by **(See Toh et al., 2022),** which indicated that younger caregivers often adapt more quickly to training programs than older caregivers. This discrepancy could be a result of interplay of different contextual factors.

Conclusion

The present study demonstrates the significant impact of a structured educational development approach on enhancing the care competency of caregivers for hemiplegic patients. The findings indicate substantial improvements in both knowledge and practice post-intervention, with total care competency increasing markedly from pre-intervention levels. The results underscore the necessity of implementing structured educational programs for caregivers, as these interventions not only elevate competency but also ensure sustained improvement through continuous support via telehealth.

Recommendations

Based on the results of the current study, the following recommendations are suggested:

1-Hospitals and healthcare facilities should integrate structured educational development programs for caregivers into standard care protocols either in discharge planning or follow up visits, especially for those attending to hemiplegic patients.

2-Post-training telehealth follow-ups are essential to reinforce learning and provide ongoing support, ensuring sustained caregiver competency through community and medical nurse.

3-Healthcare policymakers must advocate for

the inclusion of caregiver education in healthcare planning to enhance patient outcomes and caregiver well-being.

4-Further research can be conducted and replicated in other healthcare institutions on a larger representative group of caregivers to explore the long-term effects of structured educational interventions on caregiver competency and patient outcomes, as well as making generalization of the findings.

Conflict of interest:

None.

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