

## Education and Exercise on the Quality of Life among Adults with Chronic Renal Disease

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### Abstract

**Objective.** Evaluate the effectiveness of education and exercise on the quality of life among adults with chronic renal disease (CRD) on hemodialysis post-intervention (4 and 8 weeks). **Methods:** An evaluative true intervention approach was used. An ethical approval was obtained from the institutional ethics committee. A random sample of 150 patients (75 in intervention and 75 in control group) with CRD receiving dialysis was selected based on the inclusion criteria. The intervention group received interactive education and supervised exercises. RAND health-related kidney disease QOL (KDQOL) questionnaire was used. **Results:** Mean scores for the Kidney Disease and general QOL sub-scales among the intervention group were higher and statistically significant ( $p < 0.01$ ) compared to the control group. **Conclusion:** Education and exercise was shown to have a positive effect on the physical and mental health among the adults.

### Keywords

quality of life; kidney Disease quality of life; education; exercise; chronic renal disease; end-stage renal disease; hemodialysis

### Highlights

Physical health and functioning improved after education among adults with CRD.  
Exercise enhanced physical, mental health and general QOL among adults with CRD.  
Physical, mental, social and emotional domains promote KDQOL among adults with CRD.

## Introduction

Chronic kidney disease (CKD) or chronic renal disease (CRD) is a progressive loss of renal function overtime causing a slow decline in kidney function [29]. CRD may be caused by chronic hypertension, diabetes, congestive heart failure, lupus or sickle cell anemia and initiated by acute disease processes like sepsis (infection), shock, trauma, kidney stones, kidney infection, drug toxicity (aspirin or lithium), poisons or toxins (drug abuse) or after injection with an iodinated contrast dye (adverse effect). CRD may result in a life-threatening metabolic imbalance [3] and leads to end-stage renal disease [1]. In India, the causes of end-stage renal disease (ESRD) are diabetic nephropathy, hypertensive nephropathy, chronic pyelonephritis, autosomal polycystic kidney disease and obstructive uropathy [22]. The approximate prevalence of CKD is 800 per million population (pmp) and the incidence of ESRD is 150-200 pmp. There is no data on the true incidence and prevalence of chronic renal failure in the developing world [1]. Hence, CRD is a distressing medical, social and economic problem for adults and their families.

People with CRD surface with physical and emotional changes related to their disease and its treatments. They can live independently if they are able to function, both physically and mentally [26]. Physical and mental function are inversely correlated with the risk for hospitalization and mortality [15]. Health-related quality of life (QOL) refer to the measure of adult's functioning, well-being, and general health perception in each of three domains: physical, psychological, and social among adults with CRD. CRD influences QOL and QOL is predictor of outcome in CRD. Adults with CRD on dialysis have lower level of QOL. QOL of adults with CRD is influenced by the disease and by the type of replacement therapy. QOL is an indicator of the effectiveness of the medical care they receive.

## Background

QOL is compromised, by fatigue and encounters in planning meals and limiting fluids. Adults' social and role responsibilities may be altered due to problems with travel, impotence, and changes in body image [13]. Education, social support, and self-care have been shown to raise coping skills among people on dialysis [33]. Emotional adjustment, adherence to treatments, positive attitude, exercise, and engagement in life pose challenges to adults with CRD [16]. Kidney failure, treatment choices, medications, and the renal diet can help adults with CRD on dialysis to maintain a sense of control, a factor linked to improved adherence and life satisfaction [23]. Early education about renal disease, and the potential to live long can aid in overall adjustment and decision making for people on dialysis [37].

Informed adults have reported fewer symptoms as well as more confidence in their ability to manage the symptoms they do have. Supportive social environments have shown a positive impact on adjustment for people with renal disease [10]. Support received from their families and dialysis staff was a major factor in promoting employment; an activity that contributes to emotional health [31]. With education and support, people on dialysis can begin to make careful, informed decisions about their treatment [18]. Renal rehabilitation is an optimal functioning for adults and restoration to productive activities [32] and the "5 E's"-encouragement, education, exercise, employment, and evaluation are used [21]. Energy and activity levels, functional ability, sleeping and eating behaviors, disease symptoms, health status, sex life, well-being, psychological effect, satisfaction with life and health, and happiness was found to affect QOL in young and elderly adults [11]. There is no data to explore the effect of combined education and exercise on the QOL among adults with CRD on hemodialysis [34]. Hence this study was conducted to examine the effects of combined education and exercise on QOL among adults with CRD.

## Conceptual model

Adaptive system model (Roy, 1984) was used in this study (Figure 1).

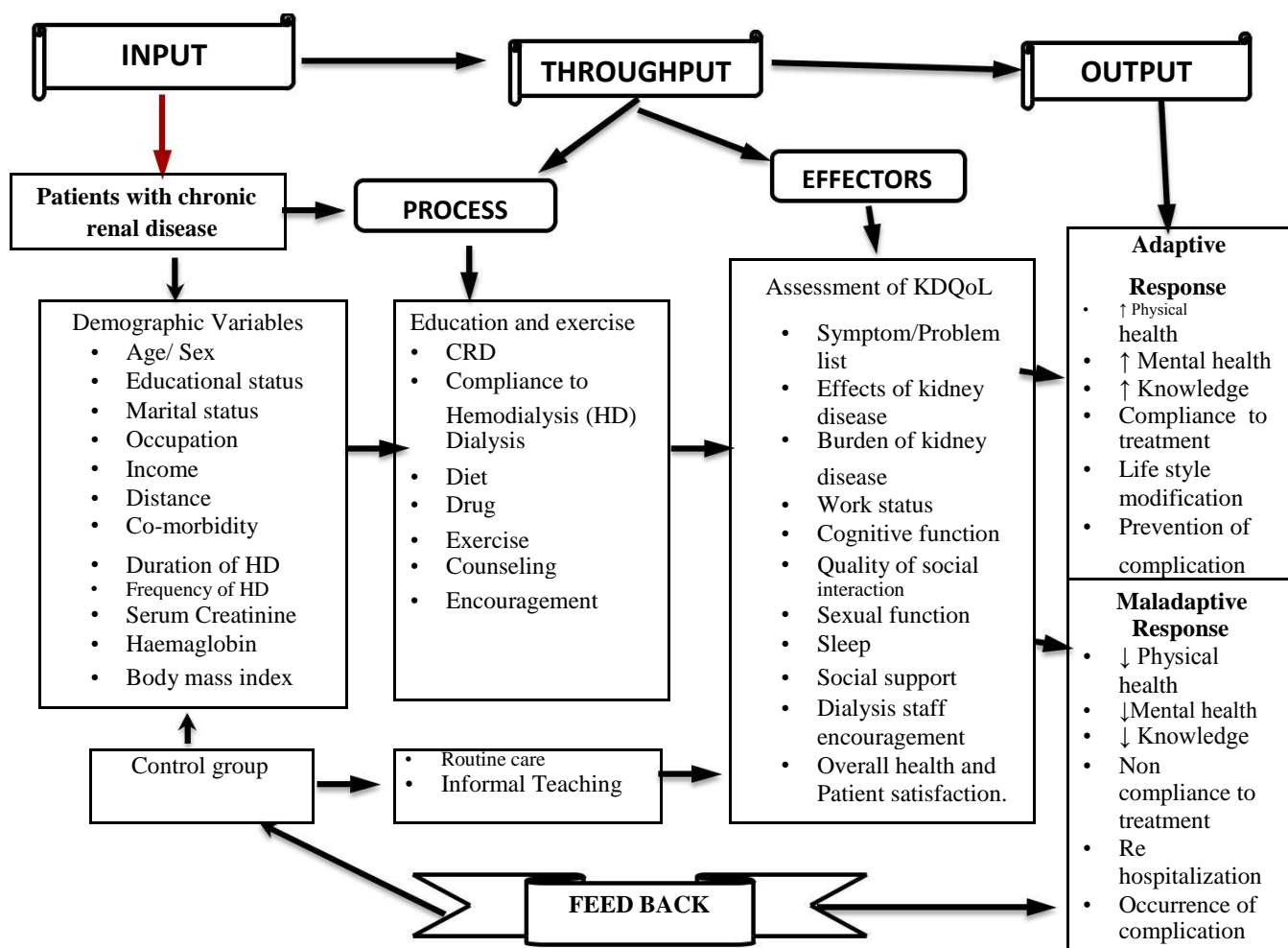


Figure 1. Adaptation Model for patients with chronic renal disease for improved renal rehabilitation

The adaptive system (person) has inputs of stimuli includes variables, outputs as adaptive responses that serves as feedback [28]. Individual is a whole and dysfunction in one component affects the entire system. The inputs is identified as stimuli are age, gender, educational status, occupation, economic status, co-morbidity, frequency of dialysis, hemoglobin level, serum creatinine and body mass index. Throughput makes use of a person processes and effectors. The processes used for intervention group special intervention like education, exercise, adherence to treatment options, dialysis, diet, drug, exercise, counseling, and encouragement. Effectors refers to the assessment of Kidney Disease QoL which includes physical functioning, role physical, bodily pain, general health, vitality, social functioning, role emotional and mental health. Output is the outcome of the system. When the system is a person, output refers to the person's behaviors. In the intervention group the adaptive responses are used when a person demonstrates behaviors that achieved the goals like better physical health, mental health, knowledge and adherence to treatment.

### Aim

Effectiveness of education and exercise on the quality of life among adults at base line and post-intervention with chronic renal disease on hemodialysis.

## Materials and Methods

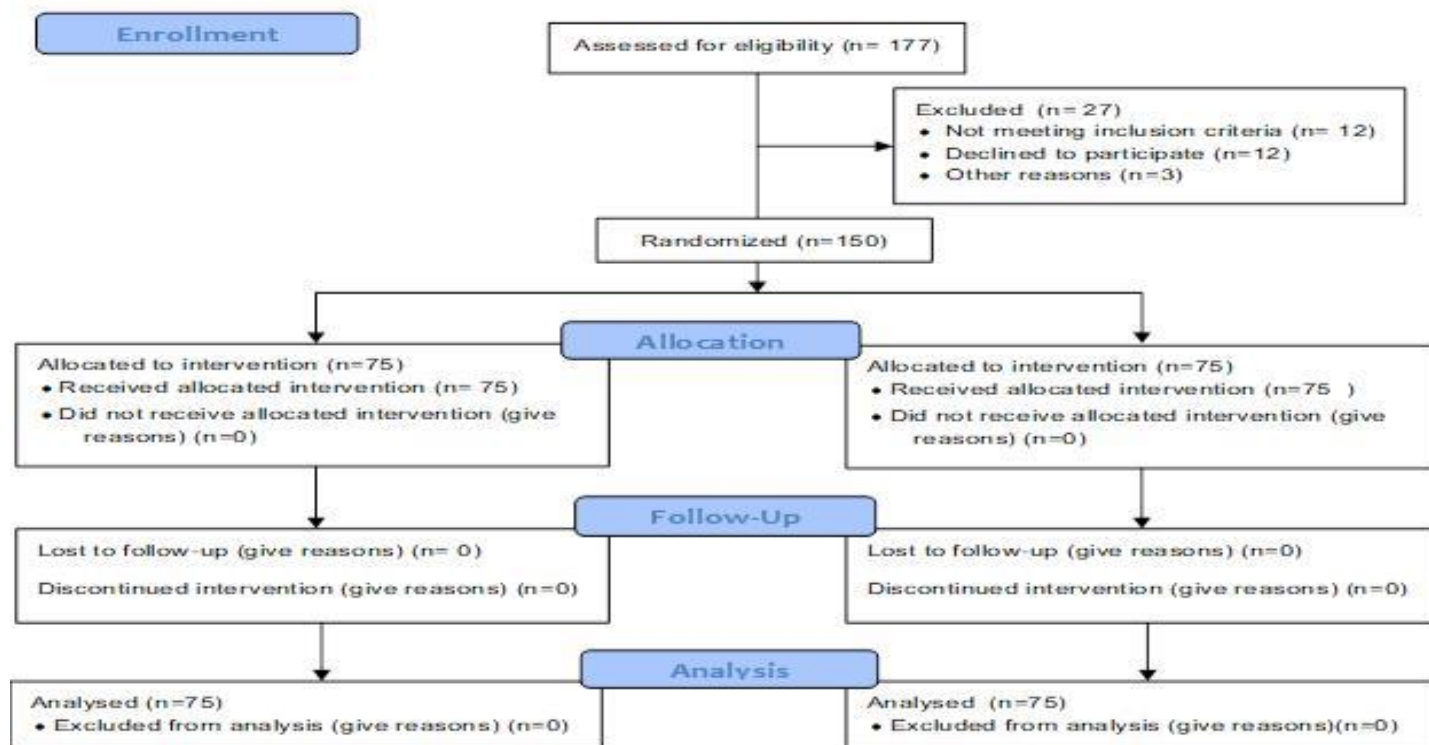
### Design

An evaluative true intervention approach using randomized pre-test and post-test control group design was employed to evaluate the effectiveness of education and exercise on the quality of life among adults on hemodialysis. This study instituted two groups, an intervention group exposed to education and exercise and the control group with usual care.

### Selection and description of participants

This study was conducted at a selected multi-specialty hospital with high-tech dialysis center consisting of 12-bedded unit with hemodialysis. The target population was adults with CRD subjected to hemodialysis at the dialysis unit during the period of data collection in 2012.

A sample size of 64 was determined using mean difference for a power of 0.80, a medium effect of 0.80 with  $p < 0.05$  (Cohen 1992). A total sample size of 75 adults was estimated for intervention and 75 adults for the control group to reduce the rate of attrition (Figure 2. Consort diagram).



**Figure 2.** consort flow diagram

A random probability sampling was used to select the total sample of 150 adults with CRD undergoing hemodialysis. Adults with CRD on hemodialysis who fulfilled the inclusion criteria (elective basis, more than 6 weeks on dialysis, and age group of 20-70 years) during the data collection period were recruited to participate in the study. Adults who were known to have psychiatric disorder, and altered level of consciousness were excluded from the study.

### Measurements

The Kidney Disease Quality of Life- Short form (KDQOL-SF) instrument is a self-report measure developed for individuals with kidney disease and on dialysis [12]. It includes 43 kidney-disease targeted items and 36 items of SF that provide a generic score and an overall health rating item. It focus on particular health-related concerns like Symptoms/Problems (12 items), Effects of kidney disease on daily life (8 items), Burden of kidney disease (4 items), Work status(2 items), Cognitive function (3 items), Quality of social interaction (3 items), Sexual function (2 items), Sleep (4 items), Social support (2 items), Dialysis staff encouragement (2 items), adult satisfaction (1 item) (KDQOL-SF 1997). The KDQOL-SF includes a 36 item health survey (RAND 36-item health survey) as the generic core (12). It consists of 8 multi-item measures of physical and mental health status: physical functioning (10), role-physical (4), bodily pain (2), general health (5), vitality (4), social functioning (sf) (2), role-emotional (re) (3) and mental health (5). An overall health rating item rates their health on a 0-10 response scale ranging from worst possible to best possible health. A score between 0 and 100 is calculated on the basis of well-defined guidelines, with a higher score indicating a better state of health. The 80 KDQOL-SF take about 16 minutes to complete. The reliability of the KDQOL-SF was  $r=0.80$  in this study. Hence the instrument was valid and reliable for the study.

Demographic variables consist of age, gender, educational status, occupation, marital status, place of residence, type of family, family monthly income, distance of residence from hospital and medical insurance. Clinical variables include presence of co-morbidity, frequency of dialysis per week, physical activity, hemoglobin level, serum creatinine and body mass index.

### Intervention

Renal rehabilitation is defined as an optimal functioning for adults and restoration to productive activities. To nurture renal rehabilitation and guide program development, the Life Options Rehabilitation Advisory Council (LORAC) identified five core principles, called the “5 E’s”—Encouragement, Education, Exercise, Employment, and Evaluation. Renal Rehabilitation Program with intervention include interactive education, exercise, life style modification, and coping was developed by the investigator and validated for content and concepts. Online, videos and CDs provided information based on the perceived needs of adults with CRD and life style modification, orientation to health team members, structure and functions of the kidneys, hemodialysis, stages of kidney failure, causes of CKD, signs and symptoms, tests, treatment, dietary guidelines and modification, quitting smoking and alcohol, strategies for slowing progression and treating conditions underlying chronic kidney disease, complications of chronic kidney disease may require medical treatment, dialysis and its impact, exercise, sexual life alteration , change of work, recreation and planning for holiday with their family members and process of leading to near normal life style. The sessions on education and exercise were provided in the local vernacular language before the dialysis. Counselling was provided by the nephrologists and the unit nurses. The control group subjects received the usual treatment and no intervention.

### Data collection

An ethical approval was also obtained from the Institution Ethics Board. The permission to conduct research in Dialysis Unit was obtained from concerned authorities. The eligible participants were identified from the hospital medical records after obtaining permission. Ethical principles were adhered too throughout the study. The purposes of the study and their right to participate or withdraw from the study were explained with written informed consent. Adults who volunteered and fulfilled the inclusion criteria were enrolled for the study. Baseline data on demographic variables was collected using interview technique. Privacy was provided during the data collection. Baseline data was collected from the selected voluntary adults with CRD in 2012. The first post test was taken after 4 weeks before initiating dialysis and reinforcement was given. The second post-test was taken after 8 weeks of the first post test before initiating dialysis and after the reinforcement was given on the same.



**Data analysis**

SPSS21 was used to analyze the descriptive and inferential data. Paired ‘t’- test, independent ‘t’-test were applied to determine the effectiveness of education and exercise. Test of homogeneity indicated no significant difference between the groups in the demographic and clinical variables.

**Results**

Demographic and clinical variables One-third of the adults were 40-49 years in the intervention (31%) and control group (41.3%) (Table 1). One-third of the adults had primary education in the intervention (32%) and control group (42.7%).

	Demographic Variable	Intervention Group(n=75)	%	Control Group (n = 75)	%
1.	Age ( in years)	01	01.3	01	01.3
	20 - 29				
	30 - 39	13	17.3	11	14.7
	40 - 49	24	32.0	31	41.3
	50 - 59	24	32.0	22	29.3
	>60	13	17.3	10	13.3
2.	Gender	42	56.0	41	54.7
	Male				
	Female	33	44.0	34	45.3
3.	Educational status				
	Not educated	05	06.7	02	02.7
	Primary school	29	38.7	32	42.7
	High school / SSLC	16	21.3	19	25.3
	PUC	15	20.0	14	18.7
	Degree and above	10	13.3	08	10.7
4.	Marital status				
	Married	61	81.3	50	66.7
	Unmarried	01	01.3	11	14.7
	Divorced	07	09.3	08	10.7
	Widowed	06	08.0	06	08.0
5.	Occupation				
	Skilled	44	58.7	40	53.3
	Unskilled	14	18.7	21	28.0
	Unemployed	17	22.7	13	17.3
	Others	00	00.0	01	01.3
6.	Income (Monthly in Rupees)				
	8000 – 10,000	09	12.0	10	13.3
	10,001 – 12,000	28	37.3	31	41.3
	> 12,001	38	50.7	34	45.3
7.	Place of residence				
	Rural	14	18.7	22	29.3
	Semi urban / Town	47	62.7	40	53.3
	Urban	14	18.7	13	17.3
8.	Type of family				
	Joint family	32	42.7	32	42.7
	Nuclear family	36	48.0	37	49.3
	Extended family	07	09.3	06	08.0
9.	Distance from hospital 5 kilometer	09	12.0	12	16.0
	10 kilometer	14	18.7	19	25.3
	15 kilometer	31	41.3	26	34.7
	More than 15 kilometers	21	28.0	18	24.0
10.	Health insurance				
	Employee insurance	42	56	48	64
	Self	33	44	27	36

**Table 1.** Demographic variables among adult with chronic renal disease on hemodialysis (N = 150).

Majority of the adults lived in the town in the intervention (62.7%) and control group (53.3%). Majority of the adults had dialysis more than once a week in the intervention (80%) and control group (73.3%) (Table 2).

	Clinical Variable	Intervention Group (n = 75)	%	Control Group (n = 75)	%
1.	Co-morbid chronic illness	23	30.7	20	26.7
	Cardiac disease				
	Diabetes mellitus	13	17.3	14	18.7
	Hypertension	4	5.3	7	9.3
	Diabetes mellitus and Hypertension	35	46.7	34	45.3
2.	Frequency of dialysis per week	15	20	20	26.7
	Once				
	More than once	60	80	55	73.3
3.	Physical activity	51	68	45	60
	Moderate				
	Sedentary	24	32	30	40
4.	Hemoglobin level (g/ dl) 3 – 5.5	4	5.3	7	9.3
	6 – 8.5	41	54.7	38	50.7
	9 <	30	40	30	40
5.	Serum creatinine (mg/dl) 2 - 4	63	84	55	73.3
	5 – 8	7	9.3	11	14.7
	9 – 12	5	6.7	9	12
6.	Body mass index	48	64	41	54.7
	Under weight				
	Obese	15	20	21	28
	Normal	12	16	13	17.3

**Table2:** Clinical variables among adults with CRD on Hemodialysis(N = 150).

Half-percentage of the adults had low hemoglobin in the intervention (54.7%) and control group (50.7%). Kidney disease quality of life after education and exercise There is no differences in the KDQOL between the intervention and control group in the pre-test (Table 3).





	Kidney disease Quality of Life (KDQOL)	Intervention Group		Control Group		Independent *P<0.05
		Mean	SD	Mean	SD	
	Pre Test					
1	Symptom/ problem list	57	12.53	54	8.91	0.132
2	Effect of kidney disease	52	14.2	50	9.9	0.961
3	Burden of kidney disease	39	18.11	35	14.67	0.182
4	Work status	30	35.72	40	33.58	0.052
5	Cognitive function	62	17.36	61	15.27	0.989
6	Quality of social interaction	64	17	59	14.32	0.077
7	Sexual function	48	19.97	58	22.41	0.191
8	Sleep	47	13.81	45	11.14	0.183
9	Social support	68	24.68	61	23.81	0.202
10	Dialysis staff encouragement	65	24.6	65	19.27	0.459
11	Overall health	54	16.95	52	17.2	0.272
12	Patient satisfaction	77	17.03	74	19.24	0.402
13	Poste test I					
	Symptom/ problem list	73	8.94	42	6.64	0.000***
14	Effect of kidney disease	65	10.33	52	14.2	0.000***
15	Burden of kidney disease	60	14.06	23	9.25	0.000***
16	Work status	30	34.87	30	35.72	0.94
17	Cognitive function	75	12.78	45	12.2	0.000***
18	Quality of social interaction	64	12.34	32	10.55	0.000***
19	Sexual function	64	8.49	48	19.97	0.016*
20	Sleep	55	10.1	47	13.81	0.000***
21	Social support	73	16.23	68	24.68	0.278
22	Dialysis staff encouragement	76	15.64	65	24.6	0.012*
23	Overall health	60	11.59	54	16.95	0.018*
24	Patient satisfaction	84	12.82	77	17.03	0.012*
25	Poste test II					
	Symptom/ problem list	77	6.4	57	12.53	0.000***
26	Effect of kidney disease	74	7.36	52	14.2	0.000***
27	Burden of kidney disease	49	11.25	39	18.11	0.000***
28	Work status	37	35.91	30	35.72	0.224
29	Cognitive function	68	8.19	62	17.36	0.000***
30	Quality of social interaction	67	10.3	64	17.01	0.195
31	Sexual function	63	7.73	48	19.97	0.011*
32	Sleep	57	10	47	13.81	0.000***
33	Social support	84	12.08	68	24.68	0.122
34	Dialysis staff encouragement	78	14.2	65	24.6	0.001**
35	Overall health	60	11.59	54	16.95	0.018*
36	Patient satisfaction	84	12.82	77	17.03	0.012*

**Table 3:** Mean and standard deviation scores of Kidney Disease QOL during Pre, Post Test I and II (N= 150) .

The mean scores of the KD QOL was significantly higher with symptom, effect of kidney disease, burden of kidney disease, cognitive function, sexual function, sleep, social support, encouragement, overall health and satisfaction in the intervention group compared to the controlgroup in the post-test 1. The mean scores of the KDQOL was significantly higher with symptom, effect, social support, encouragement, overall health, and satisfaction (p<0.001) in the intervention compared to the control group.

General QOL after intervention

Mean QOL scores of physical functioning, role physical, pain, general health, role emotional, social function, were significantly higher in the intervention group compared to the control group (p<0.001) (Table 4).

No	General QOL	Intervention Group (n= 75)		Control Group (n= 75)		Independent 't'- test
		Mean	SD	Mean	SD	
	Pre Test					
1.	Physical functioning	45	22.36	40	15.56	0.298
2.	Role physical	40	34.07	35	24.63	0.503
3.	Pain	60	25.31	55	24.27	0.258
4.	General Health	48	17.29	46	17.81	0.224
5.	Emotional well being	59	18.7	55	17.23	0.107
6.	Role emotional	52	37.23	44	29.82	0.119
7.	Social function	59	26.66	55	19.4	0.237
8.	Energy/Fatigue	49	18.39	50	15.24	0.62
	Post Test I					
9.	Physical functioning	62	15.74	37	17.16	0.000***
10.	Role physical	72	24.64	32	29.21	0.000***
11.	Pain	73	17.04	44	15.06	0.000***
12.	General Health	50	11.88	35	10.83	0.000***
13.	Emotional well being	58	13.51	43	12.14	0.000***
14.	Role emotional	78	26.07	37	30.49	0.000***
15.	Social function	71	16.7	38	13.45	0.000***
16.	Energy/Fatigue	51	12.92	54	9.58	0.117
	Post Test II					
17.	Physical functioning	77	11.22	45	22.23	0.000***
18.	Role physical	88	14.41	40	34.07	0.000***
19.	Pain	75	13.2	60	25.31	0.000***
20.	General Health	52	8.63	46	17.05	0.001**
21.	Emotional well being	57	12.03	59	18.7	0.527
22.	Role emotional	94	13.83	52	37.23	0.000***
23.	Social function	67	13.18	59	26.66	0.073
24.	Energy/Fatigue	52	10.49	49	18.39	0.216

**Table 4:** Mean and standard deviation scores of General QOL during Pre< Post Test I and II (N= 150)\*P<0.05



Mean QOL scores of physical functioning, role physical, and role emotional were higher in the intervention group compared to control group (p<0.001).

Physical and Mental Composites of General QOL

The mean scores of the QOL physical composite significantly improved among the intervention group compared to the control group (p<0.001) in the post-test 1 and post-test 2 (Table 5).

No	General QOL	Intervention group		Control group		Independent 't'-test
		(n= 75)		(n= 75)		
		Mean	SD	Mean	SD	
	Pre test					
1	SF 12 Physical composite	37	8.21	40	13.7	0.823
2	SF 12 Mental composite	45	9.05	48	11	0.275
	Posttest I					
3	SF 12 Physical composite	44	6.26	35	7.49	0.000***
4	SF 12 Mental composite	46	5.5	45	9.11	0.242
	Posttest II					
5	SF 12 Physical composite	49	4.7	36	8.08	0.000***
6	SF 12 Mental composite	46	6.46	41	6.85	

**Table 5:** Mean and Standard Deviation of General QOL Posttest I and Posttest II (N= 150)\*P<0.05.

Association between variables and KDQOL

Middle age (40-59 years), male gender, higher income (more than 12,000 IRS) were significantly associated with QOL among adults in the intervention group (Table 6).

Demographic variables	Intervention group Chi square	Control group Chi square
Age	0.001*	0.186
Gender	0.001*	0.338
Educational status	0.698	0.722
Marital status	0.869	0.592
Occupation	0.679	0.701
Income	0.000*	0.084
Place of residence	0.394	0.108
Type of family	0.747	0.853
Distance from the hospital	0.688	0.747
Co morbid	0.001*	0.396
Duration of receiving renal treatment	0.507	0.512
Frequency of dialysis per week	0.008*	0.978
Physical activity	0.308	0.812
Hemoglobin	0.002*	0.658
Serum Creatinine level	0.033*	0.095
Body mass index	0.011*	0.838

**Table 6:** Association between Demographic, Clinical variables and QOL among adults with CRD \*Significant at p <0.05.

Co-morbidity (DM and Hypertension), frequency of receiving dialysis more than once /week, moderate anemia (6-8.5 g), low Serum Creatinine (2-4 mg/dl), and underweight BMI were significantly associated with QOL among adults in the intervention group.

Discussion

In this study education and exercise improved physical functioning among adults on hemodialysis leading to an improvement in their quality of life. Education and exercise had a positive effect on improving the quality of life of adults with dialysis. Other studies showed that increased QOL had a significant decrease in serum urea, intradialytic weight gain, and improving QOL [20]. Increased QOL was observed after an intradialytic exercises [25]. Education influences dietary compliance and medication regimen improves serum albumin and hemoglobin [35].

In this study middle age group, men, higher income, dialysis more than once /week, moderate anemia, low Serum Creatinine, and underweight BMI were significantly associated with QOL after intervention at 8 weeks among the intervention group. Education, diet, and regular exercise had a better impact on the adults on hemodialysis. Men who are independent, self-controlled good family support and good biochemical control have better QOL. Better QOL mean scores were observed among men, those married, working, good hemoglobin, low serum creatinine among adults with hemodialysis [27]. Cognitive function and quality of social interaction and QOL was associated with older age, socio-economic and higher educational level among adults on HD in Romania [7]. Education and employment influenced the physical and social domains of QOL as they are aware of the quality of service and individual rights [6].

In this study intervention group that participated in education and exercise showed better physical functional and QOL than the control group. These positive effects of participating in an education were seen after 8 weeks of dialysis treatment. Adults exposed to pre-dialysis education scored significantly better mood, less functional disabilities compared to the comparison group [36]. Education improves knowledge and self-management and treatment efficacy [4]. Physical exercise increased physical function among adults on hemodialysis [24] and increased exercise capacity, improves muscle function [6].

In this study education for adults with end-stage renal failure was found to improve QOL. Other studies showed that physical composite scores were correlated with age, hemoglobin and comorbidity, and mean PCS was lower in depressed adults on hemodialysis [19]. Physical functioning scale were significantly lower for obese subjects than for those with normal weight or moderately high BMI [9]. QOL of the intervention group was higher than the control group in 50% of the dimensions in KDQOL-SF and reported better emotional state, less bodily pain, improved social functioning and fewer problems with work [18]. QOL improved by 20% in coping among adults with hemodialysis [2].

In this study, the intervention group had higher general and kidney disease QOL compared to control group, except for energy fatigue, emotional well-being, social function and energy fatigue, work status, quality of social interaction, and social support. Physical and mental composites of general QOL were higher in the intervention group compared to the control group. Reduction in HRQOL of elderly adults of the same age and gender was lower than in younger adults. Elderly adults on hemodialysis had relatively better HRQOL [30]. Intervention improves QOL among adults with CRD [8].

In this study, physical, mental domains have significantly influenced QOL. QOL was improved with interactive education and supervised exercise among adults with CRD. Education and exercise improves knowledge and QOL and impacts adults with hemodialysis. Adults with CRD are encouraged to accept responsibility for their health and self-care. Education and exercise was shown to be a positive predictor of physical and mental health for people on hemodialysis as they have reported fewer symptoms and confidence in their ability to manage the symptoms they do have. They have reported better subjective quality of life, including social and role functioning, and emotional well-being. Hence education and exercise can enhance the potential for physical activity and improved quality of life and may influence other important outcomes.



A small sample size and past experiences among adults with dialysis may influence the results.

## Implications

Adults with CRD may take more responsibility for things they can control, including exercise, remaining actively engaged in life, and renal meal plan. Their involvement in self-care can positively affect their adherence with treatment regimens. Education, exercise, staff encouragement toward education, exercise rehabilitation help adults form positive attitudes that will allow them to participate actively in life. Encouragement and counseling especially from families and dialysis staff, can increase autonomy, control, and participation in treatment. Adults with CRD on hemodialysis are encouraged and reinforced to learn about their self-care for improved quality of life. They take more responsibility for domains that they can control, including exercise, being actively engaged in life, and renal meal plan.

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