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Effect of Leg Stretching Exercises on Dialysis Fatigue in GMCH

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Abstract: ***Fatigue is a pervasive symptom in End-Stage Renal Disease (ESRD) patients undergoing hemodialysis (HD). This study evaluated the effect of intradialytic leg stretching exercises on fatigue among HD patients at Gauhati Medical College and Hospital (GMCH), Guwahati, Assam. A quasi-experimental non-equivalent pretest-posttest control group design was employed with 60 purposively selected HD patients, divided equally into experimental (n = 30) and control (n = 30) groups. Fatigue was measured across physical, cognitive, and psychosocial domains using the Modified Fatigue Impact Scale (MFIS). The experimental group performed 30-minute supervised intradialytic leg stretching exercises 3 times weekly for 2 weeks, while the control group received standard care. Post-intervention, the experimental group demonstrated a statistically significant reduction in mean fatigue scores from 45.10 ± 10.43 to 33.70 ± 7.58 (p < 0.001). Conversely, the control group showed no significant change (44.40 ± 7.49 to 45.00 ± 7.57). An independent t-test confirmed a significant difference between groups post-intervention (t = 5.77, p < 0.001). Fatigue reduction was independent of socio-demographic parameters. Intradialytic leg stretching exercise is an effective, non-pharmacological, safe nursing intervention to alleviate post-dialysis fatigue.***

Keywords: Hemodialysis, Leg Stretching, Fatigue, MFIS, ESRD

1. Introduction

1.1 Background of the Study

The human kidney maintains systemic homeostasis through waste excretion, electrolyte balance, fluid maintenance, and hormone secretion. Chronic Kidney Disease (CKD) represents a progressive, irreversible loss of renal function. When the Glomerular Filtration Rate (GFR) drops below 15 mL/min/1.73 m², the condition progresses to End-Stage Renal Disease (ESRD), requiring continuous renal replacement therapy—either dialysis or kidney transplantation.

Hemodialysis (HD) remains the primary treatment modality for ESRD patients globally. Although HD effectively purifies blood, it is associated with severe physical and physiological side effects. Among these, **fatigue** is the most pervasive, reported by 60% to 97% of maintenance hemodialysis patients.

Fatigue in HD patients is characterized as a persistent, overwhelming sense of physical, mental, and emotional exhaustion not relieved by sleep. The etiology of post-dialytic fatigue is multifactorial, stemming from uremic toxins, rapid fluid shifts, chronic anemia, systemic inflammation, muscle atrophy, and psychosocial distress.

1.2 Need for the Study

According to the Indian Council of Medical Research (ICMR), approximately 7.85 million individuals suffer from chronic renal failure in India. Despite expanding coverage of hemodialysis units, symptom management remains suboptimal.

Exercise interventions during hemodialysis sessions (intradialytic exercises) have emerged as a safe strategy to counteract muscle catabolism. Leg stretching exercises specifically focus on major muscle groups (quadriceps, hamstrings, gastrocnemius, soleus) to improve local perfusion, promote venous return, prevent muscle cramping, reduce solute retention, and decrease systemic fatigue. While aerobic interventions require specific equipment, simple passive and active leg stretching exercises are cost-free, easy to teach, and safe during passive treatment hours.

1.3 Statement of the Problem

"A study to assess the effect of Leg Stretching Exercises on reducing Fatigue among Patients undergoing Hemodialysis in Gauhati Medical College and Hospital, Guwahati, Assam."

1.4 Objectives of the Study

- To assess the baseline level of fatigue among patients undergoing hemodialysis in the experimental and control groups.
- To evaluate the effect of leg stretching exercises on reducing fatigue among hemodialysis patients in the experimental group.
- To determine the association between post-intervention fatigue levels and selected demographic variables (age, sex, education, occupation, income, dietary habits).

2. Literature Survey

(Section mandated by IJSR guidelines)

- **Veeram et al. (2016) [11]:** Reported a significant reduction in fatigue scores (27.5 ± 9.74 vs. control 35.4 ± 15.3; t = 2.20) following a leg stretching protocol in HD patients.

- **Jose et al. (2014) [10]:** Confirmed intradialytic lower-limb exercises significantly reduced fatigue (t = 4.819, p < 0.001) and enhanced activities of daily living.
- **Chang et al. (2010) [8]:** Demonstrated that 30 minutes of intradialytic lower-limb exercise lowered fatigue scores without inducing hemodynamic instability.
- **Jhamb et al. (2010) [9]:** Highlighted that fatigue in ESRD is independently associated with poor clinical outcomes, physical inactivity, and decreased health-related quality of life.

3. Methodology/ Approach

3.1 Study Design & Approach

A quantitative evaluative research approach with a quasi-experimental non-equivalent pretest-posttest control group design was used:

- **Experimental Group:** $O_1 \rightarrow X \rightarrow O_2$
- **Control Group:** $O_1 \rightarrow$ [Standard Care] $\rightarrow O_2$

Where O_1= Pretest assessment (MFIS), X= Leg Stretching Exercise intervention, and O_2= Posttest assessment (MFIS).

3.2 Study Setting & Sample

The study was conducted at the 12-bed Hemodialysis Unit, Department of Nephrology, Gauhati Medical College & Hospital (GMCH), Guwahati, Assam. Using purposive sampling, 60 eligible subjects were selected and allocated into two equal cohorts:

- **Experimental Group (n = 30):** Intradialytic leg stretching exercise program + routine care.
- **Control Group (n = 30):** Standard routine hemodialysis care.

Inclusion Criteria:

- Patients aged 30–70 years undergoing maintenance hemodialysis.
- Inpatients or outpatients attending GMCH hemodialysis unit.
- Ability to communicate in Assamese or English.

Exclusion Criteria:

- Patients with acute hemodialysis complications, altered mental status, lower extremity fractures, or open wounds.

3.3 Description of Tool & Intervention

Data was collected using a structured two-part research instrument:

1) **Section I: Socio-Demographic Questionnaire** (Age, Sex, Education, Occupation, Income, Diet).
2) **Section II: Standardized Modified Fatigue Impact Scale (MFIS):** Comprising 21 items across Physical (0–36), Cognitive (0–40), and Psychosocial (0–8) subscales (Total score range: 0–84).

Intervention Description:

The experimental group performed a targeted passive/active Leg Stretching Exercise protocol during the first 2 hours of hemodialysis sessions.

- **Protocol:** 5 complete cycles per session (2 minutes rest between cycles), totaling 30 minutes per session.
- **Frequency:** 3 times per week for 2 consecutive weeks (6 sessions total).
- **Target Muscles:** Quadriceps, hamstrings, gastrocnemius, and soleus.

4. Results & Discussion

Data were analyzed using SPSS Version 16.0. Significance threshold was set at $p < 0.05$.

4.1 Pre-Intervention vs. Post-Intervention Fatigue Severity

Table 1: Frequency and Percentage Distribution of Pretest and Posttest Fatigue Severity

Group	Fatigue Severity Level	Pretest f (%)	Post-test f (%)
Experimental Group (n = 30)	Mild (≤ 36)	6 (20.0%)	8 (26.7%)
	Moderate (36–54)	18 (60.0%)	20 (66.7%)
	Severe (≥ 54)	6 (20.0%)	2 (6.7%)
Control Group (n = 30)	Mild (≤ 36)	3 (10.0%)	0 (0.0%)
	Moderate (36–54)	25 (83.3%)	21 (70.0%)
	Severe (≥ 54)	2 (6.7%)	9 (30.0%)

4.2 Comparative Analysis of MFIS Scores

Table 2: Domain-wise Mean and Standard Deviation of MFIS Scores

Domain / Subscale	Experimental Group Pretest	Experimental Group Posttest	Control Group Pretest	Control Group Posttest
Physical Subscale	23.20 ± 4.82	17.10 ± 3.92	25.87 ± 4.10	26.10 ± 4.15
Cognitive Subscale	15.33 ± 6.95	12.10 ± 4.80	14.33 ± 4.66	14.50 ± 4.72
Psychosocial Subscale	4.83 ± 1.66	3.50 ± 1.10	4.20 ± 1.30	4.40 ± 1.25
Total MFIS Score	45.10 ± 10.43	33.70 ± 7.58	44.40 ± 7.49	45.00 ± 7.57

4.3 Hypothesis Testing & Discussion

- **Within-Group Effect:** Total MFIS mean score decreased significantly in the experimental group (Mean Difference = 11.40, t = 9.64, p < 0.001).
- **Between-Group Effect:** Post-intervention MFIS score was significantly lower in the experimental group than the control group (t = 5.77, p < 0.001).
- **Demographic Association:** Chi-square test revealed no significant association between posttest fatigue reduction and socio-demographic parameters (p > 0.05).

Physiologically, leg stretching increases muscle blood perfusion, accelerates uremic toxin clearance, and reduces vascular congestion without causing hemodynamic instability.

5. Conclusion

The study demonstrates that a structured **30-minute intradialytic leg stretching exercise protocol**, performed 3 times weekly for 2 weeks, significantly reduces physical, cognitive, and psychosocial fatigue among maintenance hemodialysis patients.

6. Future Scope

- **Longitudinal Studies:** Future research can examine the long-term sustainability of fatigue reduction over 6 to 12 months.
- **Biochemical Markers:** Combining physical outcomes with biochemical parameters (e.g., Kt/V urea clearance, hemoglobin levels, inflammatory cytokines).
- **Multi-Center RCTs:** Conducting randomized controlled trials with larger sample sizes across diverse regional tertiary centers.

Declarations

Ethical Approval and Informed Consent
Ethical clearance was obtained from the Institutional Ethics Committee (IEC) of GMCH, Guwahati, Assam. Written informed consent was obtained from all individual participants.

Conflict of Interest
The authors declare no conflict of interest.

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