ORIGINAL ARTICLE

Wiendenbach Theory – Impact of Intradialytic Exercise on Quality of Life of Hemodialysis Patients

Ramai Palar[1*], Diana Lobo[2]

[1]Sri Siddhartha College of Nursing, Tumkur, Karnataka, India.

[2]Department of Medical Surgical Nursing, Laxmi Memorial College of Nursing, Mangalore, Karnataka, India.

*Corresponding author:

Ramai Palar, Professor, Sri Siddhartha College of Nursing, Tumkur, Karnataka, India. E-mail: ramaimysore74@ gmail.com

Abstract

Background: Chronic kidney disease (CKD) results in imbalance of fluid electrolytes and acid-base making the body increasingly intoxicated. End stage renal disease (ESRD) is the last stage of CKD and renal transplant or dialysis is the only management. Dialysis patients face a lot of problems leading to reduction in quality of life (QOL).

Objective: With the advancement in medical technology and healthcare, the survival time of patients with CKD is significantly prolonged. However, they experience fatigue and poor health-related QOL. This study evaluated the impact of intradialytic exercise program (IDEP) on QOL of forty hemodialysis patients based on Ernestine Wiedenbach's model.

Methodology: Forty hemodialysis patients were randomly allocated to control and intervention groups. Subjects in the intervention group performed range of motion and resistance exercises for 25-30 minutes along with routine care whereas control group received only routine care.

Results: The results of repeated measures ANOVA and independent t test showed that within the intervention group, there was a significant improvement in all domains of SF-36 quality of life scale at $p < 0.001$ indicating that intradialytic exercise was effective. In the control group, no such improvement but rather a slight reduction in quality of life score was observed.

Conclusion: The results demonstrated that intradialytic exercise program was effective in improving quality of life of hemodialysis patients. Therefore, it is recommended that according to individual patient capacity, inclusion of exercise during dialysis shall reinforce the routine dialysis care.

Keywords: Intradialytic exercise, QOL-ESRD, Hemodialysis patients, Physical activity

Introduction

Many complications in hemodialysis patients may be minimised by either intradialytic or interdialytic exercises, which form an economical method of rehabilitation. According to the published literature, exercise improves functional capacity of kidney and health related quality of life (QOL).[1,2]

Need for the study

Many studies reported the positive effects of physical activity in hemodialysis patients. Intradialytic cycling can increase perfusion to the working leg muscle by moving the trapped urea from the muscle compartment to the blood stream for removal during hemodialysis.[3] Intradialytic resistance training program for 12 weeks showed improvement in QOL and decreased inflammatory processes.[4] Optimal intradialytic exercise program (IDEP) leads to improvement in all domains of SF-36 QOL scores.[5] One of the few studies reported from India indicated that most of the hemodialysis centres in India do not include IDEP as a part of the dialysis treatment.[6] Thus, there is a need for hemodialysis patients to be trained using appropriate and effective teaching models to develop a proper understanding of the disease and adherence to the necessary interventions. This pilot study evaluated the impact of IDEP on QOL of hemodialysis patients on the basis of Ernestine Wiedenbach's Helping Art of Clinical Nursing Theory.[7]

Conceptual Framework Based on Ernestine Wiedenbach's Helping Art of Clinical Nursing Theory

Wiedenbach's Theory states that nursing is the practice of identification of a patient's need through observation of presenting behaviour and symptoms. The four major concepts of this theory utilized in this study are - Central purpose, Identification, Ministration and Validation (Figure 1).

Central Purpose

It is the one which the nurse recognises as essential to the particular discipline. Evaluating the impact of IDEP on QOL of hemodialysis patients was the central purpose in the present study.

Identification

Identification involves individualization of the patient, his experiences and recognition of the patient's perception of his condition. In this study, investigator identified the
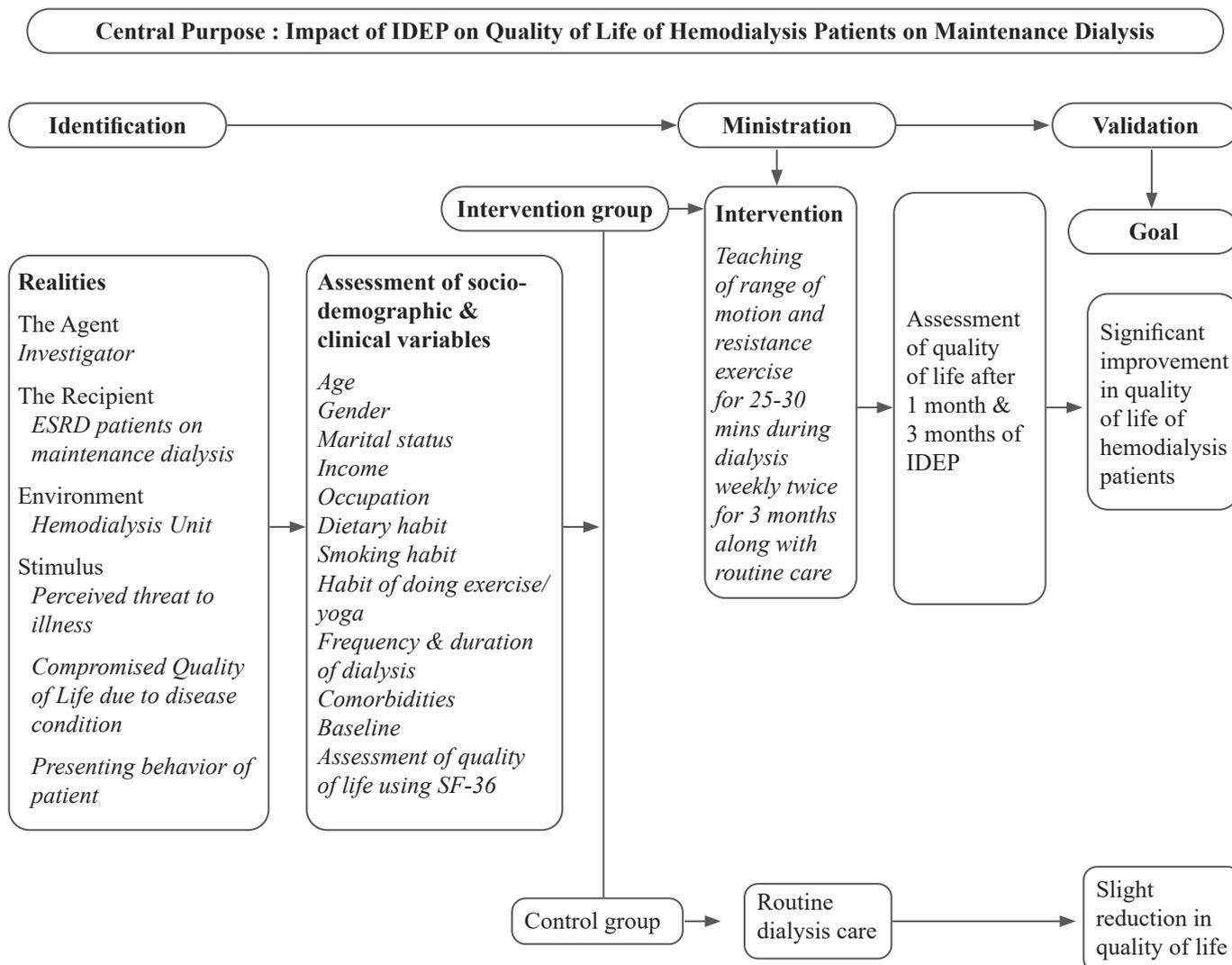

Figure 1: Conceptual framework based on modified Ernestine Wiedenbach's Helping Art of Clinical Nursing Theory

need for help in End stage renal disease (ESRD) patients on maintenance hemodialysis on the basis of the socio-demographic and clinical variables, baseline assessment of QOL using questionnaire, patients case records and SF-36 scale.

Ministration

Ministration is providing needed help. In this study, ministration was the intervention given to the hemodialysis patient.

Validation

Validation is the evidence that the patient's functional ability was restored as a result of the help given. In this study, the validation was done by evaluating the effectiveness of IDEP on QOL using SF 36 scale.

Materials and Methods

Quasi experimental repeated treatment time-series control group design was adopted in this study. Purposive sampling technique was used to recruit forty hemodialysis patients based on the defined inclusion and exclusion criteria of the study who were randomly allocated to the intervention and control groups. Patients

in the intervention group were taught IDEP for 25 minutes, two times a week which comprised range of motion and resistance exercises for upper and lower extremities during the first two hours of hemodialysis along with routine care whereas the control group patients received only routine care. RAND medical outcome study called 36 item short form survey (SF 36) comprising 36 questions classified under nine health concepts was used to assess the QOL among hemodialysis patients.[8] The original SF 36 English language tool was translated to regional language (Kannada) and the reliability of Kannada tool was established using Cronbach's alpha formula. The data was collected at baseline, after one month and after three months of intradialytic exercise.

Ethical consideration

Institutional review board approval (Ref No: SSMC/Ph.D/IEC-1/Jan-2019) was obtained from Sri Siddhartha Medical College Ethics Committee, Tumkur, India. This trial was registered in the "Clinical Trials.gov" (CTRI/2020/02/023367). The participants were informed that their participation in the study was entirely voluntary and they may withdraw from the study anytime.
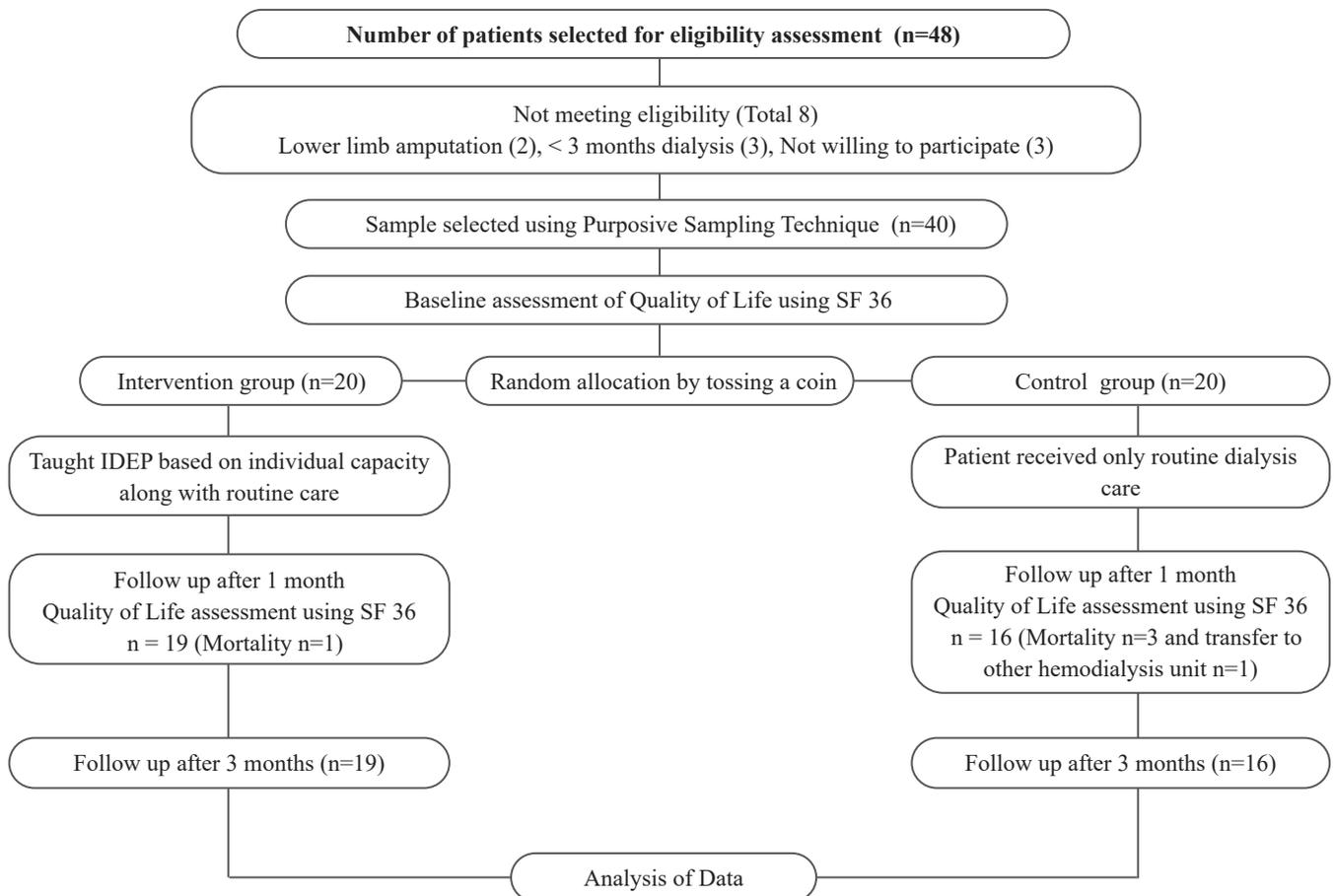

Figure 2: Flow diagram of research study

Data analysis

SPSS version 20 was used for statistical analysis of the data. Since normal distribution of all the study variables was established with the results of the Kolmogorov Smirnov test, the descriptive statistical parameters of mean, standard deviation and percentage were calculated for socio-demographic and clinical information. The parametric test of independent t test was used for inter group comparison and repeated measures ANOVA test was used for intra group comparison. In this analysis, independent variable is IDEP and dependent variable is QOL. Homogeneity of demographic and clinical variables between intervention and control groups was analysed using Chi-square test and the association between baseline QOL score and socio-demographic & clinical proforma was assessed using Chi-square test.

Results

Table 1: Homogeneity of demographic and clinical proforma of intervention and control groups

AGE	Group		Total	Chi-Square value	*p*-value
20-35	2 (10.5%)	7 (43.8%)	9 (25.7%)		
36-50	6 (31.6%)	6 (37.5%)	12 (34.3%)	7.576	0.056
51-65	9 (47.4%)	3 (18.8%)	12 (34.3%)		
66-80	2 (10.5%)	0 (0.0%)	2 (5.7%)		
Gender					
Male	17 (89.5%)	8 (50.0%)	25 (71.4%)	6.632	0.010*
Female	2 (10.5%)	8 (50.0%)	10 (28.6%)		
Marital Status					
Married	17 (89.5%)	13 (81.3%)	30 (85.7%)	0.480	0.489
Unmarried	2 (10.5%)	3 (18.8%)	5 (14.3%)		
Formal Education					
No 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%)	3.480	0.481
Higher Secondary	4 (21.1%)	5 (31.3%)	9 (25.7%)		
Other	1 (5.3%)	3 (18.8%)	4 (11.4%)		
Monthly Income					
≤ 10000	16 (84.2%)	0 (0.0%)	16 (45.7%)		
10001-15000	1 (5.3%)	1 (6.3%)	2 (5.7%)	27.612	<0.001*
15001-20000	0 (0.0%)	11 (68.8%)	11 (31.4%)		
>20000	2 (10.5%)	4 (25.0%)	6 (17.1%)		
Occupation					
Govt Employee	3 (15.8%)	2 (12.5%)	5 (14.3%)		
Pvt Employee	3 (15.8%)	1 (6.3%)	4 (11.4%)	4.366	
Daily Wager	3 (15.8%)	0 (0.0%)	3 (8.6%)		
Unemployed	10 (52.6%)	13 (81.3%)	23 (65.7%)		
Type of Family					
Joint	7 (36.8%)	4 (25.0%)	11 (31.4%)	0.565	
Nuclear	12 (63.2%)	12 (75.0%)	24 (68.6%)		
Dietary Habit					
Non-Veg	12 (63.2%)	14 (87.5%)	26 (74.3%)	2.690	
Vegetarian	7 (36.8%)	2 (12.5%)	9 (25.7%)		

Area of residence					
Urban	7 (36.8%)	3 (18.8%)	10 (28.6%)	1.393	0.238
Rural	12 (63.2%)	13 (81.3%)	25 (71.4%)		
Smoking History					
Current	2 (10.5%)	0 (0.0%)	2 (5.7%)	4.133	0.127
Past	6 (31.6%)	2 (12.5%)	8 (22.9%)		
Nil	11 (57.9%)	14 (87.5%)	25 (71.4%)		
Frequency of Smoking					
Daily	5 (26.3%)	1 (6.3%)	6 (17.1%)	3.590	0.309
Often	1 (5.3%)	1 (6.3%)	2 (5.7%)		
Rarely	1 (5.3%)	0 (0.0%)	1 (2.9%)		
Nil	12 (63.2%)	14 (87.5%)	26 (74.3%)		
Habit of doing Exercise/Yoga					
Daily	3 (15.8%)	0 (0.0%)	3 (8.6%)	6.098	0.107
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%)		
Frequency of Dialysis					
Weekly Twice	11 (57.9%)	15 (93.8%)	26 (74.3%)	5.486	0.016*
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%)	9.395	0.024*
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%)		
Comorbidities					
Hypertension	18 (94.7%)	16 (100.0%)	34 (97.1%)	0.867	0.352
Diabetes mellitus	10 (52.6%)	3 (18.8%)	13 (37.1%)	4.271	0.039*
Anaemia	3 (15.8%)	3 (18.8%)	6 (17.1%)	0.054	0.817
Erythropoietin Treatment					
Yes	19 (100.0%)	16 (100.0%)	35 (100.0%)	NA	NA
No	0 (0.0%)	0 (0.0%)	0 (0.0%)		

*Significant; NA: All the samples were undergoing erythropoietin treatment. Chi square test not applicable

Homogeneity of demographic and clinical proforma

In the intervention and control groups (n=19 and n=16 respectively), certain demographic and clinical variables such as gender, monthly income, frequency of dialysis, duration of dialysis and co-morbidities like diabetes mellitus were found to be non-homogenous ($p < 0.05$ in Chi-square test), whereas other demographic variables such as age, marital status, education, occupation, type of family, dietary pattern, area of residence, frequency and history of smoking, habit of doing exercise/yoga were found to be homogenous ($p > 0.05$ in Chi-square test). Hypertensive and anemic clients were homogenous in intervention and control groups ($p > 0.05$ in Chi-square test) (Table 1)

Table 2: Comparison of Quality of Life between and within groups (SF 36)

Time	Interventional	Control	t-value	*p*-value
Physical Functioning Baseline	47.11 ± 27.70	65.94 ± 25.31	-2.083	0.045*
1 Month	58.84 ± 24.53	61.56 ± 25.48	-0.321	0.750
3 Month	72.37 ± 22.13	57.50 ± 31.30	1.641	0.110
F-Value	50.315	5.087		
P-Value	<0.001*	0.013*		
Physical Health				
Baseline	59.21 ± 41.84	64.06 ± 44.69	-0.331	0.743
1 Month	78.95 ± 36.57	53.13 ± 49.90	1.764	0.087
3 Month	88.16 ± 26.83	45.31 ± 46.74	3.392	0.002*
F-Value	10.243	2.904		
P-Value	<0.001*	0.07		
Emotional Problems				
Baseline	49.16 ± 48.91	60.44 ± 49.02	-0.679	0.502
1 Month	82.42 ± 35.83	58.31 ± 49.45	1.669	0.105
3 Month	84.21 ± 34.03	43.75 ± 51.23	2.791	0.009*
F-Value	10.916	3.061		
P-Value	<0.001*	0.062		
Energy / Fatigue				
Baseline	25.26 ± 14.48	37.50 ± 16.93	-2.306	0.028*
1 Month	44.74 ± 12.85	34.06 ± 17.91	2.048	0.049*
3 Month	61.32 ± 12.68	32.81 ± 19.58	5.191	0.000*
F-Value	254.435	3.348		
P-Value	<0.001*	0.049*		
Emotional well being				
Baseline	32.32 ± 17.67	45.75 ± 21.46	-2.032	0.050
1 Month	54.53 ± 14.68	45.25 ± 20.69	1.547	0.131
3 Month	70.74 ± 10.92	42.50 ± 24.43	4.537	0.000
F-Value	147.868	0.965		
P-Value	<0.001*	0.392		
Social functioning				
Baseline	35.05 ± 16.52	45.50 ± 20.31	-1.679	0.103
1 Month	56.11 ± 15.27	41.63 ± 19.12	2.491	0.018*
3 Month	69.89 ± 13.93	39.19 ± 24.13	4.702	0.000*
F-Value	104.348	2.193		
P-Value	<0.001*	0.129		

Pain					
Baseline	32.37 ± 13.18	45.94 ± 17.72		-2.529	0.014*
1 Month	50.95 ± 13.43	41.56 ± 16.75		1.840	0.075
3 Month	65.74 ± 14.38	35.63 ± 18.86		5.357	0.000*
F-Value	97.458	5.175			
P-Value	<0.001*	0.012*			
General Health					
Baseline	31.84 ± 13.56	42.50 ± 20.41	-1.845		0.074
1 Month	60.79 ± 15.30	38.13 ± 20.65	3.726		0.001*
3 Month	72.11 ± 15.03	33.75 ± 22.77	5.968		0.000*
F-Value	109.305	5.288			
P-Value	<0.001*	0.011*			
Health Change					
Baseline	28.95 ± 17.21	42.19 ± 11.97	-2.592		0.014*
1 Month	50.00 ± 16.67	39.06 ± 12.81	2.144		0.040*
3 Month	63.16 ± 19.31	32.81 ± 17.60	4.820		0.000*
F-Value	45.087	4.200			
P-Value	<0.001*	0.025*			

*Significant

SF 36 Quality of Life average score comparison between and within group

There are nine health concepts in the SF-36 tool to assess the QOL. In all the health concepts, there is a gradual increase in score at various time points within the intervention group and the *p* value of < 0.001 indicated that the IDEP was effective and there has been improvement in the QOL of hemodialysis patients. Within the control group, there was a statistically significant reduction in QOL score with a *p* value <0.05 (Table 2).

Table 3: Association between baseline Quality of Life score and selected socio-demographic proforma (association between Quality of Life and age)

Baseline	Age (years)	N	Mean	SD	F-value	P-value
Physical Functioning	20-35	9	81.11	17.28	8.367	0.000*
	36-50	12	58.33	25.97		
	51-65	12	40.83	20.87		
	66-80	2	15.00	7.07		
	Total	35	55.71	27.92		
Role Limitations due to Physical Health Problems	20-35	9	77.78	29.17	3.268	0.034*
	36-50	12	77.08	39.11		
	51-65	12	41.67	45.64		
	66-80	2	12.50	17.68		
	Total	0	61.43	42.59		

Role Limitations due to Emotional Health Problems	20-35	9	74.11	43.38	1.604	0.209
	36-50	12	58.33	51.49		
	51-65	12	44.50	47.88		
	66-80	2	0.00	0.00		
	Total	35	54.31	48.57		
Energy /Fatigue	20-35	9	42.22	15.23	3.299	0.033*
	36-50	12	32.50	19.48		
	51-65	12	22.50	8.92		
	66-80	2	20.00	14.14		
	Total	35	30.86	16.60		
Emotional Well Being	20-35	9	49.78	21.08	1.997	0.135
	36-50	12	39.67	24.15		
	51-65	12	28.83	11.49		
	66-80	2	38.00	19.80		
	Total	35	38.46	20.36		
Social Functioning	20-35	9	51.44	22.08	1.912	0.148
	36-50	12	38.83	18.86		
	51-65	12	32.50	13.63		
	66-80	2	37.50	17.68		
	Total	35	39.83	18.83		

Bodily Pain	20-35	9	51.44	18.74	4.219	0.013*
	36-50	12	39.17	16.95		
	51-65	12	31.17	8.12		
	66-80	2	21.50	2.12		
	Total	35	38.57	16.66		
General Health Perception	20-35	9	51.11	15.16	3.489	0.027*
	36-50	12	34.17	22.14		
	51-65	12	29.17	7.64		
	66-80	2	32.50	3.54		
	Total	35	36.71	17.61		
Health Change	20-35	9	41.67	12.50	0.968	0.420
	36-50	12	35.42	16.71		
	51-65	12	31.25	18.84		
	66-80	2	25.00	0.00		
	Total	35	35.00	16.27		

*Significant

Association between baseline quality of life score and selected socio-demographic proforma

There was a significant association between age and certain health concepts of QOL (p <0.05) such as physical functioning (55.71±27.92), role limitations due to physical health problems (61.43±42.59), energy / fatigue (30.86±16.60), bodily pain (38.57±16.66) and general health (36.71±17.61). But there was no association between age and other health concepts of QOL (p >0.05) such as role limitation due to personal or emotional problems (54.31±48.57), emotional well-being (38.46±20.36), social functioning (39.83±18.83) and health change (35.00±16.27) (Table 3).

Table 4: Association between Quality of Life and marital status

Baseline	Marital Status	N	Mean	SD	F-value	*p*-value
Physical Functioning	Married	30	49.83	25.68	12.455	0.001*
	Unmarried	5	91.00	5.48		
	Total	35	55.71	27.92		
Role Limitations due to Physical Health Problems	Married	30	57.50	44.11	1.830	0.185
	Unmarried	5	85.00	22.36		
	Total	35	61.43	42.59		
Role Limitations due to Emotional Health Problems	Married	30	50.03	48.55	1.663	0.206
	Unmarried	5	80.00	44.72		
	Total	35	54.31	48.57		
Energy /Fatigue	Married	30	27.33	14.96	12.717	0.001*
	Unmarried	5	52.00	8.37		
	Total	35	30.86	16.60		
Emotional Well Being	Married	30	33.67	17.08	17.142	0.000*
	Unmarried	5	67.20	14.25		
	Total	35	38.46	20.36		
Social Functioning	Married	30	35.60	16.47	14.937	0.000
	Unmarried	5	65.20	10.40		
	Total	35	39.83	18.83		
Bodily Pain	Married	30	35.30	15.32	10.314	0.003*
	Unmarried	5	58.20	9.83		
	Total	35	38.57	16.66		
General Health Perception	Married	30	33.00	15.95	12.497	0.001*
	Unmarried	5	59.00	8.22		
	Total	35	36.71	17.61		
Health Change	Married	30	33.33	16.52	.287	0.140
	Unmarried	5	45.00	11.18		
	Total	35	35.00	16.27		

*Significant

Association between Quality of Life and marital status

There was a significant association between marital status and many health concepts of QOL (p <0.05) except in the concepts of role limitations due to physical health problems, role limitations due to personal or emotional problems and health change (Table 4). No association was found between socio-demographic and clinical variables such as gender, education, income, occupation, type of family, dietary pattern, area of residence, frequency and habit of smoking, frequency of dialysis, duration of dialysis, comorbidities and most of the health concepts of QOL.

Discussion

In this study, four major concepts of the conceptual framework of Ernestine Wiedenbach's Helping Art of Clinical Nursing Theory have been utilized.

Central Purpose

Central purpose was to evaluate the impact of IDEP on QOL of hemodialysis patients.

Identification

Identification data pertaining to 35 study participants (n=19 in intervention group and n=16 in control group) in terms of age group, gender, marital status, dietary pattern, employment status, smoking status, habit of doing exercise/yoga, duration of hemodialysis and erythropoietin treatment has been presented in Table 1. Identification data also includes baseline QOL assessment using SF 36 scale. In all the nine health concepts of SF 36, study participants had low score indicating compromised QOL (Table 2).

Ministration

Out of 40 study participants, three from control group and one from intervention group died due to COVID-19 complications and one from control group was transferred to other dialysis unit. Thus the number of study participants in the intervention and control group got reduced to n=19 and n=16, respectively. All the intervention study group participants were taught 25 -30 minutes of IDEP, weekly twice for three months which comprised range of motion and resistance exercises for both upper and lower extremities along with routine care. The control group participants received only routine dialysis care.

Validation

QOL of study participants was assessed after one month and three months of intervention. Results of the present study demonstrate that three months of IDEP is effective in improving QOL among hemodialysis patients along the lines of some previous studies which have concluded that IDEP is effective in improving QOL of hemodialysis patients.

Reports published on the impact of IDEP show the positive benefits of exercise on perception of fatigue and QOL, improvement of health related QOL and reduction in the depression status of hemodialysis patients.[9,10] One published pre-test post-test control trial study findings concluded that IDEP leads to improvement in QOL and patient outcome. The study recommended that optimal exercise program should be incorporated into routine hemodialysis.[5] In the current study, except with age and marital status, there was no significant association between baseline QOL scores and socio-demographic and clinical proforma.

Implications

The findings of the study may be used in the following areas:

Nursing Practice

Professionals working in the dialysis unit will be able to find opportunities to teach IDE and educate hemodialysis (HD) patients the importance of physical activity to prevent deterioration in health related quality of life.

Administration

The hospital administrator should take part in framing policies, development of protocols and standing orders with respect to IDE to make it a part of dialysis unit activity. Manpower of hemodialysis units must be adequate to impart IDE routinely at the unit. Moreover, the skill and perception of healthcare personnel must be assessed for suitability at the hemodialysis unit.

Nursing Research

The study helps to develop evidence based practice and incorporate IDE as a part of dialysis unit activity.

Limitations

This study findings cannot be generalized as it was a pilot study with a sample size of only 40 HD patients from two dialysis units.

Conclusion

IDEP led to improvement in all the nine health concepts of SF 36 health related QOL questionnaire. Although safe and feasible, IDEP is not a part of routine clinical care in many dialysis centres. It is also observed that without re-enforcement and continuous follow up, patient compliance to exercise regimen remains poor. Hence it is recommended that individualized exercise program taught by a trainer should be a part of routine dialysis healthcare for ESRD patients on maintenance dialysis. Many such studies published from India are likely to enforce the concept of IDE as a part of routine care in HD units.

Conflicts of interest

There are no conflicts of interest

References

1. Danielle LK, Shannon LE, David GE. The importance of exercise for chronic kidney disease patients. J Renal Nutrition 2014;24(6):e51-e53.

2. Villanego F, Naranjo J, Vigara LA, Cazorla JM, Montero ME, Garcia T, *et al*. Impact of physical exercise in patients with chronic kidney disease: Systematic review and meta-analysis. Nefrologia 2020;40:237-252.

3. Parker K. Intradialytic exercise is medicine for hemodialysis patients. Curr Sports Med Rep 2016;15(4):269-275.

4. Gallot M, Rieth N, Ganea A. Effect of intradialytic physical activity on the quality of life, biological parameters and sleep in hemodialysis patients. J Clin Nephrol 2019;3:168-174.

5. Monera BAS, Entisar AE, Radwa EK. Efficacy of exercise program in intra hemodialysis on patient's quality of life. IOSR J Nur Health Sci 2016;5(1):17-30.

6. Girija K, Radha R. Beneficial effect of physical activity in hemodialysis patients. Univ J Engg Sci 2013;1(2):40-44.

7. Shirley CG, Theris AT, Theresa G, Marcia D, Nettie B. Twentieth-century nursing: Ernestine Wiedenbach, Virginia Henderson, and Lydia Hall's contributions to nursing theory and their use in practice. In: Nursing Theories and Nursing Practice: Third Ed. Philadelphia: F.A. Davies Company; 2010. p. 54-66.

8. Ware JE, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. Med Care 1992;30(6):473-483.

9. Rolando TL, Michael SC. The effect of a structured intradialytic exercise program on fatigue and quality of life of a patient on hemodialysis in an acute care setting: a case report. Phy Ther Rehab 2020;7:6.

10. Chia-Huei L, Yu-Juei H, Pi-Hsiu H, Lee YL, Lin CH, Lee MS, *et al*. Effects of intradialytic exercise on dialytic parameters, health-related quality of life and depression status in hemodialysis patients: a randomized controlled trial. Int J Environ Res Public Health 2021;18(17):9205.