

Effect of intradialytic exercise on physiological parameters, biochemical markers, and quality of life among patients on hemodialysis

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Abstract:

Background: End-stage renal disease (ESRD) is a serious irreversible progressive disease with high prevalence worldwide, that makes life un sustainable in the absence of renal replacement therapy, hemodialysis (HD) is the most widely used therapy. **Objective:** To determine the effect of intradialytic exercise on physiological parameters, biochemical markers, and quality of life among patients on hemodialysis. **Design:** a quasi-experimental research design. **Setting:** The study was conducted at the hemodialysis units of the National Medical Institute in Damanhur, Elbeheira governorate. **Subjects:** A convenience sample of 50 patients. **Tools:** two tools were used for data collection. **The first tool** was Socio- demographic and Clinical Data Structured Interview Schedule. **The second tool** was the Kidney Diseases Quality of Life Short Form (KDQoL-SFTM 1.3). **Results:** Intradialytic exercise program has a positive effect in reduction of serum urea and creatinine and improving levels of some electrolytes as serum phosphate, potassium, calcium, haemoglobin level, Systolic and diastolic blood pressure. In addition, there was a significant statistical difference between the study and control groups in most domains of QOL ($P < 0.05$) except work status and staff encouragement. **Conclusion:** The study concluded that hemodialysis patients who practice intradialytic exercise exhibit significant improvement in biochemical markers, blood pressure and quality of life than those who don't practices it. **Recommendations:** Application of educational program should be carried out for hemodialysis patients at hemodialysis unit to be aware about the importance of intradialytic exercises which help them to improve their quality of life.

Key words: Intradialytic exercise, physiological parameters, biochemical markers, quality of life, hemodialysis patients.

Introduction

End stage renal disease (ESRD) is a progressive and untreatable condition which is associated with a wide range of complex metabolic and hormonal abnormalities leading to the development of serious complications which affect the function of all organ systems (Biabani et al., 2019).

The United States has the highest incident rate of ESRD, followed by Japan. Global Kidney Health Atlas (GKHA) indicated that the average number of new ESRD diagnoses was 144 individuals per million worldwide to general populations (International Society of Nephrology, 2019). In Egypt the estimated annual incidence of ESRD is around 74 per million (Abd Elhameed & Fadila, 2019).

Renal replacement therapy (RRT) continues to be the most important treatment option for all patients with ESRD worldwide. Dialysis continues to be the most common type of RRT because of the lower rate of kidney transplantation, hemodialysis (HD) is the most widely used therapy (Araújo et al., 2016).

Although hemodialysis increases the lifespan of individuals with renal insufficiency, it can cause notable changes like decreased efficiency and ability to perform activities, social isolation, immobility, and decreased self-confidence. In addition experience many physiological changes, these patients face numerous mental and psychological stresses as disturbance in their mental health and sleep quality, anxiety, depression and loneliness all of which have an impact on quality of life (Dashtidehkordi et al., 2019).

Conventional HD includes three sessions per week that last between three and four hours each. In all, such period “on the machine” consumes 9 to 12 hours per week process ensures the survival of patients (Theodorou et al., 2020). But this cause Patients' everyday lives to be monotonous and constrained, which restricts their activities after therapy begins and encourages sedentary behaviour, functional impairment, and inactivity so impaired quality of life (Lim & Lee, 2022).

Intradialytic exercise has positive effect in improving urea clearance by exposing more tissue and opening vascular beds in the working muscle, allowing the fluid within the tissue to flow to the intravascular compartment. Furthermore, ions like potassium and phosphate are transferred from the intracellular compartment to the muscle interstitial fluid this occurs during exercise. Moreover, exercise can improve blood flow to the muscles, which will decrease pain for these patients (Paluchamy & Vaidyanathan, 2018).

The National Kidney Foundation Disease Outcomes Quality Initiative (K/DOQI) suggested exercise as one of the cornerstones of rehabilitation for HD patients because it is a cost-effective method. As it have beneficial effects on the treatment of HD patients, such as reducing uremic symptoms, controlling systolic and diastolic blood pressure successfully, and enhancing physical fitness and quality of life (Huang et al., 2020).

Regular intradialytic exercise must be considered as a vital therapeutic modality of managing HD patients, and serving as a model for clinical practice (Chung et al., 2017). For this, nurses have a significance role in facilitating and encouraging HD patients to maintain their physical and psychological health, by assisting them in practice intradialytic exercises and explaining the purpose and benefits of such exercises to them. Therefore, this study is conducted to determine the effect of intradialytic exercise on physiological parameters, biochemical markers, and quality of life among patients on HD.

Aims of the study

The aim of the study is to:

Determine the effect of intradialytic exercise on physiological parameters, biochemical markers, and quality of life among patients on hemodialysis..

Research hypothesis:

1. Hemodialysis patients who practice intradialytic exercise exhibit significant improvement in physiological parameters than those who do not.
2. Hemodialysis patients who practice intradialytic exercise exhibit significant improvement in biochemical markers than those who do not.
3. Hemodialysis patients who practice intradialytic exercise exhibit

significant improvement in quality of life than those who do not.

Materials and Method

Materials:

Research design:

Quazi-experimental design was used in this study

Settings:

The study was conducted at the hemodialysis units of the National Medical Institute in Damanhur, Elbeheira governorate,

Subjects:

A convenience sample of 50 patients on maintenance hemodialysis, was selected from the previously mentioned setting according to the following inclusion criteria

• Inclusion criteria:

- Adult aged $21 \geq 60$ years
 - Scheduled for hemodialysis session three times per weeks since at least 6 months.
 - Communicated effectively
 - Free from heart diseases, uncontrolled hypertension, unstable angina, musculoskeletal disorders, amputation at any limb and not have any type of virus hepatitis.
 - Accepted to participate in the study.
- The selected subjects were equally assigned to control and study group, 25 in each group.

Tools: two tools were used:

Tool (I): Socio- demographic and Clinical Data Structured Interview Schedule: It was developed by the researcher based upon review of recent related literature (Hinkle & Cheever, 2018; National Kidney Foundation, 2019) to collect the necessary data from the patients. It was divided into four parts: **part I:** socio demographic characteristics

which includes patient age, gender, marital status, residence, education, and occupation, **part II:** clinical data includes history of renal failure, cause of the disease, duration of disease, dialysis access site, medication, date of the first dialysis session, duration of hemodialysis, duration of each dialysis session, **part III** biochemical markers which included items related to blood urea, serum creatinine, potassium, phosphorus, calcium and hemoglobin, **Part IV** physiological parameters which included pulse, respiration, blood pressure, pulse pressure and body weight.

Tool (II): The Kidney Diseases Quality of Life Short Form (KDQoL-SFTM 1.3): this tool was developed by Hays et al. (2019) and modification, translation into Arabic was done by the researcher, it used for assessment and evaluation of QOL multi items that measure the health status of hemodialysis patients. This tool includes 12 domains which contains 43 kidney disease targeted items focus on particular health-related health problem to individuals with ESRD disease and on dialysis; the 1st domain symptom/problems which include (12 items), the 2nd domain was effect of kidney disease on daily life which include (8 items), the 3rd domain was burden of kidney disease which include (4 items), the 4th domain was work status which include (2 items), the 5th domain was cognitive function which include (3 items), the 6th domain was quality of social interaction which include (3 items), the 7th domain was sexual function which include (2 items), the 8th domain was sleep which include (4 items), the 9th domain which include social support which include (2 items), the 10th domain was dialysis staff encouragement which include (2 items), the 11th domain was patient satisfaction which include (1 item) and finally the overall quality of life domain.

Scoring system:

Total score ranges from zero to 100

- A score less than 50% was considered as “a poor quality of life.”
- A score from 50 % and less than 75 % was considered as “a fair quality of life”
- A score more than 75 % was considered as “a good quality of life.”

Method:

- An official ethical committee approval and agreement from Faculty of Nursing, Alexandria University to carry out the study was obtained.
- An official letter from Faculty of Nursing, Alexandria University was submitted to head of Hemodialysis units of the National Medical Institute in Damanshour, El beheira governorate.
- An official permission to carry out the study was obtained from head of urology department and head of hemodialysis unit and the hospitals directors at the selected settings, after explanation of the aim of the study
- **Tool I** was developed by the researcher based on the relevant recent literature and **Tool II** was adapted and translated into Arabic.
- Validity: A jury of five experts specialized in the field of Medical-Surgical Nursing and Nephrology field, was consulted to test content validity of the study, completeness, and clarity of items. Then, the necessary modifications were done, accordingly.
- Reliability testing for tool II was estimated using the Cronbach's Alpha test and was equal 0.885 consequently.
- A Pilot study was conducted on 5 patients from the previously mentioned settings to test clarity, feasibility, the applicability of the tools, and necessary modifications were done. Those patients were excluded from the actual sample.

The study was conducted through the following phases:

1. Assessment and planning phase:

- Patients meeting the inclusion criteria were selected using convenience sampling technique and divided into two equal groups (control group and study group).
- The control group received the routine hospital care, they didn't receive intradialytic exercise program.
- The study group received intradialytic exercises program.
- The patient of both groups initially interviewed individually by the researcher to establish rapport and apply pre- test collection of socio-demographic and clinical data using tool I (part I and II) and pretest collection of the biochemical values, Physiological parameters and quality of life using tool I (part III and IV) and tool II. The data were collected from the control group who attends to the dialysis unit on Sunday, Tuesday and Thursday and from the study group who attend to the dialysis unit on Saturday, Monday and Wednesday to prevent any influence on the knowledge and practices of patients in the control group.
- The purpose of the study was explained to each patient by the researcher.
- An Arabic handout booklet with colored pictures was designed by the researcher and was given to every patient in the study group from the beginning of the first session for more illustration how to do exercise.

3. Implementation phase

- The control group received the routine hospital care. as, assessing vital signs especially blood pressure before, during and after the session, measure body weight before and after the session, assess the vascular condition before inserting the arterial and venous lines, administer any medication as doctor order and report any complain, they didn't receive intradialytic exercise program.

- The study group received intradialytic exercises program.
- Implementation of the intradialytic exercise program was applied in two stages, the first phase started with range of motion exercises that includes rotating the wrist 20 rounds per minute (RPM) clockwise and counter-clockwise, 10 RPM full flexion and extension of the wrist, 10 RPM forearm supination/pronation, and 10 RPM fingers flexion/extension, 10 times full flexion and extension of the elbow joint, 10 RPM shoulder full flexion and extension of the shoulder of the upper extremity which is not connected to the hemodialysis machine, then 20 RPM of rotating the ankles clockwise and counter-clockwise, 10 RPM times full flexion and extension of the ankles, 10 RPM toes flexion/extension, 10 RPM full flexion and extension of the knee joint of each lower extremity. The second phase includes stretching the exercised muscles groups for example (Hamstring muscle stretch and Triceps muscle stretch).
- Intradialytic exercise was performed individually in the first 2 hours of dialysis according to patients' tolerance and stopped next two hours of hemodialysis, intradialytic exercises performed to all upper and lower limbs joints; body part that connected to dialysis machine was excluded and maintaining patient on supine position to avoid intradialytic hypotension.
- Patients were received and practiced intradialytic exercise program, by the researcher; each session ranged from 15- 20 minutes. The total number of sessions in which patient practiced intradialytic exercise about 36 sessions for three months (3 sessions per week).
- Data was collected in a period of 5 months from beginning of June 2021 to end of October 2021.

4. Evaluation phase

- After every month of the three months of implementation of intradialytic exercise program, every patient recruited in both groups was interviewed individually using tool I that used in pretest (pre intradialytic exercise program) and after first month, after second month and after third month. Except tool II it used after the end of three months of implementation of intradialytic exercise program to determine the effect of intradialytic exercise on physiological parameters, biochemical markers, and quality of life among patients on hemodialysis.
- Comparison between the study and control groups was carried out using appropriate statistical analysis to evaluate the effect of intradialytic exercise on physiological parameters, biochemical markers and quality of life among patient on hemodialysis.
- **Statistical analysis:**
 - Data was analyzed using PC with statistical package for social science (SPSS) version 22. The level of significance was < 0.05 .
 - **Ethical considerations:**

An informed written consent was obtained from each study subject after explanation of the study purpose. Anonymity and privacy of the study subjects, confidentiality of the collected data, and the subject's right to withdraw at any time were maintained.

Results:

Table (1) shows the distribution of the studied patients according to socio-demographic data. It was found that, more than one third (36%) of patients in the study group were aged from 20 years to less than 40 years in control group less

than half of patient (44%) were aged from 50 years to 60 years. More than half of patients in the study group (52%) were female and more than half of patients in the control group (56%) were male. around less than one third (32%) of the patient in the study and more than one third (36%) of the patients in the control groups were illiterate. Most of the studied patients were married, not working, living in rural areas.

Table (2) exhibits comparison between the studied groups in relation to biochemical markers pre and post intrdialytic exercises. There were statistical significant differences between the study and control groups after application of the intradialytic exercises program in serum urea, creatinine, potassium and phosphorus ($p = .001^*$, $.003^*$, $.023^*$, $.001^*$) respectively. Additionally, in relation to serum calcium and haemoglobin level the table revealed that there was no statistical significant differences between the study and control groups post exercise program ($p = .074$, $.972$), but there was difference in mean in the study group at post intradialytic exercise better than the control group.

Table (3) portrays comparison between the studied groups in relation to physiological parameters pre and post intradialytic exercise. There were no significant differences between patients in the study and control groups in relation to physiological parameters pulse, heart rate, respiration, pulse pressure, systolic blood pressure, diastolic blood pressure and body weight before and after application of intradialytic exercise program ($p > 0.05$). But in relation to systolic, diastolic blood pressure and pulse pressure the table revealed that patients in the study group had improvement post intradialytic exercises than those in control group.

Table (4) Shows Comparison between the studied groups in relation to domains of overall quality of life after three months of intradialytic exercises. There were significant statistical relationship between the study and control groups after

application of intradialytic exercise in relation to symptom, effect of kidney disease, burden of kidney disease, cognitive function, social interaction, sexual function, sleep, social support, patient satisfaction and overall quality of life ($p = .001$, $.001$, $.012$, $.001$, $.001$, $.049$, $.001$, $.001$, $.042$ and $.001$) respectively. And there was no significant statistical difference between the study and control groups after application of intradialytic exercise in relation to work status and dialysis staff encouragement ($p = .732$ and $.400$) respectively **Table (5)** reveals comparison between levels of quality of life for patients in the study and control groups pre and post of intradialytic exercises. There was significant statistical relationship between the study and control groups in relation to their levels of quality of life after application of the intradialytic exercise program ($p = .001$).

Discussion

Hemodialysis is a time consuming, expensive treatment and needs more dietary and fluid restrictions. Long-term dialysis results in loss of freedom, dependence on caregiver, disturbance of marriage, family, social life, and reduction or lack of income. These causes have a negative impact on life's physical, psychological, socioeconomic, and environmental components, which compromises quality of life. (Ravindran et al., 2020). Therefore, this study is conducted to determine the effect of intradialytic exercise on physiological parameters, biochemical markers, and quality of life among patients on HD.

The current study results revealed intradialytic exercise program has a positive effect in reduction of serum urea and creatinine and improving levels of some electrolytes as serum phosphate, potassium, calcium, haemoglobin level. This might be attributed to the effect of intradialytic exercises as it increased the muscle blood flow and opened the

capillary surface area which subsequently increased the flux of urea and diffuse it from the muscle into circulation and then removed by HD this leading to improvement in the dialysis efficacy (Brown et al., 2018). Supporting the current results, Ali et al. (2020) who concluded that intradialytic exercise improved the removal of urea and the creatinine during the dialysis. The current study results illustrated slightly improvement in serum calcium and hemoglobin level among patients in the study group comparing to those in the control group, these results are consistent with Santhi et al., (2018) who reported that intradiaytic exercises improve the level of hemoglobin, also, the study done by Paluchamy & Vaidyanathan, (2018) who found that the levels of serum calcium significantly improved in the experimental group. Contrast to this result Dashtidehkordi et al, (2021) who revealed that the serum calcium level did not show any improvement after intradialytic exercise. Additionally, Elshinnawy et al. (2021) who found that intradialytic exercise program in hemodialysis patients had no effect on hemoglobin level.

The current study revealed there were no significant differences between patients in the study and control groups in relation to physiological parameters (pulse, heart rate, respiration, pulse pressure, blood pressure and body weight before and after application of intradialytic exercise program. But there was slightly improvement in pulse pressure and blood pressure in the study group post intradialytic exercise program. This can be justified that, hemodialysis patient need strong types of exercises as strengthening, ergometric and cycling of exercise to cause significant change in blood pressure, pulse pressure and body weight. This result is in accordance with, (Mohamed et al, 2020) who found that there is a significant decrease in systolic and diastolic blood pressure after practice of intradialytic exercise in the study group. Also,

Pujiastuti et al. (2020) who reported that intradialytic exercise has an influence on control of intradialytic weight gain in patients on HD.

The current result showed that there was significant statistical relationship between the study and control groups in most domains of QOL. It may be due to provision the study group with the illustrated instructional booklet with clarifying pictures about intradialytic exercises that make the study patient compliance with practicing the exercises and reach to this positive result. In the same line Mary & Chiranjeevi, (2019) who revealed that physical activity aids HD patients to improve their HRQOL in all dimensions of health. These findings contradicted with the results of Huang et al, (2020) who reported that intradialytic exercises did not affect quality of life of HD patients.

According to the results of the current study, the proposed hypotheses are proved as hemodialysis patients who practice intradialytic exercise exhibit significant improvement in biochemical markers, pulse pressure and blood pressure than those who receive the routine care only. Furthermore, those patients exhibit significant improvement in their quality of life than those who receive the routine care only.

Conclusion:

Based on the results of the current study, it was concluded that Hemodialysis patients who practice intradialytic exercise exhibit significant improvement in biochemical markers, blood pressure and quality of life than those who don't practice it.

Recommendations:

- Application of educational program should be carried out for hemodialysis patients at hemodialysis unit to be aware about the importance of intradialytic exercises which help them to improve their quality of life.

Intradialytic exercise, Patients on hemodialysis

- Encourage dialysis nurses to attend conferences, workshop on non-pharmacological measures to reduce complications associated with hemodialysis as intradialytic exercise program.
- Administrator should plan and implement periodic patient teaching programs about intradialytic exercise as one of hospital policies, and procedures.
- A simple manual of guidelines of intradialytic exercise programs should be available in all units to be provided to newly admitted patients undergoing hemodialysis.

Table (I): Distribution of patients in the study and the control groups according to socio-demographic characteristics (n=50).

Socio-demographic characteristics	Study group (n = 25)		Control group (n = 25)		X ² (P)
	No	%	No	%	
Age in years					
20 < 40	9	36.0%	8	32.0%	0.81 (.664)
40-49	8	32.0%	6	24.0%	
50-60	8	32.0%	11	44.0%	
Mean ± SD	43.0 ± 10.6		43.7 ± 13.4		.634 [#]
Gender					
Male	12	48.0%	14	56.0%	0.32 (.571)
Female	13	52.0%	11	44.0%	
Education					
Illiterate	8	32.0%	9	36.0%	MCP=.684
Read and write	6	24.0%	4	16.0%	
Primary education	1	4.0%	4	16.0%	
Secondary education	5	20.0%	4	16.0%	
University or more	5	20.0%	4	16.0%	
Marital					
Single	4	16.0%	7	28.0%	MCP=.317
Married	20	80.0%	15	60.0%	
Divorced	1	4.0%	1	4.0%	
Widow	0	0.0%	2	8.0%	
Occupation					
Manual	5	20.0%	6	24.0%	MCP=.360
Employee	0	0.0%	1	4.0%	
Housewife	5	20.0%	4	16.0%	
Not working	12	48.0%	14	56.0%	
Retired	3	12.0%	0	0.0%	
Residence					
Urban	3	12.0%	8	32.0%	2.9 (.088)
Rural	22	88.0%	17	68.0%	

N= number of patient

X2: Pearson X2 test

MCP: Mont Carlo exact test

#: Independent t-test

* P < 0.05 (significant)

Table (2): Comparison between the studied groups in relation to biochemical markers pre and post interdialytic exercise.

Biochemical markers	Pre intradialytic exercises		P1-value	Post intradialytic exercises		P2-value
	Study group N=25	Control group N=25		Study group N=25	Control group N=25	
	Mean± SD	Mean± SD		Mean± SD	Mean± SD	
Blood urea	167.8±39.7	167.6±45.4	.984	132.8±22.8	170.8±23.5	.001*
Serum creatinine	13.0±3.4	11.9±4.3	.333	8.9± 2.3	13.5±6.5	.003*
Serum potassium	5.7±1.9	5.2±1.2	.346	4.9± 0.8	5.4±0.7	.023*
Serum phosphorus	5.2±1.7	5.4±1.7	.613	4.7± 1.3	5.8±1.1	.001*
Serum Calcium	8.6±1.2	8.9±2.2	.455	9.0±1.0	8.6±0.6	.074
Haemoglobin	9.1±1.7	8.9±1.3	.647	9.5±1.2	8.8 ±1.2	.972

N= number of patient P: Independent samples t-test * P < 0.05 (significant)

P 1= value for comparing between the studied groups pre intrdialytic exercise.

P 2= value for comparing between the studied groups post intrdialytic exercise.

Table (3): Comparison between the studied groups in relation to physiological parameters pre and post intrdialytic exercise.

Physiological parameters	Pre intradialytic exercises		P1-value	Post intradialytic exercises		P2-value
	Study group N=25	Control group N=25		Study group N=25	Control group N=25	
	Mean± SD	Mean± SD		Mean± SD	Mean± SD	
Pulse	74.3±11.9	73.4±11.0	.778	77.1±6.0	76.2±6.2	.576
Heart rate	90.9±11.9	86.4±18.2	.305	94.2±5.3	88.1±15.7	.073
Respiration	19.6±1.8	23.2±22.3	.415	19.2±1.1	22.4±16.9	.351
Systolic blood pressure	124.0±18.5	130.8±21.0	.230	119.6±16.4	130.6±19.9	.092
Diastolic blood pressure	76.8±12.2	81.6±11.4	.157	74.1±10.2	80.9±10.3	.088
Pulse pressure	47.2±11.7	49.2±12.6	.563	45.5±9.6	49.1±12.3	.407
Body weight	75.1±14.1	67.4±17.6	.093	75.3±14.5	68.4±17.1	.131

N= number of patient P: Independent samples t-test * P < 0.05 (significant)

P 1= value for comparing between the studied groups pre intrdialytic exercise.

P 2= value for comparing between the studied groups post intrdialytic exercise.

Table (4): Comparison between the studied groups in relation to domains of overall quality of life after three months of intradialytic exercises.

Quality of life domains	Pre intradialytic exercises		P1-value	Post intradialytic exercises		P2-value
	Study Group N= 25	Control Group N= 25		Study Group N= 25	Control Group N= 25	
	Mean± SD	Mean± SD		Mean± SD	Mean± SD	
Symptom/problems	58.5±21.0	61.2±20.5	.652	95.7±7.5	47.5±15.5	.001*
Effects of kidney disease	61.8±26.4	66.8±23.8	.485	94.3±7.6	50.8±19.1	.001*
Burden of kidney disease	34.0±19.4	35.0±17.3	.848	43.8±14.7	32.0±17.1	.012*
Work status	22.0±41.0	20.0±40.8	.864	24.0±41.1	20.0±40.8	.732
Cognitive function	48.0±21.7	50.7±19.5	.650	62.7±14.7	40.0±16.0	.001*
Social interaction	68.0±21.5	78.0±29.9	.181	89.3±13.5	64.0±27.1	.001*
Sexual function	78.0±24.3	54.0±11.8	.001*	76.0±11.4	69.0±13.1	.049*
Sleep	54.0±29.5	60.5±26.2	.414	73.5±18.5	34.0±19.3	.001*
Social support	77.0±32.2	56.0±32.5	.026*	83.0±24.7	46.0±33.6	.001*
Dialysis staff encouragement	12.0±20.6	28.0±37.0	.065	12.0±26.1	7.0±13.5	.400
Patient satisfaction	98.0±10.0	90.0±20.4	.085	98.0±10.0	88.0±21.8	.042*
Overall QOL	55.6±11.6	54.6±10.5	.747	68.4±7.3	45.3±10.1	.001*

N= number of patient P: Independent t-test * P < 0.05 (significant)
 P 1= value for comparing between the studied groups pre intrdialytic exercise.
 P 2= value for comparing between the studied groups post intrdialytic exercise.

Table (5): Comparison between levels of quality of life for patients in the study and control groups pre and post of intradialytic exercises.

Overall QOL	Pre intradialytic exercises				P1-value	Post intradialytic exercises				P2-value
	Study group N= 25		Control group N= 25			Study group N= 25		Control group N= 25		
	No	%	No	%		No	%	No	%	
Poor	10	40.0%	8	32.0%	.837	0	0.0%	16	64.0%	.001*
Fair	14	56.0%	16	64.0%		20	80.0%	9	36.0%	
Good	1	4.0%	1	4.0%		5	20.0%	0	0.0%	

N= number of patient P: Exact probability test *P<0.05(significant)
 P 1= value for comparing between the studied groups pre intrdialytic exercise.
 P 2= value for comparing between the studied groups post intrdialytic exercise.

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