

# Impact of Intradialytic Rehabilitation Program on General Health of Chronic Kidney Disease Patients

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**Abstract** Background: CKD patients received intradialytic rehabilitation program developed improvement in their general health. Exercise also improve solute removal which increase the HD efficiency. **Aim:** to evaluate the impact of intradialytic rehabilitation program on general health of CKD patients. **Design:** Quasi experimental. **Setting:** The study conducted at hemodialysis unit of Minia urology hospital. **Sampling:** 60 patients divided in two groups 30 for each. **Results:** more than half of both groups were female. More than half of both group were diabetic and hypertensive. Mean age of both groups were (39.73 ± 8.17) & (40.00 ± 8.27). The 6 MWT was lower in the control group (325.3 ±24.1, 310.6 ±18.3 & 308 ±17.8) at the three observations than the study (352.3 ±46.8, 393.8 ±78.4 & 448 ±26.9). Small percentage of the rehabilitation group experienced dyspnea (16.6 % and 26 %). The study group showed improvement in mean serum creatinine (4.85± 0.54 & 4.58±0.54) than the control group (5.58± 0.68 & 5.58± 0.68). After rehabilitation program half of the study had low depression and only (13.3%) of them had high depression level. **Conclusion:** Intradialytic rehabilitation program for CKD patients enhance their activities of daily living abilities which improves their psychological health status.

**Keywords:** intradialytic, rehabilitation program, general health, and chronic kidney disease

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## 1. Introduction

Chronic kidney disease (CKD) is an important international health problem that developed from progressive and irreversible loss of renal function [1]. CKD or End-stage renal disease (ESRD) stage V is recognized by structural and functional damage to the kidneys (loss of glomerular filtration) resulting in collection of waste products in the blood which are toxic to the body and leads to various metabolic and systemic complications that needs continues renal replacement therapy in the form of hemodialysis [2].

Hemodialysis (HD) patients categorized as critical ill patients, due to the hazard of blood loss and hemodynamic imbalance during sessions of blood filtration. Also anemia and imbalance in the body homeostasis reduce approximately 50% of maximal oxygen consumption and 30% to 40% of muscle strength, compared to the values found in healthy subjects [3]. This side effects leads to reduction in the muscular strength and functions ability also affect the cardio-respiratory capacity [4].

The mortality rate of CKD patients is 15 to 30 times higher than that of healthy personnel's. The disease is also associated with great health expenditures and lower

health-related quality of life (HRQOL) all of these events are enrage because of the disease itself and the inactivity hours spend during HD. Ill patients with CKD usually have a sedentary life style because of the HD hemodialysis therapy [5]. Patients on maintenance HD have regular sessions with scheduled hours a week of inactivity due to attachment with HD machine. The HD sessions usually takes place in critical dialysis units which was facilitated to help patients sit or sleep comfortable without activity. Three days a week of inactivity will by the time of gradual dismiss in muscular activity and general health status [6].

The treatment of HD itself carried out in a semi or supine sitting position from 3 to 6 hours per visit, which adds up to around 400 to 900 hours per year without any physical activity [7]. The failure of physical functions for HD patients regardless of age, results in unemployment, dependence in activities of daily living, disability and an increased risk of hospitalization and mortality. Patients suffering from HD are significantly sedentary individuals, less active than healthy, and low motivation especially "intrinsic motivation" has been identified as a major hinder to prescribing exercise [8].

HD patients needs a necessary intradialytic rehabilitation program provided by highly qualified critical care nurse to minimize complication risk. Rehabilitation program

include resistance exercise on regular basis and breathing exercise for about 30 min for "3" sessions per week. The resistance exercise will improve the muscular activity. Exercise during the HD sessions will reduce the stasis of circulation which promote solute removal by increasing muscle blood flow and efflux of urea and other toxins into the vascular compartment where they can be removed. Exercise for CKD patients helps in improvement of arterial stiffness decrease in pulse pressure, increase oxygen diffusion, which leads to promote aerobic capacity, raise in concentration of hemoglobin and hematocrit levels and improve lipid metabolism [9].

Deep breathing and coughing exercise will progress tissue oxygenation and minimize pre and post dialysis session dyspnea severity and the hazard of cardiovascular disease including high blood pressure, diabetes mellitus, stress and depression. There is also significant evidence that intra-dialysis exercise may raise quality of life and reduces anemia in dialysis patients [10]. The wellbeing of a person with CKD which include emotional and psychological wellbeing can be affected by several factors. These include the nature of response, acceptance and adjustment to diagnosis, progression of the disease, treatment or non-treatment choices, and co-morbidities [10].

Patients will be challenged by many stressors that exacerbate emotional and psychological problems which include loss of biochemical and physiologic kidney functions, and deposition of chemical substances leads to development of cognitive and neurologic disorders, also the loss of sexual function, needle phobia, altered body image, decreased physical and cognitive competence, and inability to maintain employment and lifestyle. In addition the medication employed in the treatment of patients may compress depressive effect [10].

The professional critical care nurse and in home nurse play an essential role in patient education about the intradialytic rehabilitation program. Home nurse also should insure that their patient follow their exercise tarring in regular biases at home which is associated with improvement in their general health status. [9].

#### **Significance of the Study**

CKD is increasing worldwide the number of patients receiving hemodialysis is estimated at more than 1.4 million, with the annual incident rate growing to 8%. In Egypt, there are no recent data about the prevalence of CKD; however, the last statistics was performed in 2004, with a prevalence of 483 pm. In Minia governorate, one of the upper Egypt governorates, the prevalence was 308 pm [11].

A low level of physical exercise is associated with gradual muscle impairment, atrophy and significant impairment of physical and psychological well being which reflect on the quality of daily living activities including those related to self-care as (e.g., bathing, housework, dressing, and shopping), paid work, functioning in the community, and recreation [12,13]. The lack of physical activity has been directly linked to numerous negative health concerns such as: Obesity, High blood pressure, Lower quality of life, Musculoskeletal problems, such as low back pain and muscle tightness [13,14,15].

The role of rehabilitation program which include breathing and resistance exercise for CKD patients is not well recognized, many hospitals did not have trained

personnel or facilities to provide effective exercise. In the recent years there is increasing number of literature that support the benefits of regular exercise on improving patients metabolic, hemodynamic, muscular and psychological wellbeing. In addition, the expected benefits of engaging in a regular exercise program include: weight loss, improved blood sugar control, dyspnea reduction, improved mental health, improvements in fitness, reduced risk of chronic disease, increased muscular strength, power and flexibility and increased independence during daily life activity for better quality of life, all of this things are of great value for the patient and his family.

## **2. The Aim of the Study**

To evaluate the impact of intradialytic rehabilitation program on general health of CKD patients.

## **3. Research Question**

1. Dose structured rehabilitation program will improve the physical health of CKD patients undergoing hemodialysis?
2. Dose structured rehabilitation program will improve oxygenation status of CKD patients undergoing hemodialysis?
3. Dose structured rehabilitation program will improve the general health of CKD patients undergoing hemodialysis?

## **4. Patient and Methods**

### **4.1. Research Design**

Quasi experimental research design was done to fulfill the aim of this study

### **4.2. Setting**

The study was conducted at hemodialysis unit of Minia urology hospital.

### **4.3. Sampling**

A sample of 60 patients was selected conveniently meeting the inclusion criteria divided equally into two groups 30 patients for each (study and control groups).

### **4.4. Inclusion Criteria**

- CKD patients undergoing regular hemodialysis
- Adult (18years -65years) patients from both genders (male and female).
- Patients able to stand and walk independently

### **4.5. Exclusion Criteria**

- Patients will be excluded if they have:
- Impaired cognitive function
  - Impaired bilateral hearing or vision

-Symptomatic ischemic heart disease  
 -Musculoskeletal or neuromuscular disorders that may limit the study practice.

#### 4.6. Tools of Data Collection

Data was collected through:

Three tools was used for collecting data for this study, these tools was prepared and tested by researchers, and content of the tools was established after extensive literature review.

- **Tool one: Socio-demographic and medical data assessment sheet included two parts:-**

**Part I:** Patient's socio- demographic data as (age, sex, marital status, level of education etc.)

**Part II:** Laboratory investigations as kidney functions test (serum creatinin and blood urea nitrogen) and serum electrolyte as (serum calcium and potassium). In addition to heart rate and oxygen saturation.

**Tool two: the physical assessment sheet included two parts**

**Part I: Six-minute Walk Test (6MWT): adopted from [22].** is an easy and inexpensive way to evaluate physical function of an individual and reflects the ability to undertake day-to-day activities. 6MWT covered distance in a quick self-paced walk on a flat, hard surface in a period of 6 minutes.

**Part II: The Modified Medical Research Council Dyspnea Scale (MMRC)** adopted from [21]. Dyspnea Scale uses a simple grading system to assess a patient's dyspnea level and shortness of breath. The MMRC dyspnea scale, scoring ranges from (0 =patient has breathless with strenuous exercise to, 4= patient has breathless to leave the house or breathless when dressing.

**Tool three: General Health Questionnaire (GHQ)** adopted from (Goldberg and Hillier 1979)— The GHQ–28 is divided into four subscales: somatic symptoms, anxiety and insomnia, social dysfunction, and severe depression. Each subscale comprises 7 items, each rated on a 4-point scale. The GHQ–28 total score is typically calculated based on the following scores assigned to each rating with 1: “Never,” 2: “Same as usual,” 3: “More than usual,” and 4: “A lot more than usual”, the total scale score ranges from 28 to 112.

#### 4.7. Study Procedure

##### 1. Preparatory phase

**Ethical consideration:** An official permission was granted from the director of Minia urology University Hospital to conduct the study. Written informed consent was obtained by the researchers from patients after explanation of the aim of the study, confidentiality of data, privacy, voluntary participation and right to refuse to participate in the study was emphasized to them by the researchers through direct personal communication for getting their approval and cooperation in the study.

##### Validity and Reliability

The tools of the study were tested for content validity by a jury panel of experts (5) in the field of the study and the necessary modifications were done. Pilot study was done on 10 % (6) of patients to test the feasibility of the

study and applicability of the tool and there is no modifications done.

##### 2. Implementation phase

- **The control group:** received the intradialytic routine nursing care provided during the HD sessions by the critical care nursing staff that worked at the unit.
- **The intervention group:** received the routine nursing care plus the structured intradialytic rehabilitation program. The intradialytic rehabilitation program was done after spending 30 minutes of the dialysis session to be sure that HD patients is hemodynamic stable and there is no warning signs to withdraw or stop the session or preventing the application of the rehabilitation program. The rehabilitation program includes the following: Breathing exercise and resistance exercise for lower and upper limbs.

**Breathing exercise includes:** Pursed lip breathing (PLB) involves breathing in through the nose and breathing out through the mouth. The expiratory time is double the inspiratory time. PLB helped to maintain air pressure in the small airways, preventing the airways from collapsing. This exercise was done at the beginning for about 5-10 minutes and repeated 3-4 times per day.

**3- Diaphragmatic breathing** is intended to help patient use the diaphragm correctly while breathing to strengthen the diaphragm and decrease the work of breathing. Patient was instructed to sit comfortably with the knees bent and the shoulders, head and neck relaxed. Breathe in slowly through the nose so that the stomach moves out against the hand. Then exhaled through pursed lip technique so that stomach moves in again. Patients was instructed to place one hand on the upper chest and the other just below the rib cage. This will allow patient to feel the diaphragm move as he or she breathe. Patients was instructed to practice this exercise 5-10 minutes about 3-4 times per day.

**Resistance exercises:** The researcher taught patients these exercise and encouraged them to do it daily and during every dialysis session per week, each once about 20 to 30 minute. The exercise started with moderate intensity of no more than 10 minutes then time of practice increased gradually to 30 minutes per dialysis session.

4. Resistance exercise included the following: Neck stretch, chest press, arm and hand stretch, bicep curl, triceps extension, shoulder shrug rotation, chest and upper back strength (this exercise improves the chest muscle tone and increases patient's ability to push and carry things). Seated row (this exercise designed to strength the shoulder and upper back muscles) which include three movements: neutral grip, supine grip and prone grip. Calf press (this exercise strengthen the calf and leg muscles in two steps: straight knee and bent knee. leg stretch, lower leg extension, straight leg extension, heel raise, and abdominal leg extension, this group of exercise strengthen the thigh, legs and calf muscle to improve the patients movement ability.

##### 5. Evaluation phase

Researchers evaluated the in session hemodialysis patients from both groups. Evaluation was done in four times once before starting any exercise to provide base

line data for comparing the effect of these exercise on the physical and psychological health of the patient. The other three times were done as following, once after the 1st month, then after the 2nd, and 3<sup>rd</sup> month using the following tools:

**Tool one, part II:** was done to determine the effect of the exercise on the clinical health of the HD patients.

Tool two: Part I: Modified Medical Research Council Dyspnea Scale (MMRC) and part II: Six-minute Walk Test (6MWT) were used to determine the effect of exercise on dyspnea and the physical fitness of HD patients.

**Tool three: General Health Questionnaire** was used to determine the effect of exercise on physical and psychological health of the CKD patients.

#### 4.8. Data Analysis

Data was coded, entered and analyzed using the Statistical Package for Social Science (SPSS) software package version 20. Frequency and percentage distribution were used to present qualitative data. Mean and standard deviation, t-test, ANOVA, Pearson correlation coefficient were used to study the relationship between variables. Statistical significance was considered at the (0.05) level.

### 5. Results

**Table 1:** Illustrated the demographic data of the study participants. Regarding to the gender, it was appear that, more than half of the study and control groups were female (53.3, 56.7 %) respectively. In addition, more than half of the control and study group were diabetic (66.7, & 60 %) and more than half of the control and study group were (53.3, & 63.3 %) hypertensive. In relation to age, the Mean  $\pm$  SD of in both groups (control & study) was (39.73  $\pm$  8.17) & (40.00  $\pm$  8.27) respectively.

**Table 2:** Shows the mean  $\pm$ SD of the participant's heart rate and oxygen saturation before and after 6MWT at the four observations of the study. At the 1<sup>st</sup> time it was observed no statistical significant difference between both groups in the (HR & SPO<sub>2</sub>). At the fourth observation of the study the control group mean score of HR was (89.16  $\pm$  6.39) before the 6MMWT and (89.50  $\pm$  4.72) after. While the study group mean score of HR was higher (93.10  $\pm$  5.27) before 6MMWT and also increased to (96.0  $\pm$  3.18) after it, there were statistical significant difference presented by P value (0.000\*\*) between both groups. Also the SPO<sub>2</sub> at the 4<sup>th</sup> time was (96.20  $\pm$  2.36) in the control group before the 6MWT and increased to (97.64  $\pm$  1.24) in the study group, but after the 6MWT the SPO<sub>2</sub> was decreased in the control group (94.93  $\pm$  1.08) while increased in the study group to (98.90  $\pm$  0.30). There were statistical significant differences between both groups at the 2<sup>nd</sup> 3<sup>rd</sup> 4<sup>th</sup> observation presented by P value (.000\*\*). The 6MWT 1<sup>st</sup> observation was (319  $\pm$  22.7) in the control group and (316.3  $\pm$  29.6) in the study, there were no statistical significant differences between them. But after the rehabilitation program it was observed that the mean score of the 6MWT was lower in the control group (325.3  $\pm$  24.1, 310.6  $\pm$  18.3 & 308  $\pm$  17.8) at the three observations than that of the study which was (352.3  $\pm$  46.8, 393.8  $\pm$  78.4 & 448  $\pm$  26.9) and there were statistical significant

differences between them presented by P value (0.007\*, 0.000\*\* and 0.000\*\*) respectively.

**Table 3:** shows the changes of dyspnea level before and after applying the intradialytic rehabilitation program using the MMRC dyspnea scale. More than half of both groups (control and study) had to stops for breath after walking because of dyspnea (56.6 %) and (63.3 %) respectively. After applying the intradialytic rehabilitation program after the 2<sup>nd</sup> and 3<sup>rd</sup> month (33.3 %) of the control group had to stops for breath after walking which increased to (40 %) after the 4<sup>th</sup> month. In relation to the study group (43.3%) had to stop for breath after walking which decreased to (13 % and 10 %) after the 3<sup>rd</sup> and 4<sup>th</sup> month. (26, 23.3 & 16.6 %) of the control group had too dyspnea to leave house while (3.3 %, 0 %, 0 %) of the study group had it. There were statistical significant difference between both after the 2<sup>nd</sup> and 3<sup>rd</sup> month and presented by P value (0.002\* & 0.000\*\*) respectively.

**Table 4:** Shows the laboratory results of HD patients from both groups before and after the study. The first mean  $\pm$ SD of serum creatinine and in both groups (control and study) was (5.56 $\pm$ 0.72 & 5.48  $\pm$  0.77), serum urea (130.7 $\pm$ 14.22 & 127.9 $\pm$ 10.30) respectively and there were no statistical significant difference between them presented by P value (0.70) and (0.39) respectively. At the 3<sup>rd</sup> and 4<sup>th</sup> observations there were improvement in the mean  $\pm$ SD of serum Creatinine in the study group (4.85 $\pm$ 0.54 & 4.58 $\pm$ 0.54) respectively than that of the control group (5.58 $\pm$ 0.68 & 5.58 $\pm$ 0.68) also, there were statistical significant difference between both groups at the same observations presented by P value (.000\*\*). Serum urea after the 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> month the control group was (130.7 $\pm$ 14.22) without change. But the study group serum urea results were lower (123.8 $\pm$ 7.49, 120.1 $\pm$ 7.83 & 118.9 $\pm$ 7.13) there were highly significant relation in the last three observations presented by P value (.023\*, 001\*\* & 0.000\*\*).

**Table 5:** Shows frequency distribution of general health dimension before and after the rehabilitation program. It was observed that (30 %) of the control group and (50 %) of the study group had high somatic symptoms before the rehabilitation program which decreased to (10 %) in the study group. Regarding to depression symptoms, it was noticed that half of both groups (50 %) had moderate depression symptoms, and (43.3%) of them had sever level of depression. After the rehabilitation program it was observed that half of the study group had low depression and (36.7 %) had a moderate level and only(13.3 %) of them had a high depression level. In relation to the general health it was observed that more than half of the control group had moderate general health before the rehabilitation program. But the study group before the rehabilitation program were (23.3 %) of them had low general health, (66.7 %) had a moderate level and 10% had high general health. While after rehabilitation program were (66.7 %) moderate and (33.3 %) had high level of the general health.

**Table 6:** Shows differences between both groups of the study regarding to the Mean  $\pm$ SD of general health questionnaire. It was noticed that there were no statistically significant differences between the Mean  $\pm$ SD of both study and control groups before the application of the rehabilitation program which presented by P value (.534). Also there were no statistical significant difference

in the Mean  $\pm$  SD of the control group before and after the rehabilitation program, presented by P value (.112). While there were statistical significant differences in Mean  $\pm$ SD of the general health questionnaire in both groups after the

rehabilitation program presented by P value (.003\*\*). Also there were statistical significant differences in the Mean  $\pm$ SD of the study group before and after the study presented by P value (.005\*\*)

**Table 1. Frequency distribution of Demographic characteristics of the study and control group (N= 30)**

Item		Control group		Study group	
		NO	%	NO	%
Gender	Male	14	46.7	13	43.3
	Female	16	53.3	17	56.7
Education	Illiterate	10	33.3	8	26.7
	Read and write	10	33.3	10	33.3
	Secondary school	8	26.7	8	26.7
	University	2	6.7	4	13.3
Marital status	Single	8	26.7	9	30
	Married	9	30	8	26.7
	Divorced	8	26.7	8	26.7
	Widow	5	16.7	5	16.7
Type of job	Unemployed	6	20	5	16.7
	employ	7	23.3	8	26.7
	farmer	8	26.7	9	30
	Others	9	30	8	26.7
Residence	Urban	17	56.7	14	46.7
	rural	13	43.3	16	53.3
Diabetes mellitus	Yes	20	66.7	18	60
Hypertension	Yes	16	53.3	19	63.3
Age	Mean $\pm$ SD			Mean $\pm$ SD	
	39.73 $\pm$ 8.17			40.00 $\pm$ 8.27	

**Table 2. Comparing the differences between heart rate, oxygen saturation and the 6Minut Walk Test among the control and study groups before and after the rehabilitation program (N= 30)**

Variable	Heart rate			Oxygen Saturation		
	Mean $\pm$ SD	T	P	Mean $\pm$ SD	T	P
<b>1<sup>st</sup> time before exercise</b>						
Control group	89.96 $\pm$ 5.72	0.413	.681	96.38 $\pm$ 3.14	1.41	0.161
Study group	90.60 $\pm$ 6.15			97.36 $\pm$ 2.104		
<b>1st time after exercise</b>						
Control group	89.76 $\pm$ 5.53	0.651	.518	96.20 $\pm$ 2.13	1.16	0.248
Study group	90.76 $\pm$ 6.33			96.83 $\pm$ 2.06		
<b>2nd time before exercise</b>						
Control group	89.06 $\pm$ 6.08	1.02	.309	95.71 $\pm$ 3.36	1.54	0.129
Study group	90.70 $\pm$ 6.24			96.73 $\pm$ 1.36		
<b>2nd time after exercise</b>						
Control group	89.80 $\pm$ 5.70	5.53	0.000**	95.93 $\pm$ 1.59	8.82	.000**
Study group	96.30 $\pm$ 2.97			98.65 $\pm$ 0.54		
<b>3rd time before exercise</b>						
Control group	90.0 $\pm$ 5.43	0.422	.675	95.60 $\pm$ 2.01	5.61	.000**
Study group	90.63 $\pm$ 6.17			97.90 $\pm$ 0.99		
<b>3rd time after exercise</b>						
Control group	89.13 $\pm$ 5.96	5.09	.000**	95.93 $\pm$ 2.09	6.85	.000**
Study group a	95.70 $\pm$ 3.77			98.66 $\pm$ 0.60		
<b>4th time before exercise</b>						
Control group	89.16 $\pm$ 6.39	2.59	.012*	96.20 $\pm$ 2.36	3.94	.000**
Study group	93.10 $\pm$ 5.27			97.64 $\pm$ 1.24		
<b>4th time after exercise</b>						
Control group	89.50 $\pm$ 4.72	6.24	0.000**	94.93 $\pm$ 1.08	14.61	.000**
Study group	96.0 $\pm$ 3.18			98.90 $\pm$ 0.30		
<b>6MWT</b>	<b>Control group</b>		<b>Study group</b>		<b>T</b>	<b>P</b>
<b>6MWT 1<sup>st</sup> time</b>	319 $\pm$ 22.7		316.3 $\pm$ 29.6		0.391	0.698
<b>6MWT 2<sup>nd</sup> time</b>	325.3 $\pm$ 24.1		352.3 $\pm$ 46.8		-2.8	0.007*
<b>6MWT 3<sup>rd</sup> time</b>	310.6 $\pm$ 18.3		393.8 $\pm$ 78.4		-5.6	0.000**
<b>6MWT 4<sup>th</sup> time</b>	308 $\pm$ 17.8		448 $\pm$ 26.9		-23.6	0.000**

**Table 3. Analysis of variance of MMRC before and after applying the intradialytic exercise**

Item	1 <sup>st</sup> MMRC				2 <sup>nd</sup> MMRC				3 <sup>rd</sup> MMRC				4 <sup>th</sup> MMRC			
	Control		Study		Control		Study		Control		Study		Control		Study	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Dyspnea with strenuous exercise	0	0	0	0	0	0	0	0	0	0	5	16.6	0	0	8	26
Dyspnea in walking 100 yards	3	10	3	10	1	3.3	8	26	6	20	12	40	6	20	15	50
Walks slower than people	4	13	4	13	11	36.6	8	26	7	23.3	9	30	7	23.3	4	13
Stops for breath after walking	17	56.6	19	63.3	10	33.3	13	43.3	10	33.3	4	13	12	40	3	10
Too dyspnea to leave house	6	20	4	13	8	26	1	3.3	7	23.3	0	0	5	16.6	0	0
P value	0.91				0.008*				0.002*				0.000**			

**Table 4. Differences between laboratory results before and after the implementation of the rehabilitation program:**

Variable	Control group		Study group		T	P
	Mean ±SD		Mean ±SD			
Serum Creatinine 1 <sup>st</sup> time	5.56±0.72		5.48 ± 0.77		0.37	0.70
Serum Creatinine 2 <sup>nd</sup> time	5.58± 0.68		5.19± 0.57		2.41	.019*
Serum Creatinine 3 <sup>rd</sup> time	5.58± 0.68		4.85+ 0.54		4.60	.000**
Serum Creatinine 4 <sup>th</sup> time	5.58± 0.68		4.58±0.54		6.28	.000**
Serum Urea 1 <sup>st</sup> time	130.7±14.22		127.9±10.30		0.85	0.39
Serum Urea 2 <sup>nd</sup> time	130.7±14.22		123.8± 7.49		2.35	.023*
Serum Urea 3 <sup>rd</sup> time	130.7±14.22		120.1±7.83		3.56	.001**
Serum Urea 4 <sup>th</sup> time	130.7±14.22		118.9±7.13		4.04	.000**
Serum Potassium 1 <sup>st</sup> time	4.23 ± 0.54		4.34± 0.53		0.76	.447
Serum Potassium 2 <sup>nd</sup> time	4.23 ± 0.54		4.22± 0.56		0.07	.945
Serum Potassium 3 <sup>rd</sup> time	4.23 ± 0.54		4.20±0.53		0.24	.812
Serum Potassium	4.23 ± 0.54		4.03±0.42		1.64	.106
Serum Sodium 1 <sup>st</sup> time	139.1± 3.24		139.5±2.47		0.53	.593
Serum Sodium 2 <sup>nd</sup> time	138.5±3.57		139.5±2.47		0.83	.405
Serum Sodium 3 <sup>rd</sup> time	139.1±3.68		139.0±2.40		0.13	.901
Serum Sodium 4 <sup>th</sup> time	139.1±3.68		136.5±3.28		2.81	.007**

**Table 5. Frequency distribution of general health questionnaire dimension before and after the study:**

Items	Control						Study							
	Before						Before							
	Low		Moderate		High		Low		Moderate		High			
	N	%	N	%	N	%	N	%	N	%	N	%		
1-Somatic symptoms	10	33.3	11	36.7	9	30	7	23.3	8	26.7	15	50		
2-anxiety and Insomnia	8	26.7	15	50	7	23.3	4	13.3	10	33.3	16	53.3		
3-Socialdysfunction	5	16.6	13	43.3	12	40	10	33.3	10	33.3	10	33.3		
4-Depression	2	6.6	15	50	13	43.3	5	16.7	15	50	10	33.3		
General health	6	20	21	70	3	10	7	23.3	20	66.7	3	10		
<b>Total Score of General health Questionnaire</b>	<b>Mean±SD</b>						<b>Mean±SD</b>						<b>T</b>	<b>P</b>
	67.43±13.01						64.93±17.62						.625	.534
	After						After							
	Low		Moderate		High		Low		Moderate		High			
	N	%	N	%	N	%	N	%	N	%	N	%		
1- Somatic symptoms	9	30	12	40	9	30	20	66.7	7	23.3	3	10		
2-anxiety and insomnia	7	23.3	15	50	8	26.7	15	50	10	33.3	5	16.7		
3-Socialdysfunction	5	16.6	13	43.3	12	40	20	66.7	8	26.7	2	6.6		
4-Depression	2	6.6	15	50	13	43.3	15	50	11	36.7	4	13.3		
General health	8	26.7	19	63.3	3	10	0	0	20	66.7	10	33.3		
<b>Total Score of General health Questionnaire</b>	<b>Mean±SD</b>						<b>Mean±SD</b>						<b>T</b>	<b>P</b>
	66.57±13.78						77.13±12.29						3.07	.005**

**Table 6. Differences between study and control group regarding the total of general health questionnaire before and after the rehabilitation program**

Variable	General health		T	P
	Mean±SD	Mean ± SD		
Pre control and pre study	67.43±13.01	64.93±17.62	.625	.534
Pre and post control group	67.43±13.01	66.57±13.78	.163	.112
Post control and post study	66.57±13.78	77.13± 12.29	3.13	.003**
Pre and post study group	64.93±17.62	77.13± 12.29	3.07	.005**

## 6. Discussion

CKD and its management had a highly significant impact on patient's physical and psychological health. HD is the most effective management way for CKD, but also affect on lifestyle and general health quality of patients [17]. (Qiu 2017) stated that quality of life of CKD have a significantly decrease in its score when compared with normal population because of the HD treatment, regular periods of inactivity during the session and the inverse effect of the pharmacological therapy. In addition, the majority of CKD patients are job retired and abstain from work which increase their immobility and its attached complications [18].

In general people, physical exercise can improve cardiac output, walking capacity and nutritional status further helping in the control of chronic diseases and prevent its occurrence, including CKD, there were a hypothesis that the kidney functional level of CKD well be improved if there is improving in the patient's physical fitness level [19]. Rehabilitation one of the important nursing role for hemodialysis patients which lead to positive significant improvement in patient's physical and general health also lowers the depression symptoms. So this necessary for close participation of patients and their healthcare team where the role of nurses is outstanding. (Song, et al 2017) suggested that rehabilitation programs for patients with CKD have many beneficial effects on uremic symptoms, sleep deprivation, depression, and low quality of life which includes breathing and resistance exercise programs [19].

The present study showed the impact of intradialytic rehabilitation program on general health of CKD patients undergoing hemodialysis, the present study included 60 patients whom selected conveniently into two groups 30 patients for each (study and control groups). The control group received the routine in unit nursing care for HD patient but the study group received the in unit routine nursing care plus the intradialytic rehabilitation exercise. The study participant mean age was ( $39.73 \pm 8.17$ ) for the control group and ( $40.00 \pm 8.27$ ) for the study group. As regard to chronic disease the study participants (66.7 %) and (60 %) had DM of the control and study group respectively, also hypertension was found in (53.3 %) of the control group and (63.3 %) of the study. These findings prove that the common CKD risk factors were the presence of DM and hypertension because of their vascular effect on renal tubular system. The study showed that about half of the participant were female in both (control and study) groups (53.3 %) & (56.7 %) respectively.

This present finding was in a similar line with the study conducted by (Greenwood, S. et al., 2014) which included eighteen participants completed the study, 8 participants (6 men) in the rehabilitation group and 10 participants (9 men) from the usual care group. In the similar spirit (Greenwood, et al) found that, the mean age of the participant groups were ( $53.8 \pm 6$  13.5) for the rehabilitation group and ( $53.3 \pm 6$  12.9) for the usual care group [20] The finding of the present study is consistent with the result of (DeMarco, et al., 2018) which included 20 hemodialysis patients with mean age was  $50.8 \pm 10$

years, (35 %) of them were women and (30 %) had DM [21].

The study examined the effect of intradialytic rehabilitation program (breathing exercise and resistance exercise) on both groups general health and cardiopulmonary capacity of them through the evaluation of patient's heart rate and oxygen saturation before and after the 6MWT. There were no statistical significant difference between both groups HR & SPO<sub>2</sub> before applying the exercise at the first observation. But after applying the intradialytic exercise at the 4<sup>th</sup> observation the control group HR was ( $89.16 \pm 6.39$ ) but the study one was higher ( $93.10 \pm 5.27$ ) before the 6MWT. After the 6MWT the control group mean HR was also lower ( $89.50 \pm 4.72$ ) than the study group mean HR which increased to ( $96.0 \pm 3.18$ ), there were statistical significant difference presented by P value (0.12 & 0.000\*\*) before and after the 6MWT. This reflected the positive effect of rehabilitation program and resistance exercise on the cardio-respiratory muscle because both improve the cardiac output and HR. Also strength the chest muscle tone. As regard to the SPO<sub>2</sub> from the second month shows significant improvement in the study group than that of the control one which reflect that the performing of both breathing and resistance exercise leads to positive tissue oxygenation and improves the activity capacity for CKD patients.

This result was in agreement with (Campos, et al., 2018) who examined the effect of respiratory muscle training (RMT) on hemodialysis patient. The result of the study showed no significant difference in patients assigned to control or RMT groups in relation to cardiovascular or respiratory parameters baseline even before and after the 6MWT, except for heart rate was ( $76.5 \pm 14.3$ ) & ( $86.1 \pm 17.0$ ) before and after 6MWT respectively of the RMT group and ( $77.1 \pm 12.5$ ) & ( $86.9 \pm 12.8$ ) before and after 6MWT of the control group [22].

Regarding to the capacity of physical activity for both groups before and after applying the rehabilitation program which was tested using the 6MWT, at 1<sup>st</sup> time there were no statistical significant differences between both groups (0.698). But after applying the rehabilitation program the 6MWT was lower in the control group at the three observations ( $325.3 \pm 24.1$ ,  $310.6 \pm 18.3$  &  $308 \pm 17.8$ ) which reflected that there were low activity level due to the effect of immobility hours of the regular HD sessions. But patients of study group had improvement in their physical activity level presented by increasing their mean walked distance in the 6MWT ( $352.3 \pm 46.8$ ,  $393.8 \pm 78.4$  &  $448 \pm 26.9$ ) and there were statistical significant differences between them presented by P value (0.007\*, 0.000\*\* and 0.000\*\*). Rehabilitation program gradually improves cardiac function, and tissue perfusion. Exercise increases patient's tolerance to the daily activity level. Resistance exercise strengthen muscle tone of patients of the study group and made them more tolerant to activities than those of the control group.

The finding of this study in a line with (Tang, et al., 2016) who showed that 6MWT test was mainly similar in both the exercise group and control group at baseline ( $p = .527$ ). After 12 weeks of exercise training, significant improvements were observed in pre-change and post-change between the 2 groups with regard to 6MWT ( $t = 14.655$ ,

$p < .001$ ). For the physical function aspect, it was observed an increased mean change of (41.93 m) with the 6WMT in the exercise group than that of the control group [23]. In the same context, (Anding, et al., 2015) showed an improvement of the physical mobility in patients completed the exercise program presented by 6MWT ( $360 \pm 132$ ,  $374 \pm 134$  &  $403 \pm 141$ ) which increased gradually and showed significant difference presented by P value was (0.002). In deed (Anding, et al., 2015) stated that exercise program should be incorporated into the HD routine care [24].

In addition, the present study showed that patient who completed the intradialytic exercise experienced low dyspnea level with ordinary activity and small percentage of the study group experienced dyspnea with strenuous exercise (16.6 % and 26 %). Also (0 %) of the study group experienced dyspnea at the daily life activity. This results due to the positive effect of deep breathing and coughing exercise and the diaphragmatic breathing that applied during the dialysis session on the lung functions. Breathing exercise regulates patient's oxygenation and improves lung capacity which enhance oxygenation and tissue oxygen diffusion. The improvement of lung oxygenation leads to effective carbon dioxide removal which in turn reduce the dyspnea level before and after the HD treatment. Also the rehabilitation program which includes breathing and resistance exercise strengthens the respiratory muscle which reduce the feeling of dyspnea with activity of daily living.

This finding result is congruent with (Sarmiento, et al., 2016) which explore that, conventional physical therapy and Pilates exercise, were equal effective in maintaining functionality, respiratory muscle strength, and exercise capacity [25]. Also the study conducted by (Campos, et al., 2018) which observed that patients whom completed the study intervention had significant reduction in their dyspnea level and improved pulmonary function test. Also their respiratory muscle strength and their lung's functional capacity had increased after 8 weeks respiratory muscle training for patients undergoing hemodialysis replacement therapy,

HD patient often experience low level of activity which leads to progressive deterioration on renal function. In the present study the participant baseline data of renal function test of serum creatinine and blood urea nitrogen shows no statistical significant difference between both groups (0.70 & 0.39) respectively. But after applying the rehabilitation program for the study group at the 3<sup>rd</sup> and 4<sup>th</sup> observations showed improvement in the mean serum creatinine in the study group ( $4.85 \pm 0.54$  &  $4.58 \pm 0.54$ ) respectively than that of the control group ( $5.58 \pm 0.68$  &  $5.58 \pm 0.68$ ). The blood urea nitrogen test shows also highly significant relation at the last three observations presented by P value (.023\*, 001\*\* & 0.000\*\*).

This finding reflected that the application of intradialytic rehabilitation program which includes resistance and breathing exercise during the HD session enhances the circulation activity and leads to positive removal of toxic substances (serum creatinine and blood urea nitrogen) that have a pathological effect on the CKD patients. The resistance exercise reduces stasis in circulation and increases the efflux of toxic substances form the body through machine filter system during HD session.

Breathing exercise reduces the dyspnea and hypercarnia which improves the oxygenation and aerobic metabolism which improves tissue perfusion and removal of waste product for CKD patients. All of this things improves their activity and enhance their independence level during life

The present finding is inconsistent with (Sheng, et al., 2014) who denoted that intradialytic exercise program will improve the cardiopulmonary functions of CKD patients which will progress their renal perfusion and muscle blood flow to the open capillary surface area which expedite the easy efflux of urea and other toxic agents from the body. The easy and smooth removal of toxic substance from the body leads to positive significant improvement in the physical health status of intradialytic group of HD patients which presented by improvement in the 6MWT results of them [26].

In the study supported by (Hamada, et al, 2016) who reported that modest physical exercise program will upgrade the physical functional status of CKD patients undergoing HD treatment and will not a reason for any functional deterioration of the renal functional tests, in addition the same authors reported that, the exercise program should be included in the routine care of stage 4, or 5 CKD patients [27]. Also (Stewart, 2017) supported that, the intradialytic exercise program may raise the efficiency of the dialysis treatment by improving the efflux of urea from the tissue to the vascular closet resulting in an increase in serum urea clearance [28].

The current study also revealed that (30 %) of the control group and (50 %) of the study group had a high somatic symptoms before the rehabilitation program which decreased to (10 %) in the study group. This could be attributed to that somatic symptoms may result from physical exhaustion and fatigue due to HD. Letchmi (2011) [29] reported that, fatigue is consider one of the most debilitating symptoms reported by HD patients, and about 60% to 97% of patients on HD experience some degree of it. In addition, the same authors added that, people with renal disease, regardless of whether they are pre-dialysis or receiving either HD or PD, having high levels of fatigue and somatic complains and are often unable to engage in normal daily activities [29].

It also noticed that 50% of control group and 33.3% of study group have moderate anxiety and insomnia before rehabilitation program which decreased to 50% have low level of anxiety and insomnia after rehabilitation program. This could be explained by that, practicing physical exercise can produce feeling of relaxation and relief physical discomfort then induce sleep. In this respect Bossola (2011) [30] which indicated that 47.5% of 80 HD patients had mild symptoms of anxiety, while 48.7% had moderate or severe symptoms of anxiety. In addition, the anxiety scores correlated significantly with age and comorbidities, and anxiety were commonly noted in patients with poor appetite. A review of 55 studies that investigated symptoms of anxiety in HD patients found that 12% to 52% of patients had substantial anxiety.

Regarding to depression symptoms, it was detected that half of both groups 50 % had moderate depression symptoms, and 43.3% of them had sever level of depression. After the rehabilitation program it was observed that half of the study group had low depression and 36.7 % had a moderate level and only 13.3% of them had a high depression



level. This can be explained by Abbas (2009) [31] which stated that, depression is one of the most important mental illnesses among HD patients. In addition, there were a strong correlations between depression and longitudinal outcome among HD patients, including poor treatment adherence and higher mortality rates. Also, depression in HD patients is linked with higher rates of hospital admission, and a major likelihood of emergency department visits [31].

Finally, Several of the known advantage of exercise or regular physical activity in the general population are regarding to areas of specific concern to patients with ESRD, or CKD such as decrease risk for cardiovascular mortality, improvement in blood pressure (BP) control among hypertensive individuals, better control of diabetes, and improvement in general health as a result of enhanced psychological well-being and improved physical functioning. Exercise is a physical activity defined as a planned, structured, and repetitive bodily movement done to improve mental and physical functioning and general health. The barriers faced by patients on maintenance hemodialysis therapy include fatigue, decreased motivation and the inability to schedule exercise around daily activities and dialysis schedules [32].

## 7. Conclusion and Recommendations

Intradialytic rehabilitation program for HD patients should be one of the routine clinical practice that provided by critical care nurses in the dialysis units and continued at home. Regular in session physical activities had beneficial effects on CKD patients which associated with improvement in patients cardiac and pulmonary function which reflected on patients activity and general health. Furthermore, we are hopeful that this study will assist dialysis staff in their management to establish intradialytic planed schedule rehabilitation program include (breathing and resistance exercise) at optimal volume and intensity to be based on the patient's age and co-morbidities for those undergoing HD treatment.

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