FishTaxa - Journal of Fish Taxonomy
Vol 37, ISSN: 2458-942X

Effects of Intradialytic Exercise on Fatigue, Biochemical and Physiological Parameters among patients undergoing Hemodialysis in selected tertiary hospital, Chennai

Dr.Kavinmozhi James[1], Dr.Vahitha Mala K[2], Mrs.Sheeba Basil B[3], Ms.Kavikuilrani B[4], Mr.Muthu Selvan N V[5], Shevani B[6]

[1]*Principal & Professor, Department of Adult Health Nursing, Panimalar College of Nursing, Varadharajapuram, Poonamallee, Chennai – 600 123, Tamil Nadu, India.*
[2]*Professor, Department of Community Health Nursing, Panimalar College of Nursing, Varadharajapuram, Poonamallee, Chennai – 600 123, Tamil Nadu, India.*
[3]*Assistant Professor, Department of Community Health Nursing, Panimalar College of Nursing, Varadharajapuram, Poonamallee, Chennai – 600 123, Tamil Nadu, India.*
[4]*Tutor, Department of Adult Health Nursing, Panimalar College of Nursing, Varadharajapuram, Poonamallee, Chennai – 600 123, Tamil Nadu, India.*
[5]*Tutor, Department of Adult Health Nursing, Panimalar College of Nursing, Varadharajapuram, Poonamallee, Chennai – 600 123, Tamil Nadu, India.*
[6]*Tutor, Department of Adult Health Nursing, Panimalar College of Nursing, Varadharajapuram, Poonamallee, Chennai – 600 123, Tamil Nadu, India.*

Abstract

Introduction: Patients undergoing hemodialysis are most likely to be physically inactive, and this is associated with several detrimental clinical outcomes. Fatigue and elevated metabolic markers are directly linked to decreased physical activity. Intradialytic exercise is a non-pharmacological treatment for hemodialysis patients with end-stage renal disease (ESRD), although it is rarely utilized in most hemodialysis centers. This study aims to evaluate the effects of an intradialytic exercise program (IDEP) on fatigue, biochemical and physiological parameters in hemodialysis patients with end-stage renal disease.

Methods: Using a quasi-experimental design, 40 patients from two dialysis centers were recruited and randomly assigned to 20 intervention and 20 control groups. Patients in the intervention group received IDEP education twice a week for 25 minutes each, while patients in the control group merely received standard care. Fatigue, biochemical, and physiological indicators were assessed at baseline and at various points after IDEP. While there was minimal change in the physiological and biochemical markers, such as potassium, urea, creatinine, and hemoglobin, and systolic and diastolic blood pressure, fatigue steadily decreased in the intervention group. The majority of patients in the control group reported no change in their degree of fatigue. In certain instances, the level of fatigue is increased.

Conclusion: IDEP is a non-pharmacological, complementary, safe, and affordable treatment for fatigue that can be used during hemodialysis. The patient's level of fatigue will be decreased without requiring more time if IDEP is incorporated into routine therapy.

Citation: Dr.Kavinmozhi James1, Dr.Vahitha Mala K2, Mrs.Sheeba Basil B3, Ms.Kavikuilrani B4, Mr.Muthu Selvan N V5, Shevani B6. 2025. Effects of Intradialytic Exercise on Fatigue, Biochemical and Physiological Parameters among patients undergoing Hemodialysis in selected tertiary hospital, Chennai. FishTaxa 37: 99-105.

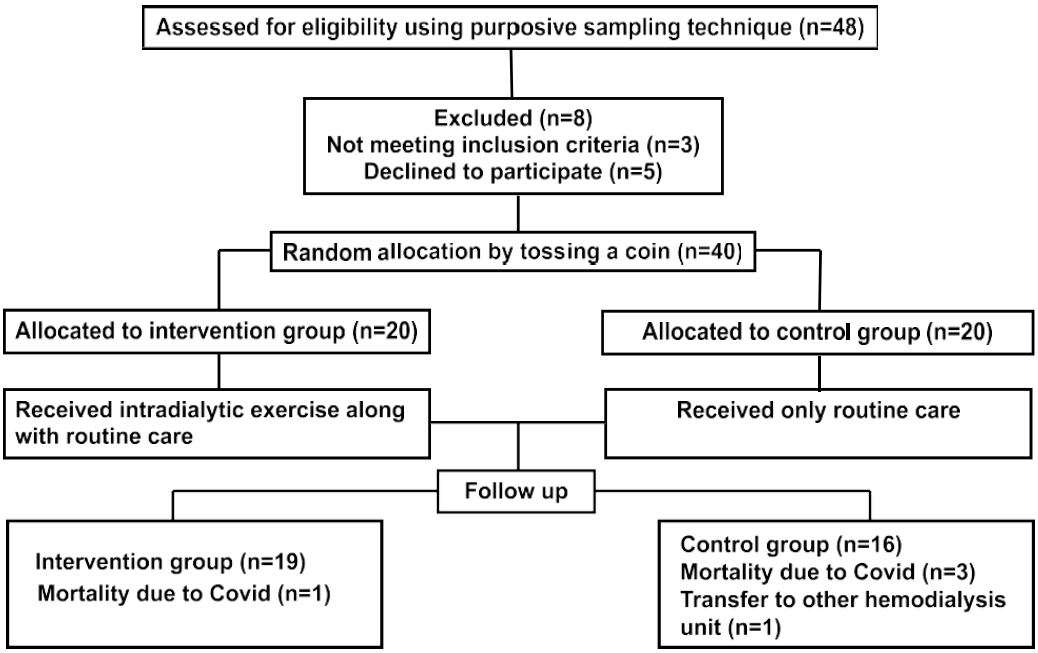
Introduction

Chronic kidney disease (CKD) and are becoming more common worldwide, in both developed and developing nations. The final stage of chronic kidney disease, known as end-stage renal disease (ESRD), is characterized by a progressive decline in renal function and a failure of the body to maintain fluid electrolyte, metabolic, and acid-base balance. Protein metabolism end products build up in the blood, causing uremia and other symptoms that impact every bodily system. For patients to survive, dialysis or kidney transplants are essential. Hemodialysis patients experience numerous problems, which can be brought on by the disease, dietary restrictions, and behavioral, psychosocial, or even dialysis-related variables. One of the significant symptoms that hemodialysis patients encounter is fatigue, which is frequently disregarded by medical professionals. The term "fatigue" describes a generalized sense of being worn out or lacking vitality. Research reports discuss the positive benefits of exercise in patients receiving hemodialysis. During exercise blood vessels in active skeletal muscles vasodilate and the autonomic nervous system are engaged. Intradialytic exercise improves urea clearance by exposing more tissue and opening vascular beds in the working muscle, allowing fluid in the tissue to flow to the intravascular compartment. During exercise, ions such as potassium and phosphate are also shifted from the intracellular compartment to the muscle interstitial fluid. The results of a study which evaluated the effect of intradialytic exercise program on fatigue in hemodialysis patients indicated that there was a significant difference in the level of fatigue among experimental and control group after intradialytic exercise program. There was a significant difference in the level of fatigue in experimental group before and after intradialytic exercise program. The study concluded that intradialytic exercise program is an effective intervention in reducing the level of fatigue among hemodialysis patients. In another pilot study program it was reported that intradialytic exercise is both safe and beneficial for hemodialysis patients.[4] Incorporating intradialytic exercise program for hemodialysis patients is relatively easy, inexpensive and requires not much of a preparation. But only very few such studies have been reported from India. Hence the investigator felt the need to take up such a study to evaluate the impact of intradialytic exercise program on hemodialysis patients.

AIM OF THE STUDY:
To assess the effects of intradialytic exercise on fatigue and biochemical–physiological parameters among patients undergoing hemodialysis in a selected tertiary hospital, Chennai.

METHODS AND MATERIALS
A quasi-experimental repeated treatment time series design was used to accomplish the aim to evaluate the impact of IDEP on fatigue, biochemical and physiological parameters. Initially hemodialysis patients were selected using purposive sampling technique based on the inclusion criteria of male and female patients aged between 20 and 80 years on maintenance dialysis for at least 3 months and the hemodialysis patients with uncontrolled hypertension, unstable angina, recent MI and lower limb amputation were excluded from the study. These 40 selected patients from selected tertiary hospital, chennai were randomly allocated to the intervention and control groups. Patients in intervention group were taught IDEP for 25 min, two times a week which comprised range of motion and resistance exercises for upper and lower extremities along with routine care whereas control group patients received only routine care

Fig. 1. Flow diagram of methodology.



Following an intradialytic exercise program, the experimental group's level of weariness before and after the intradialytic exercise program differed significantly. The study results revealed that an intradialytic exercise program is a useful strategy for lowering hemodialysis patients' levels of weariness. Intradialytic exercise has been shown to be safe and helpful for hemodialysis patients in another pilot study program. For hemodialysis patients, incorporating an intradialytic exercise regimen is comparatively simple, affordable, and requires little planning. However, India has only reported a relatively small number of these investigations. In order to assess the effects of an intradialytic exercise program on hemodialysis patients, the researcher felt compelled to conduct this kind of study.

STATISTICAL ANALYSIS

Table 1

Analysis of Demographic Variables

Age, sex, education, dietary habit, smoking history and habit of exercise/yoga distribution of study participants.

Age	Interventional (n = 19)	Control (n = 16)	Total
20–35	2 (10.4%)	7 (43.9%)	9 (25.7%)
36–50	6 (31.5%)	6 (37.6%)	12 (34.3%)
51–65	9 (47.4%)	4(18.8%)	11 (34.3%)
66–80	2 (10.5%)	0 (0.0%)	1 (5.7%)
Gender			
Male	16 (89.5%)	9 (50.0%)	25 (71.4%)
Female	3 (10.5%)	7 (50.0%)	10 (28.6%)
Education Status			
No Formal Education	3 (15.8%)	1 (6.3%)	4 (11.4%)
Primary	4 (21.1%)	4 (25.0%)	8 (22.9%)
Secondary	7 (36.8%)	3 (18.8%)	10 (28.6%)
Higher Secondary	4 (21.1%)	5 (31.3%)	9 (25.7%)
Other	1 (5.3%)	3 (18.8%)	4 (11.4%)
Dietary Status			
Non-Veg	12 (63.2%)	14 (87.5%)	26 (74.3%)
Vegetarian	7 (36.8%)	2 (12.5%)	9 (25.7%)
Smoking History			
Current	2 (10.5%)	0 (0.0%)	2 (5.7%)
Past	6 (31.6%)	2 (12.5%)	8 (22.9%)
Nil	11 (57.9%)	14 (87.5%)	25 (71.4%)
Habit of doing Exercise/Yoga			
Often	1 (5.3%)	0 (0.0%)	1 (2.9%)
Rarely	2 (10.5%)	0 (0.0%)	2 (5.7%)
Nil	13 (68.4%)	16 (100.0%)	29 (82.9%)

The effect of IDEP on physiological, biochemical, and fatigue markers was evaluated using a quasi-experimental repeated time series methodology. Patients receiving hemodialysis who had unstable angina, uncontrolled hypertension, a recent MI, or lower limb amputation were not included in the study. According to the inclusion criteria male and female patients aged 20 to 80 years on maintenance dialysis for at least three months, hemodialysis patients were first selected using a purposive selection technique. The 40 patients were randomly assigned to the intervention and control groups after being selected from Chennai's District Hospital and tertiary care hospital. Patients in the intervention group got IDEP twice a week for 25 minutes, which included resistance and range-of-motion exercises for the upper and lower extremities, while patients in the control group received just standard care (Fig. 1).

The Multidimensional exhaustion Inventory (MFI 20) scale was used to quantify the degree of exhaustion at various points in time. The items on the MFI 20 scale are categorized into five groups: mental exhaustion, physical weariness, decreased activity, diminished motivation, and general fatigue. Every item on the scale has a score ranging from 1 to 5. 20 (20 items X 1) is the least score on the MFI 20 scale, and 100 (20 items X 5) is the maximum. The higher a patient's score on this scale, the more exhausted they are. The reliability of the translated MFI 20 scale which was first written in English and then translated into Tamil, a vernacular language was assessed using the Cronbach's Alpha test. Biochemical measures and physiological characteristics were monitored at various points throughout time. In addition to monitoring the systolic and diastolic blood pressure, the researcher obtained biochemical values for potassium, serum creatinine, urea, and hemoglobin from the patient's medical file.

Table 2
Analysis of Clinical Variables.
Descriptive statistical parameters of mean, standard deviation and percentage were calculated for socio-demographic and clinical information and parametric test of independent t-test was used for inter group comparison and repeated measures ANOVA test for intra group comparison. In this analysis, independent variable is IDEP and dependent.

Frequency of Dialysis

Group	Interventional (n = 19)	Control (n = 16)	Total
Weekly Twice	11 (57.9%)	15 (93.8%)	26 (74.3%)
Weekly Thrice	8 (42.1%)	1 (6.3%)	9 (25.7%)
Duration of dialysis			
3–6 Months	6 (31.6%)	0 (0.0%)	6 (17.1%)
6–12 Months	1 (5.3%)	0 (0.0%)	1 (2.9%)
1–3 Years	7 (36.8%)	5 (31.3%)	12 (34.3%)
>3 Years	5 (26.3%)	11 (68.8%)	16 (45.7%)
Co morbidity			
Hypertension	18 (94.7%)	16 (100.0%)	34 (100.0%)
Diabetes mellitus	10 (52.6%)	3 (18.8%)	13 (100.0%)
Anemia	3 (15.8%)	3 (18.8%)	6 (100.0%)

Table 3
Comparisons of Fatigue between and within groups (MFI 20).variables were fatigue, biochemical and physiological parameters.

General Fatigue				
Baseline	4.04 ± 0.64	3.61 ± 0.85	1.715	0.096
Day7	3.64 ± 0.85	3.64 ± 0.86	0.014	0.989
Day15	3.20 ± 0.94	3.61 ± 0.84	— 1.353	0.185
1 Month	2.86 ± 1.01	3.78 ± 0.81	— 2.948	0.006
3 Months	2.54 ± 1.07	3.92 ±	— 4.082	0.000
P-value			<0.001	0.005
Physical Fatigue				
Baseline	4.36 ± 0.64	3.55 ± 0.98	2.930	0.006
Day7	3.97 ± 0.82	3.53 ±	1.459	0.154

		0.97		
Day15	3.58 ± 0.90	3.50 ± 0.86	0.264	0.793
1 Month	3.18 ± 0.99	3.66 ± 0.79	— 1.539	0.133
3 Months	2.84 ± 1.12	3.83 ±	— 2.735	0.010
F-Value	55.25	0.98		
P-value			<0.001	0.025
Reduced Activity				
Baseline	4.39 ± 0.50	3.86 ± 0.99	2.064	0.047
Day7	4.04 ± 0.72	3.88 ± 0.98	0.571	0.572
Day15	3.62 ± 0.90	3.80 ± 0.96	— 0.569	0.573
1 Month	3.26 ± 0.96	3.97 ± 0.91	— 2.221	0.033
3 Months F-value	2.75 ± 1.12 59.883	3.94 ± 0.96	— 3.325	0.002
P-value			<0.001	0.46
Reduced Motivation				
Baseline	3.93 ± 0.82	3.08 ± 1.34	2.319	0.027
Day7	3.59 ± 0.97	3.08 ± 1.35	1.306	0.200
Day15	3.09 ± 1.04	3.05 ± 1.35	0.112	0.911
1 Month	2.75 ± 1.06	3.13 ± 1.18	— 0.993	0.328
3 Months F-value	2.41 ± 1.09 46.499	3.28 ± 1.25	— 2.201	0.035
P-value			<0.001	0.207
Mental Fatigue				
Baseline	3.53 ± 1.08	3.17 ± 1.26	0.894	0.378
Day7	3.05 ± 1.14	3.20 ±	— 0.376	0.709

		1.23		
Day15	2.79 ± 1.09	3.13 ± 1.20	— 0.867	0.392
1 Month	2.46 ± 1.05	3.17 ± 1.09	— 1.963	0.058
3 Months F-value	2.14 ± 1.05 37.747	3.27 ± 1.27	— 2.862	0.007
P-value			<0.001	0.711

Analysis of clinical proforma showed that 26 of the patients were undergoing hemodialysis weekly twice and 9 of them weekly thrice. In terms of duration of hemodialysis, 45.7% of the patients were on maintenance hemodialysis for more than 3 years, 34.3% for 1–3 years and 17.1% for 3–6 months.

Primary Outcome Measures

Physical Fatigue

The fact that there is a statistically significant difference in fatigue scores between the intervention group and the control group after one month and three months after the intervention indicates that IDEP was successful in lowering general fatigue. In the intervention group, there has been a gradual reduction in general fatigue, and the p value of less than 0.001 shows that the IDEP was beneficial (Table 3).

The only time there was a significant difference in fatigue score between the intervention group and the control group was after three months had passed. A statistically significant decrease in fatigue score was seen within the intervention group, with the p value being less than 0.001 (as shown in Table 3).

Secondary Outcome Measures

Reduced Activity

The fact that there is a significant difference between the intervention group and the control group either after one month or after three months of IDEP is evidence that the intervention was successful. There was a statistically significant drop in fatigue levels among those in the intervention group, as demonstrated by the fact that the average fatigue score of the intervention group has gradually decreased (Table 3).

At 15 days, 1 month, and 3 months of IDEP, there is a statistical difference between the intervention group and the control group, which indicates that the intervention was successful. On the other hand, within the intervention group, there is a steady decrease in tiredness score, and the p value is less than 0.001, which indicates that there is a decrease in fatigue score over a period of time. There was no significant difference between the intervention group and the control group in terms of the average score for physical exhaustion even after one month of participation in the IDEP process. There was a statistically significant difference between the fatigue scores of the intervention group and the control group within one month after the IDEP. This difference was observed with regard to the other four components of tiredness, which are general fatigue, reduced activity, lower motivation, and mental exhaustion. There was a progressive drop in fatigue score at various time intervals in the intervention group, which indicated that IDEP was beneficial. This was observed across all five components of MFI 20, which were evaluated.

Results and Discussion

The majority of the 35 patients (n = 19 in the intervention group and n = 16 in the control group) were between the ages of 36 and 65 years old (68.6%), 25.7% were between the ages of 20 and 35 years old, and just 5.7% were between the ages of 66 and 80 years old. Regarding the gender of the participants, there were 25 males and 10 girls. Four of the thirty-five patients had no formal education, eight had completed elementary school, ten had completed secondary school, nine had completed higher secondary school, and four had completed undergraduate school. In total, there were 25 patients who did not smoke, 8 patients who had a history of smoking in the past, and 2 patients who were now smoking. The vast majority of the patients, including 82.9% of them, did not make it a routine to engage in physical activity or yoga (Table 1).

The findings of the current study indicated that an intradialytic exercise program that lasted for three months was beneficial in reducing fatigue, but it did not result in any changes to the biochemical and physiological parameters of the patients who were undergoing hemodialysis. An intradialytic leg exercise program was found to be helpful in reducing fatigue and enhancing quality

of life for patients who were receiving hemodialysis, according to the findings of the previous research.6. The results of a study that was carried out with a sample size of sixty and a pre-test and post-test methodology came to the conclusion that an exercise program during hemodialysis increased patients' quality of life and decreased weariness. A recommendation was also made in this study that patients with renal failure should have an exercise program created for them while they are undergoing hemodialysis.

The results of another study indicate that after eight weeks of participating in an exercise program that involved intradialytic range of motion, patients saw a considerable reduction in their levels of fatigue, serum phosphate, potassium, calcium, urea, and creatinine, as well as a minor increase in their hemoglobin level. Additionally, both the systolic and diastolic blood pressures of the experimental group exhibited significant changes. The findings of the study indicate that a simple physical exercise program has the potential to be considered as a clinical nursing modality that is both safe and effective for patients who are undergoing hemodialysis and have reached the end stage of renal disease. According to the findings of the study as a whole, the intradialytic exercise program is efficient in reducing fatigue; nevertheless, it did not show any improvement in terms of biochemical and physiological indicators.

In a nutshell, the results of this study indicate that the intradialytic exercise program did not have any meaningful impact on the biochemical and physiological markers of the patients who were undergoing hemodialysis. There have been previous studies that are comparable to this one. An example of such an experimental study was conducted with the purpose of determining the impact that physical activity during hemodialysis has on the effectiveness of the treatment for patients suffering from chronic renal disease. Through examination, it was determined that there was a statistically significant improvement in the levels of blood urea and nitrogen, as well as a minor improvement in the level of hemoglobin. However, there was no significant change in pressure, Kt/V, or biochemical variables.

Conclusion

A significant number of dialysis clinics in India still do not include exercise programs as part of their usual clinical practice, despite the fact that intra dermal exercise is not only safe and effective but also practicable and useful for patients undergoing hemodialysis. This pilot study has also provided the investigator with the opportunity to gain a better understanding of the various challenges that hemodialysis patient's experience, such as psychological, economical, and intradialytic concerns, which were not included in the factors that were being investigated in this study specifically. It is necessary to do additional research and prepare case reports in order to have a better understanding of these features and to construct a full interventional package for hemodialysis patients while they are undergoing dialysis.

Limitations

- The number of people who participated in this study was small.
- Co-morbidity patients were not allowed to participate in the study.

REFERENCES

1. Degler MA. Management of patients with urinary disorders. In: Smeltzer SC, Bare BG, editors. Brunner and Suddarth's Textbook of Medical Surgical Nursing, fourteenth ed. New York: Lippincott Williams and Wilkins.
2. Paluchamy T, Vaidhyanathan R. Effectiveness of Intradialytic exercise on dialysis adequacy,physiological parameters,biochemical markers and quality of life - a Pilot Study. Saudi J Kidney Dis Transpl. 2018;29(4):902–910.
3. Merline MS, Deepa R, Nirmala T. Effect of intradialytic exercise on fatigue among patients undergoing hemodialysis at selected hospital Coimbatore. Int J Applied Res. 2018;4(4):394–397.
4. Davis JS, Holcombe J. Intradialytic exercise: a pilot program. Dial Transplant. 2011; 40(6):258–260.
5. Smets EMA, Garssen B, Bonke B, De Haes JC. The multidimensional fatigue inventory (MFI) psychometric qualities of an instrument to assess fatigue. J Psychosom Res.1995;39(3):315–325.
6. Tamilmozhi TD, Valarmathi A, Tamilselvi S, Mekala C. A Quasi-experimental study to evaluate the effectiveness of intradialytic leg exercise on pain, fatigue and quality of life among patients undergoing hemodialysis in selected hospitals at Erode. Int J Advances in Nur Management. 2021;9(2):176–180.
7. Monera BA, Shemy EL, ElghiteElhossinyElkazch EA, RadwaElkuallly. Efficacy of
8. exercise program in intrahemodialysis on patient's quality of life. IOSR J Nurs Health Sci. 2016;5(1):17–30 pressure in hemodialysis patients: a randomized controlled trial. JNursing Edu and Practice. 2015;5(11):16–28.
9. Rashedi SAL, Ghaleb MA. Effectiveness of intradialytic leg exercise on dialysis efficacy among patients undergoing hemodialysis. Int J Adv Res and Innovative Ideas in Education. 2017;3(1):133–144.
10. Rhee SY, Song JK, Hong SC, et al. Intradialytic exercise improved physical function and reduces intradialytic hypotension and depression in hemodialysis patients. The Korean J Int Med. 2019;34(3):588–598.