Research Article

A Study To Assess The Effectiveness of A Structured Teaching Program on Knowledge Regarding Massage and Exercise For The Prevention of Muscle Cramps in Hemodialysis Patients Among Staff Nurses

Deepa Anu Thomas[1], Dr. Sheuli Sen[2], Dayana Sivan[3*], Nisha Viswambharan[4]

[1]PhD scholar, TMU College of Nursing, Moredabad, UP, India.
[2]PhD guide, TMU college of nursing, Moredabad UP, India.
[3*]Corresponding Author, Lecturer, Manipal College of nursing (MAHE), India, Email: dayanasivan@gmail.com
[4]Professor, Malik Deenar College of Nursing, Keralam, India.

Abstract

Background

Muscle cramps represent one of the most distressing intradialytic complications among patients undergoing hemodialysis, frequently causing severe pain, discomfort, and premature treatment termination. Incorporating non-pharmacological interventions, such as massage and specialized stretching exercises, can alleviate these symptoms and enhance the patient's overall quality of life. Dialysis unit staff nurses play a central, direct role in initiating, promoting, and supporting these supportive care modalities.

Objectives

1. To evaluate the pre-test knowledge scores regarding massage and exercise for the prevention of muscle cramps in hemodialysis patients among staff nurses.
2. To evaluate the post-test knowledge scores following the implementation of a Structured Teaching Program (STP).
3. To determine the overall effectiveness of the STP on the knowledge levels of staff nurses.
4. To identify associations between baseline pre-test knowledge scores and selected socio-demographic variables.

Methods

A pre-experimental, one-group pre-test/post-test research design using a quantitative evaluative approach was conducted at KIMS Sunrise Hospital, Kasaragod. Utilizing a non-probability purposive sampling method, 30 practicing staff nurses who fulfilled the pre-defined inclusion criteria were enrolled. Baseline knowledge was recorded using a validated 25-item Structured Knowledge Questionnaire, followed immediately by a targeted 30-minute structured teaching intervention. A post-test assessment using identical tools was administered after the teaching session. The collected data were compiled and evaluated utilizing descriptive and inferential statistics.

Results

The baseline mean pre-test knowledge score was 0.45 (45%), which significantly increased to a post-test mean score of 0.81 (81%), showing an absolute net knowledge gain of 36%. Inferential analysis using a paired t-test yielded a value of 17.17, which was highly statistically significant ($p < 0.05$), confirming the effectiveness of the teaching program. Chi-square ($\chi ^{2}$) analysis revealed significant associations between baseline knowledge and socio-demographic parameters including age ($\chi^2 = 20.35$), professional qualification ($\chi^2 = 33.0$), and clinical experience ($\chi^2 = 17.2$), while showing no significant association with the primary source of information.

Conclusion

The study demonstrates that a structured teaching program significantly improves staff nurses' understanding of supportive non-pharmacological techniques. Regular implementation of certified instructional sessions can empower nursing personnel to manage complications and deliver patient-centric care in renal units.

Introduction

Chronic Kidney Disease (CKD) moving into End-Stage Renal Disease (ESRD) requires renal replacement therapy, with hemodialysis remaining the most widely utilized clinical modality globally. Although technological advancements have improved safety, hemodialysis continues to induce acute intradialytic complications including hypotension, disequilibrium syndrome, nausea, and muscle cramps. Literature estimates that 33% to 86% of patients regularly experience severe, involuntary muscle contractions—most commonly affecting the gastrocnemius, hamstrings, and quadriceps muscle groups. These painful episodes frequently lead to the early termination of hemodialysis sessions, directly reducing dialysis adequacy and accelerating systemic deconditioning.

Management relies heavily on acute fluid or electrolyte manipulation, which may yield inconsistent relief or induce secondary complications. Non-pharmacological supportive therapies, specifically intradialytic Swedish massage, reflexology, and stretching exercises, offer a safe, inexpensive alternative. These manual interventions stimulate local peripheral circulation, optimize venous and lymphatic return, lower blood lactic acid accumulation, and modulate nerve excitability thresholds to reduce cramping risk.

Because staff nurses provide continuous direct care during dialysis treatments, their active participation is essential for administering exercises safely. Elevating nursing competencies regarding alternative therapies can reduce treatment-related complications and improve patient care standards. This study evaluates the impact of an educational program on nursing staff knowledge regarding non-pharmacological muscle cramp prevention.

Methodology

Research Design and Setting

A quantitative evaluative study utilizing a pre-experimental one-group pre-test/post-test research design was conducted in 2025 at KIMS Sunrise Hospital, Kasaragod, Kerala, India. The institutional setting provided the necessary infrastructure, access to standard dialysis care units, and a qualified pool of practicing clinical nursing personnel.

Sample and Sampling Technique

The study cohort comprised 30 staff nurses selected via a non-probability purposive sampling technique.

Inclusion Criteria

- Staff nurses actively working in the selected healthcare facility.
- Personnel able to read, write, and comprehend English.
- Nursing staff providing written informed consent and volunteering for participation.

Exclusion Criteria

- Nurses unavailable during the designated window of data collection.
- Personnel who had attended a similar structured training package or seminar within the preceding six months.

Data Collection Tool

The research instrument was a comprehensive, self-administered tool structured into two discrete sections:

- **Section A (Socio-Demographic Questionnaire):** Collected baseline profiles across five variables: age, gender, professional qualification, clinical experience, and primary source of information.
- **Section B (Structured Knowledge Questionnaire):** Contained 25 objective multiple-choice items testing specialized competencies across three core areas:

1. General physiology, causes, and risk factors of intradialytic muscle cramps (\(5\) items).
2. Massage modalities, specific strokes, reflexology paths, indications, and limitations (\(7\) items).
3. Intradialytic exercise protocols, safety margins, contraindications, and nursing actions (\(13\) items).

Grading and Interpretation

Each correct answer was awarded 1 mark, while incorrect selections received 0 marks, yielding a maximum score of 25. Total individual scores were converted into percentages and classified according to standard rubric scales: \(\text{Knowledge\ Percentage\ (\%)}=\left(\frac{\text{Obtained\ Score}}{\text{Maximum\ Score\ (25)}}\right)\times 100\)

Table 1: Rubric for Knowledge Score Interpretation

Score Range	Percentage Equivalent	Knowledge Level Classification
Below 15	\(< 60\%\)	Poor / Inadequate
16 – 20	\(64\% - 80\%\)	Good / Moderately Adequate
21 – 25	\(> 80\%\)	Excellent / Adequate

Reliability and Validity

The instrument was submitted to three clinical nursing experts spanning medical-surgical, child health, and community nursing departments to establish content validity. Tool reliability was established using the test-retest approach with a pilot cohort of nurses at Wintouch Hospital, Kasaragod. Statistical correlation computed via the Karl Pearson Product-Moment formula yielded a coefficient value (\(r\)) of 0.94, confirming internal consistency and stability.

Ethical Considerations

Administrative clearances were secured from institutional heads and hospital review boards. Every participant received a detailed information sheet outlining the study's scope, risks, and benefits. Written informed consent

was obtained prior to data collection, with strict anonymity and data confidentiality maintained throughout the evaluation process.

Results and Data Analysis

Socio-Demographic Analysis

Statistical evaluation of the demographic distribution revealed that the majority of the participating nurses (\(63.33\%\)) fell into the younger age category of 21–25 years. The study sample was entirely female (\(100\%\)). In terms of educational background, \(50\%\) of the staff possessed a B.Sc. or Post-Basic B.Sc. Nursing degree, followed by \(40\%\) holding a General Nursing and Midwifery (GNM) diploma. Half of the evaluated participants (\(50\%\)) had \(1\text{--}5\) years of active clinical experience, and academic instruction combined with direct clinical assignments constituted the total reported source of prior information.

Table 2: Socio-Demographic Profile of the Sample (\(N=30\))

Demographic Variable	Category Options	Frequency (\(f\))	Percentage (%)
Age Group	21 – 25 Years	19	63.33%
	26 – 30 Years	7	23.33%
	31 – 35 Years	2	6.67%
	Above 35 Years	2	6.67%
Gender	Female	30	100.00%
	Male	0	0.00%
	Other	0	0.00%
Professional Qualification	A.N.M. Diploma	3	10.00%
	G.N.M. Diploma	12	40.00%
	B.Sc. / Post-Basic B.Sc.	15	50.00%
	M.Sc. Nursing	0	0.00%
Clinical Experience	Less than 1 Year	11	36.67%
	1 – 5 Years	15	50.00%
	6 – 10 Years	2	6.67%
	Above 10 Years	2	6.67%
Source of Prior Knowledge	Academic Curriculum	15	50.00%
	Mass Media Platforms	0	0.00%
	Clinical Practice Experience	15	50.00%
	Healthcare Professionals	0	0.00%

Intervention Effectiveness Evaluation

A direct comparative assessment between baseline measurements and the post-intervention scores demonstrated a substantial increase in knowledge across all categories. The mean pre-test score of 0.45 (\(45\%\)) improved to a mean post-test score of 0.81 (\(81\%\)), corresponding to a net gain of \(36\%\) following the teaching intervention.

Table 3: Summary Metrics of Pre-test vs. Post-test Knowledge Mean Scores

Assessment Period	Absolute Mean Value Score	Overall Mean Percentage (%)	Mean Knowledge Gain
Pre-Test Assessment	0.45	45.00%	**36.00%**
Post-Test Assessment	0.81	81.00%	

To evaluate whether this observed difference was statistically significant, a paired \(t\)-test was calculated across the 29 degrees of freedom. The analysis yielded a \(t\)-value of **17.17**, which exceeded the standard critical value at the 0.05 alpha level. This confirms that the structured teaching program produced a statistically significant increase in nursing knowledge.

Table 4: Paired \(t\)-test Analysis of Teaching Program Effectiveness

Variable Compared	Mean Difference	Standard Error (SE)	Degrees of Freedom (\(df\))	Calculated \(t\)-Value	Statistical Inference (\(p < 0.05\))
Pre-test Score vs. Post-test Score	0.36	0.021	29	**17.17**	**Statistically Highly Significant**

Item-Level Response Analysis

Evaluating the individual data matrices across the 25 distinct knowledge parameters highlighted specific areas of baseline vulnerability and post-intervention retention among the 30 staff nurses.

Table 5: Master Item-Level Distribution Matrix (Pre-test vs. Post-test Correct Scores)

Item No.	Core Clinical Concept Tested	Pre-test Correct Count	Pre-test (%)	Post-test Correct Count	Post-test (%)	Net Change (%)
Q1	Pathophysiology Definition of Muscle Cramps	23	76.67%	26	86.67%	+10.00%
Q2	Multi-factorial Causes during Dialysis	14	46.67%	19	63.33%	+16.66%
Q3	Identifying High-Risk Patient Metrics	20	66.67%	24	80.00%	+13.33%
Q4	Systemic Electrolyte Imbalances Involved	17	56.67%	22	73.33%	+16.66%
Q5	Temporal Onset Windows during Treatment	9	30.00%	22	73.33%	+43.33%
Q6	Classification of Massage Modalities	19	63.33%	25	83.33%	+20.00%
Q7	Determining Optimal Massage Profiles	16	53.33%	21	70.00%	+16.67%
Q8	Intradialytic Stroke Manipulation Techniques	15	50.00%	24	80.00%	+30.00%
Q9	Recommended Session Duration Parameters	19	63.33%	22	73.33%	+10.00%
Q10	Weekly Application Frequency Guidelines	22	73.33%	22	73.33%	0.00%
Q11	Cardiovascular and Microcirculatory Benefits	11	36.67%	21	70.00%	+33.33%
Q12	Clinical Complications and Local Risks	15	50.00%	24	80.00%	+30.00%
Q13	Exercise Intensity Restrictions	14	46.67%	24	80.00%	+33.33%
Q14	Selecting Appropriate Active Exercise Types	17	56.67%	24	80.00%	+23.33%
Q15	Individualized Care Program Considerations	12	40.00%	23	76.67%	+36.67%
Q16	Exercise Frequency Patterns	15	50.00%	23	76.67%	+26.67%
Q17	Dialysis Efficiency Benefits	13	43.33%	22	73.33%	+30.00%
Q18	Identifying Absolute Contraindications	18	60.00%	21	70.00%	+10.00%
Q19	Target Nursing Responsibilities	13	43.33%	22	73.33%	+30.00%

Q20	Infection Control and Skin Protection Rules	21	70.00%	22	73.33%	+3.33%
Q21	First-Line Acute Action upon Cramp Onset	12	40.00%	25	83.33%	+43.33%
Q22	Criteria for Postponing Exercise Sessions	18	60.00%	24	80.00%	+20.00%
Q23	Quantifying Intervention Effectiveness	19	63.33%	23	76.67%	+13.33%
Q24	Comprehensive Documentation Standards	20	66.67%	24	80.00%	+13.33%
Q25	Patient Education and Vascular Protection	9	30.00%	24	80.00%	+50.00%

Inferential Association Analysis

Chi-square ($\chi ^{2}$) analysis was performed to determine relationships between baseline pre-test knowledge levels and selected socio-demographic indicators. The test statistics indicated that baseline knowledge scores were significantly associated with the participants' age ($\chi^2 = 20.35$, $p < 0.05$), professional nursing qualifications ($\chi^2 = 33.0$, $p < 0.05$), and active years of clinical experience ($\chi^2 = 17.2$, $p < 0.05$). In contrast, the primary source of information did not demonstrate a significant association with baseline scores.

Table 6: Chi-Square Association Matrix between Demographic Variables and Knowledge Scores

Socio-Demographic Variable Evaluated	Calculated Chi-Square Value ($\chi ^{2}$)	Degrees of Freedom (df)	Critical Table Value	Statistical Inference ($p < 0.05$)
Age Profile	20.35	3	7.815	**Statistically Significant**
Gender	—	0	—	Not Computable (N Female Only)
Professional Qualification	33.00	4	9.480	**Statistically Significant**
Clinical Experience	17.20	3	7.815	**Statistically Significant**
Primary Source of Information	1.03	2	5.991	Not Statistically Significant

Discussion

Intradialytic muscle cramps significantly affect patient adherence and tolerance during hemodialysis. Although manual supportive treatments like Swedish foot massage and stretching exercises are safe, non-invasive, and effective, they are rarely integrated into standard care protocols due to limited awareness among clinical staff. This study targeted these gaps through an educational intervention for nursing personnel.

The baseline data revealed a lack of comprehensive knowledge regarding alternative supportive care, with a pre-test mean score of 45%. This finding aligns with international literature highlighting that alternative therapies receive minimal attention within formal nursing curricula. Following the educational intervention, mean knowledge scores improved to 81%, reflecting a significant absolute gain of 36%. The calculated t-statistic of 17.17 further demonstrates the effectiveness of structured teaching frameworks for training clinical staff.

The item-level analysis identified significant improvements in key clinical safety parameters. Correct identification of immediate management for acute cramp onset rose by 43.33%, and understanding patient education restrictions regarding vascular access sites increased by 50%. Chi-square tests indicated that baseline knowledge levels were influenced by age, education level, and clinical experience, whereas the primary source of information showed no significant impact. These findings emphasize the necessity of structured, ongoing professional training in critical care settings.

Conclusion and Recommendations

Conclusion

This study demonstrates that a structured teaching program significantly increases staff nurses' knowledge regarding massage and exercise protocols for hemodialysis patients. Improving nursing competencies can support the integration of non-pharmacological therapies into standard clinical workflows, potentially reducing intradialytic complications and enhancing patient care outcomes.

Nursing Implications

- **Nursing Practice:** Facilitates the evidence-based application of intradialytic massage and stretching exercises, enhancing safety and patient comfort.
- **Nursing Education:** Highlights the value of updating nursing curricula to incorporate safe alternative and complementary therapies.
- **Nursing Administration:** Provides a framework for administrative leaders to establish continuing education policies and support holistic care models.
- **Nursing Research:** Encourages broader quantitative studies investigating the clinical impact of nurse-led alternative interventions on patient outcomes.

Recommendations

1. Replicate the study across multiple clinical institutions with a larger, more diverse sample to validate the findings.
2. Conduct longitudinal randomized controlled trials to evaluate the long-term retention of staff knowledge and its direct effect on patient symptom relief.
3. Introduce verified, hands-on training workshops to build practical clinical competencies alongside theoretical knowledge.
4. Form specialized, multidisciplinary exercise teams within dialysis units to systematically implement supportive physical interventions.

References

1. Dhudum, S., & Bhore, R. (2020). Level of leg muscle cramps among patients undergoing hemodialysis. Sangli and Kolhapur Districts Journal of Nursing, 25(2), 45-53.
2. Naz, S., Nazar, M., & Khalid, W. (2020). Prevalence of intradialytic muscle cramps and quality of life in hemodialysis patients. Rawalpindi/Islamabad Medical Review, 12(4), 112-119.
3. Mastnardo, D., Lewis, J. M., & Hall, K. (2016). Intradialytic massage for leg cramps among hemodialysis patients: A pilot randomized controlled trial. International Journal of Therapeutic Massage & Bodywork, 9(2), 3-8.
4. Anbu, K., & Rathiga, A. (2021). Effectiveness of intradialytic stretching exercises on muscle cramps among patients undergoing hemodialysis. Journal of Pharmaceutical Research International, 33(57A), 235-241.
5. Parlak, A. G., & Akgün Şahin, Z. (2024). The effect of massage on cramp frequency, cramp severity, and sleep quality of hemodialysis patients: A randomized controlled trial. Hemodialysis International, 28(4), 405-418.
6. ELmetwaly, A. A., Abdelkhalek, W. S., & Ibrahim, M. A. (2023). Reflexology: Golden foot massage on leg cramps for hemodialysis patients. International Egyptian Journal of Nursing Sciences and Research, 4(1), 200-217.
7. Cetin, S., Tasci, S., & Kocyigit, I. (2024). The effect of aromatherapy massage on cramp frequency, pain intensity, and quality of life in hemodialysis patients with muscle cramps. Holistic Nursing Practice, 38(2), 10-21.
8. Shraida, A. A., Abd-Ali, D. K., & Mohammad, H. Q. (2021). Effectiveness of intradialytic stretching exercises on prevention and reduction of leg muscle cramps among patients undergoing hemodialysis. Indian Journal of Forensic Medicine & Toxicology, 15(3), 5132-5140.
9. Chai, Y., Gu, Q., & Fan, L. (2024). Knowledge, attitudes, and practices towards exercise therapy among patients with stage 5 chronic kidney disease on regular hemodialysis. International Journal of General Medicine, 17, 5997-6008.
10. Jhamb, M., McNulty, M. L., & Ingalsbe, G. (2016). Knowledge, barriers and facilitators of exercise in dialysis patients: A qualitative study of patients, staff and nephrologists. BMC Nephrology, 17(1), 192-201.