IOSR Journal of Nursing and Health Science (IOSR-JNHS)
e- ISSN: 2320–1959.p- ISSN: 2320–1940 Volume 7, Issue 3 Ver. IV (May-June .2018), PP 11-19
www.iosrjournals.org

Leg Exercise: Effect on Reducing Fatigue and Improving Activities of Daily Living For Hemodialysis Patients

Mona Mohamed Ibrahim And Islam Mokhtar Mokhtar
Lecturer, Medical-Surgical Nursing, Faculty of Nursing Aswan University
Corresponding Author: Mona Mohamed Ibrahim

Abstract: ***Background****: Hemodialysis is a physically worrying procedure and most of the patients will have fatigue and thereby disturbances of the electrolytes, and hemoglobin level. Exercises supplied in the course of hemodialysis consultation do now not fee sufferers more time and will be effective in decreasing fatigue level and enhancing the potential for appearing their activities of each day living & might also moreover improve the elimination.* ***Aim:*** *to determine the impact of leg exercise during hemodialysis on the fatigue level and activity of daily living among patient performing hemodialysis.* ***Design****: Quiz experimental (Pre-posttest) research design was utilized in this study.* ***Setting****: This study was conducted in hemodialysis unit at Aswan University hospital.* ***Sample:*** *A total number of one hundred adult patients who satisfy the inclusion criteria have been involved in the study.* ***Tools****: Socio-demographic and medical data, Katz Index of Independence in Daily Living Activities and Multidimensional Assessment of Fatigue scale.* ***Results:*** *there has been a statistically significant distinction among pre and post-test regarding Katz Index of Independence in Daily Living Activities, and a surprising statistically significant distinction among pre and post-test concerning fatigue degree among patient participant.* ***Recommendations:*** *A simple physical exercise program may be considered as a safe and effective clinical nursing modality in patients on Hemodialysis to decrease fatigue degree and enhance Daily Living Activities.*

Keywords: *Leg Exercise, Fatigue, Activities of Daily Living, and Hemodialysis*

Date of Submission: 09-05-2018 Date of acceptance: 24-05-2018

I. Introduction

Patients who acquired hemodialysis had limitations in a number of areas like energy, physical activities, and physical role boundaries and assumed a drastically lower physical functioning when compared with that of the general population.**(Chang, Cheng et al. 2010).** Humans with the chronic renal disease, either hemodialysis HD or peritoneal dialysis PD are suggested having high levels of fatigue regularly not able to interact in daily activities. Depending on the severity of fatigue, sometimes patients can't carry out their activities of daily living as; ingesting, bathing, dressing, toileting, transferring (walking), and continence or can only do so to a lesser degree **(Bonner, Wellard et al. 2010)**.

Increasing activity degrees is a promising solution to fight muscle wastage and related decreased physical function in HD patients.(Parker 2016) research suggests that patients on hemodialysis in Europe, Asia, and the center East felt the most fatigue right now after hemodialysis, have been not capable of performing everyday activities, and experienced position boundaries and a lower in strength and bodily potential because of their fatigue **(Heiwe, Clyne et al. 2003). (Kazemi, Nasrabadi et al. 2011).** certainly, fatigue influences the lives of patients on hemodialysis worldwide.**(Horigan and Barroso 2016).**

Fatigue represented as weak spot, loss of power and feeling of exhaustion. Fatigue influences not only daily life but also disturbed daily self-care activities, emotional status **(Checheriţă, Turcu et al. 2010)** Demonstrating Intradialytic exercise will improve the effectiveness of dialysis and remove lengthy-time period complications.**(Soliman,2015).** Being concerned for sufferers with CKD and ESRD demanding challenges of all healthcare personnel. Whereas patients in the hospital need nurses to demonstrate knowledge of the renal disease and renal pathology, and expertise in the identification and management of fatigue that usually impacts patients' quality of life. Apparently several studies show that most of the patients on dialysis suffer from fatigue.**(Jablonski 2007) .**

Identification of fatigue by HD nurses may be difficult because the restoration of this situation fairly varies amongst patients. Furthermore, the majority of HD patients complain of "nonspecific signs" that are assessed through health care workers as "irrelevant" to fatigue. Therefore, the diagnosis of fatigue is critical so one can acquire early detection and treatment**(Lindsay, Heidenheim et al. 2006) and(Sakkas and Karatzaferi 2012).**

Additionally, aerobic staying power exercise training in patients with ESRD has been shown to enhance physical functioning **(Kopple, Storer et al. 2005).** Notwithstanding those validated blessings, a structured physical exercise programme for patients with dialysis is not frequently completed on a routine basis. Even extra scarce is regular exercise training during hemodialysis. that is surprising, as this approach gives a supervised setting for the patients, is time to spare as patients will now not need to attend greater exercise periods and even improves dialysis efficacy **(Williams, Fassett et al. 2014) and (Capitanini, Lange et al. 2014)**.

Therefore, empirical statistics on short-term and long-term follow-up including adherence and scientific benefit are mandatory to implement this approach in routine clinical practice. The reason of performing this study was to evaluate the effectiveness of leg exercise throughout the dialysis session on the degree of fatigue, and daily living activities among hemodialysis sufferers.

II. Patients And Methods

Study design: A Quasi-experimental research design (pre posttest) turned into applied in this study.
Study setting: This study has been carried out in the dialysis unit at Aswan University Hospital during the period of July to December 2017.

Study sample: A convenience sample of 100 adult patient undergoing hemodialysis at least from six months have been included in this study with fulfilled the inclusion criteria: Both men and women with age ranged between 18 to 65 year, regularly performing hemodialysis sessions for three times a week, free from associated diseases.

Tools for data collection:
Three tools have been utilized for data collection
Tool I: Socio-demographic and medical data:
This tool has been developed with the aid of the nursing researcher. It has been composed of parts consisting of **Part one:** the socio-demographic and medical data of the sufferers as patient's: age, gender , marital status, educational level, occupational status, income/ month, family numbers, housing condition, years of performing dialysis, height, weight, dry weight, body mass index**, etc….** These data were acquired via interviewing the patients and from the medical files **.Part two:** It included laboratory investigations as Hemoglobin level, serum creatinine, and urea.

Tool II: Katz Index of Independence in Daily Living Activities it was developed by (Katz 1983).

It includes a six-item scale: dressing, bathing, toileting, transfer, continence, and feeding. The scale dimensions rank subjects in line with carrying out each item and give a total score corresponding to universal overall performance. Interpretation has been for each item as follows: 1 – performs the activity without any help or assistance (independent); 0.5 – performs the activity with partial assistance or help (partially dependent); 0 – needs full help to perform the activity (dependent). the total score varies from zero to 6, with six being the most independent. Subjects were categorized into three levels of dependency: independent (≥ six points), partially dependent (three-five points) and dependent (≤ two points). patients are provided with the tool and it is scored as sure or no in finding the independence degree in six regions of functioning Scoring stages from six which shows a complete functioning, four shows moderate impairmentand two or less indicating severe functional impairment.

Tool III: Multidimensional Assessment of Fatigue scale, it was created by **(Belza 1995).** This scale is a sixteen item scale that measures fatigue level according to 4 dimensions: degree and severity, distress that it causes, timing of fatigue (over the past week, when it occurred and any changes), and its impact on every day living (household chores, cooking, washing, dressing, working, socializing, sexual activity, relaxation and recreation, shopping, walking, and exercising). There are sixteen items. The items are utilized to calculate scores for each of the 4 dimensions listed above and fifteen of the sixteen items are used to calculate the global fatigue index.

Scoring system of Global Fatigue Index (GFI):

Numerical score scale (one - ten) for items 1, and four - fourteen (1 = not at all, 10 = a great deal), item 2 (1 = mild to 10 = severe), item 3 (1 = no distress, 10 = a great deal of distress). Categorical responses (one - four) for Timing items fifteen and sixteen. Method of scoring: To calculate the Global Fatigue Index (GFI), convert item fifteen to a zero - ten scale by multiplying each score by 2.5 and then sum items one, two, and three, and average four - fourteen, and newly scored item fifteen. Do not assign a score to items four - fourteen if the respondent gave a response of "do not do any activity for reasons other than fatigue." If a respondent selects "no fatigue" on item 1, assign a zero to items two - sixteen. Item sixteen is not included in the GFI. Scores Interpretation: A higher score indicates severe fatigue, fatigue distress, or impact on daily living activities. The reliability of tools was determined by test and retest method. Scores range from one (no fatigue) to fifty (severe fatigue). Scores are not assigned to items four - fourteen if the respondents select "no fatigue" on item 1, then zero is the score assigned to items two - sixteen.

Exercise program

The program became explained in details for each patient. The leg exercise program concerned the subsequent: warm up (extension, flexion, internal and external, rotation (for the hip, knee, and ankle). biking on the cycle ergometer and cooling down (stretching). The total length of exercise program was forty minutes divided into five minutes before the session of hemodialysis and thirty-five minutes during the of a hemodialysis session. Warm-up (approximately five minutes) – free active exercises of the lower extremities in the supine position. (Ten minutes to half-hour) foot pedal exercise of increasing duration beginning with fifteen minutes in the first week, twenty minutes in the second week, and thirty minutes the following and subsequent weeks in a semi-supine position. Cool-down (approximately five minutes) – free active exercises of the lower extremities in the supine position associated with breathing exercises.

The intervention changed the application of resistance exercise during hemodialysis sessions, three times weekly for duration of three months. All contributors underwent an individualized tri-weekly pedal exercise program for three months during the dialysis session. Participants exercise was scheduled within the first 2 hours of dialysis session in order to encourage motivation and prevent decrease blood pressure. Duration of the training was gradually prolonged, from five-seven minutes initially to thirty - four minutes. Training of intensity was also gradually increased, however, not earlier than the full-time duration of the training session was achieved. At the onset of the exercise program, the following variables were analyzed: creatinine level, and hemoglobin level, as well as daily living activity, and Multidimensional Fatigue Assessment. It was supposed that the exercises program must terminate during the training session in the following cases: inability to maintain the recommended rate of pedaling; occurrence of retrosternal muscle, articular pain; increase of respiration rate above forty per minute; occurrence of nausea, dizziness, muscle cramps; or patient's request (malaise, fatigue).

All participants were verbally encouraged at the onset of dialysis session regarding their exercise program. The program was developed under a supervisor and the advice of physician and nurses from the faculty of nursing and the dialysis unit, and all of them were assisted in the evaluation of physical functioning and in developing the exercises. The effectiveness the exercise program was carried out post three months. At the end of the exercise program, the following variables were analyzed: creatinine level, and hemoglobin level, the activity of daily living, as well as Multidimensional Fatigue Assessment.

III. Method

Administrative approval: An official permission to perform the study was acquired from responsible authorities at College of Nursing at Aswan University. Then, the permission was obtained from the hospital administrative authority.

The first tool (Socio-demographic and medical data) has been designed by the researcher after an intensive review of the relevant literature. The tool has been tested for content validity by five professional experts of academic medical and nursing staff at Aswan University. The tool was tested for reliability by using internal consistency for the tools measured by the usage of Cronbach test, the tools proved to be reliable (0.73).

Ethical consideration: An oral permission for voluntary participation was obtained from patients and the nature and purpose of the study were explained. The researcher initially introduced himself to all patients and they were assured that the collected information would be absolutely confidential. Patients were informed of voluntary participation and that withdrawal at any time of the study can occur as they want. Confidentiality of the patient's information changed into ascertained. Patient's names have been coded for data entry so that their names could not be recognized.

Pilot study: A pilot study was conducted on ten percent of the sample (ten patients) in a selected setting to evaluate the applicability & clarity of the tools. According to this pilot study, the suggested modifications have been performed.

Table (1): Illustrated that; more than one-third of patients their ages ranged from 40-50yrs, the mean age was (44.93±10.65), more than half of them were females (53%), and (52%) of them lived in rural areas. As regard to marital status, more than two-thirds of patients (71%) were married. Also, more than fifty percent of sufferers were illiterate (can't read and write). As regarding occupation, more than one-third of patients were housewives while only (18%) of the patients were working and their income was insufficient.
Table (2): Illustrated that; the majority of patients (89%) suffered from leg cramps especially at the calf muscle. All of them (100%) didn't perform any type of exercise at home or practice any type of exercise to reduce muscle cramps while undergoing hemodialysis. Also, more than half of them didn't take vitamin calcium tablets.
Table (3): showed that; there was a statistically significant difference between pre and post-test regarding Katz Index of Independence in Daily Living Activities.

Table (4): The table revealed an obvious statistically significant distinction among pre and post-test regarding Katz Index of Independence in of everyday Living Activities.
Table (5): The table showed a highly statistically significant distinction among pre and post-test regarding fatigue degree among patient participant.
Table (6): The table illustrated that there was a statistically significant difference between pre and post-test concerning sociodemographic data and Katz Index of Independence in every Day Living Activities in the educational level and the occupational status. On the same time, there was a surprisingly statistically significant distinction concerning age, gender, and the financial income.

Table 1: Frequency distribution of socio-demographic characteristics of patients Subjected to Hemodialysis:

Variables	N (100)	%
Age group		
18-28yrs	9	9.0
29-39yrs	19	19.0
40-50yrs	41	41.0
more than 50 yrs	31	31.0
Mean ±SD	**44.93±10.65**	
Sex		
Male	47	47.0
Female	53	53.0
Residence		
Rural	52	52.0
Urban	48	48.0
Marital status		
Married	71	71.0
Single	19	19.0
Divorced	1	1.0
Widow	9	9.0
Level of education		
Illiterate	56	56.0
read and write	17	17.0
primary school/ secondary school	20	20.0
Collage	7	7.0
Occupation		
Worker	18	18.0
Employment	6	6.0
Housewife	46	46.0
Farmer	10	10.0
not working	20	20.0
Occupational Status		
full time	20	20.0
part time	14	14.0
Non	66	66.0
Income		
Insufficient	87	87.0
Sufficient	13	13.0
Total	**100**	**100%**

Table (2): Frequency distribution of study sample related to leg exercises among participant n=100:

Variables	N	%
Cramps		
No	11	11.0
Yes	89	89.0
In which part of the leg often do you get cramps?		
calf muscle	85	85.0
Thigh	4	4.0
Non	11	11.0
Do you perform any type of exercise at home?		
Yes	0	0
No	100	100
If yes; perform exercise----------		
Regularly		
Irregularly		
Stooped due to illness		
Do you practice any of exercise to reduce muscle cramps while undergoing hemodialysis?		
Yes	0	0
No	100	100
Are you taking tablet calcium?		
No	51	51.0
Yes	49	49.0
Total	**100**	**100**

Table (3): Frequency distribution of study sample for Katz Index of Independence in Activities of Daily Living (ADL) among participant n=100:

Variable	Pre		Post		p.value
	N	%	N	%	
Bathing					
needs help for bath more than one part	27	27	20	20	
bath self or need help for one part	73	73	80	80	
Dressing					
need help with dressing	17	17	11	11	
get clothes self	83	83	89	89	
Toileting					
need help	5	5	2	2	
toileting self without help	95	95	98	98	
Transferring					.053*
need help	28	28	27	27	
not need help on transferring	72	72	73	73	
Continence					
partially or completely incontinence	3	3	2	2	
complete self-control	97	97	98	98	
Feeding					
need partial or total help	3	3	2	2	
no need for help during feeding	97	97	98	98	
Total	**100**	**100**	**100**	**100**	

*=Significant difference, *p≤0.05 **= highly significance, **p≤0.01 Ns= Non significant

Table (4): Comparison between pre and post-test regarding total score of Katz Index of Independence in Activities of Daily Living (ADL) among participant n=100:

Variable	Pre		Post		p.value
	N	%	N	%	
Complete independent function					
% of Total	66	66	80	80	
moderate impairment function					
% of Total	25	25	17	17	
Indicating severe functional impairment.					**.053***
% of Total	9	9	3	3	
Total	**100**	**100**	**100**	**100**	

Use Pearson chi-square (cross tabs test).
*=Significant difference, *p≤0.05 **= highly significance, **p≤0.01 Ns= Non significant

Table (5): Comparison of fatigue level between pre and posttest among patient participant n=100:

Level of fatigue	Study group n = 100						P v.
	Mild		Moderate		Severe		
	N	%	N	%	N	%	
Pretest	0	0.0%	17	17%	83	83%	**.0001****
Posttest	41	41%	28	28%	31	31%	

*=Significant difference, *p≤0.05 **= highly significance, **p≤0.01 Ns= Non significant

Table (6): Relation between pre and post-test regarding sociodemographic characteristics and Katz Index of Independence in Activities of Daily Living (ADL) among participant n=100:

Variables	Pre						Post						p. v
	Complete function		moderate impairment		Sever impairment		Complete function		moderate impairment		Sever impairment		
	N	%	N	%	N	%	N	%	N	%	N	%	
Age group													
18-28yrs	8	8.0	1	1.0	0	0.0	8	8.0	1	1.0	0	0.0	
29-39yrs	16	16.0	3	3.0	0	0.0	19	19.0	0	0.0	0	0.0	
40-50yrs	28	28.0	11	11.0	2	2.0	33	33.0	7	7.0	1	1.0	**.001****
more than 50 yrs	14	14.0	10	10.0	7	7.0	20	20.0	9	9.0	2	2.0	
Sex													
Male	36	36.0	10	10.0	1	1.0	42	42.0	5	5.0	0	0.0	**.003****
Female	30	30.0	15	15.0	8	8.0	38	38.0	12	12.0	3	3.0	
Level of education													
Illiterate	32	32.0	16	16.0	8	8.0	40	40.0	13	13.0	3	3.0	
read and write	12	12.0	4	4.0	1	1.0	15	15.0	2	2.0	0	0.0	
primary / secondary	16	16.0	4	4.0	0	0.0	18	18.0	2	2.0	0	0.0	**.02***

school													
Collage	6	6.0	1	1.0	0	0.0	7	7.0	0	0.0	0	0.0	
Occupation													
Worker	18	18.0	0	0.0	0	0.0	18	18.0	0	0.0	0	0.0	
employment	4	4.0	2	2.0	0	0.0	5	5.0	1	1.0	0	0.0	
house wife	24	24.0	14	14.0	8	8.0	31	31.0	12	12.0	3	3.0	**.010***
Farmer	5	5.0	5	5.0	0	0.0	7	7.0	3	3.0	0	0.0	
Not working	15	15.0	4	4.0	1	1.0	19	19.0	1	1.0	0	0.0	
Occupational Status													
full time	17	17.3	3	3.0	0	0.0	19	19.0	1	1.0	0	0.0	**.03***
part time	11	11.0	3	3.0	0	0.0	12	12.0	2	2.0	0	0.0	
Non	38	38.0	19	19.0	9	9.0	49	49.0	14	14.0	3	3.0	
Income													
Insufficient	57	57.0	21	21.0	9	9.0	67	67.0	17	17.0	3	3.0	**.001****
Sufficient	9	9.0	4	4.0	0	0.0	13	13.0	0	0.0	0	0.0	

*=Significant difference, *p≤0.05 **= highly significance, **p≤0.01 Ns= Non significant

IV. Discussion

Fatigue is documented as a terrible symptom experienced by a big wide variety of patients with end-stage renal disease undergoing hemodialysis. Fatigue is a problematic symptom, and the results of fatigue may be overwhelming **(Liu 2006).** Dialysis software influences patients' disability, activities of each day living and self-efficacy stages **(Mollaoglu 2011)**.

This study represented that the majority of patients suffered from leg cramps specifically at the calf muscle. All of them didn't carry out any form of exercise at home or exercise any type of exercise to reduce muscle cramps while undergoing hemodialysis. Some of our hospitals do not have a leg-training protocol during the dialysis session. This finding in contrast with **(Mokabel 2000)** who mentioned that the hemodialysis patients donning daily living activities better than patient used other methods of dialysis. **(Soliman 2015)** concluded that, a simplified physical exercise program can be considered as a cozy and effective scientific nursing modality in patients with end-stage renal disease on hemodialysis.

The end result of the prevailing study clarifies a statistically significant distinction among pre and post-test regarding Katz Index of Independence in Activities of Daily Living. A large and increasing variety of research showed the benefit of exercise during dialysis and indicated the improvement in those patients **(Bayoumi and Al Wakeel 2015, Seong 2015).**

In our study, there was a significant change in fatigue degree post leg exercise program. Accordingly, findings of the study with the aid of **(Soliman 2015)** discovered the effectiveness of an Intradialytic range of motion intervention program on hemodialysis patients, on decreasing fatigue. Fatigue is supposed as the most common and the most severe symptom ever pronounced by patients with chronic kidney disease. Intradialytic exercises being cost-efficient, relevant easy, applicable, and flexible for alleviating the fatigue in patients on hemodialysis.

(Motedayen, Nehrir et al. 2014) Concluded in their study that the positive effects of exercise, regarding performance time and method, on the improvement of the quality of life, reduction of cardiovascular complications, mortality rate, depression, sleep, and fatigue has been documented clearly. In the study by **(Monera EL Shemy 2016)** who reported that exercise-induced an overall diminution of physical and psychological imprudent including the "will to live", leading to positive expectations about the return to a productive life.

(Lee, Chang et al. 2014) suggest that we can design exercise programs or set simple exercise equipment's for uremia patients to enhance physical energy to enhance the sense of fatigue and well-being. In view of this study's results, it is recommended to organize education programs to increase self-efficacy levels of dialysis patients and prepare complete plans including patients' families. The consequences of study by **(Lekha 2016)** which about intradialytic stretching exercises on prevention and reduction of muscle cramps among

patients undergoing hemodialysis discovered that high statistical significant improvements were noted in the pre and post interventions on muscle cramps.

(Brenner 2009) mentioned that Intradialytic exercise programs which include aerobic and resistance exercise that promote exercise adherence and should be encouraged on dialysis units.**(Subish Jose 2014)** Physical exercises provided during hemodialysis do not cost patients extra time and will be powerful in lowering t the level of fatigue and increasing the ability to perform the daily activities. Presenting these exercises with dialysis will enhance the effectiveness of dialysis and decrease long-term complications. **(Chang, Cheng et al. 2010, Chen, Godfrey et al. 2010**), felt a sturdy need to undertake a study on the effectiveness of intradialytic leg exercise on the degree of fatigue and daily activities among patients undergoing hemodialysis. **(Bahgat, Bahgat et al. 2016)** Concluded in their study that a significant negative correlation was found between degree of fatigue and daily activities which means that when the fatigue increases the daily living activities decreases and when the fatigue decreases the daily living activities increases.

Our study revealed that there has been a statistically significant difference between pre and post-test related to sociodemographic data and Katz Index of Independence in Daily Living activities in the level of education and status of occupation. While there was a highly statistically significant difference regarding age group, sex, and the economic income. The study results by **(Mollaoglu 2011)** exhibit that there is a positive correlation between self-care ability and age, educational level, marital status and additional health problems, factors like patient's age, sex, educational level, work status, income level, social insurance status and frequency of hemodialysis procedure specify self-efficacy. A physical exercise program needs to be planned at optimal volume and intensity and be based on the patient's age and comorbidities.

V. Conclusion And Recommendations

The majority of hemodialysis patients suffered from cramps in their leg, especially inside the calf muscle and all of them didn't carry out any sort of physical exercise at home or perform any type of exercise to reduce muscle cramps during hemodialysis sessions. There has been a statistically significant distinction among pre and post-test concerning Katz Index of Independence in daily activities and it was found that a highly statistically significant distinction among pre and post-test related to fatigue degree among participants who performing hemodialysis. A simplified bodily exercise program can be taken into consideration as a safe and effective medical nursing modality in patients with end-stage renal disease on hemodialysis to decrease fatigue degree and enhance the patient's daily activities.

References

[1]. Bahgat, Z. F., R. S. Bahgat and H. M. El-azazy (2016). "The effect of fatigue on daily living activities for adults undergoing hemodialysis." IOSR Journal of Nursing and Health Science 5(3): 82-89.

[2]. Bayoumi, M. M. and J. S. Al Wakeel (2015). "Impacts of Exercise programs on Hemodialysis Patients' Quality of Life and Physical Fitness." Quality in Primary Care 23(4).

[3]. Belza, B. (1995). "Comparison of self-reported fatigue in rheumatoid arthritis and controls." The Journal of Rheumatology 22(4): 639-643.

[4]. Bonner, A., S. Wellard and M. Caltabiano (2010). "The impact of fatigue on daily activity in people with chronic kidney disease." Journal of clinical nursing 19(21-22): 3006-3015.

[5]. Brenner, I. (2009). "Exercise performance by hemodialysis patients: a review of the literature." The Physician and sports medicine 37(4): 84-96.

[6]. Capitanini, A., S. Lange, C. D'Alessandro, E. Salotti, A. Tavolaro, M. E. Baronti, D. Giannese and A. Cupisti (2014). "Dialysis exercise team: the way to sustain exercise programs in hemodialysis patients." Kidney and Blood Pressure Research 39(2-3): 129-133.

[7]. Chang, Y., S.-Y. Cheng, M. Lin, F.-Y. Gau and Y.-F. C. Chao (2010). "The effectiveness of intradialytic leg ergometry exercise for improving sedentary lifestyle and fatigue among patients with chronic kidney disease: a randomized clinical trial." International journal of nursing studies 47(11): 1383-1388.

[8]. Checheriță, I., F. Turcu, R. Dragomirescu and A. Ciocâlteu (2010). "Chronic complications in hemodialysis: correlations with primary renal disease." Rom J Morphol Embryol 51(1): 21-26.

[9]. Chen, J. L., S. Godfrey, T. T. Ng, R. Moorthi, O. Liangos, R. Ruthazer, B. L. Jaber, A. S. Levey and C. Castaneda-Sceppa (2010). "Effect of intra-dialytic, low-intensity strength training on functional capacity in adult hemodialysis patients: a randomized pilot trial." Nephrology Dialysis Transplantation 25(6): 1936-1943.

[10]. Heiwe, S., N. Clyne and M. A. Dahlgren (2003). "Living with chronic renal failure: patients' experiences of their physical and functional capacity." Physiotherapy Research International 8(4): 167-177.

[11]. Horigan, A. E. and J. V. Barroso (2016). "A comparison of temporal patterns of fatigue in patients on hemodialysis." Nephrology nursing journal: journal of the American Nephrology Nurses' Association 43(2): 129.

[12]. Jablonski, A. (2007). "The multidimensional characteristics of symptoms reported by patients on hemodialysis." Nephrology Nursing Journal 34(1): 29.

[13]. Katz, S. (1983). "Assessing self-maintenance: activities of daily living, mobility, and instrumental activities of daily living." Journal of the American Geriatrics Society 31(12): 721-727.

[14]. Kazemi, M., A. N. Nasrabadi, M. Hasanpour, H. Hassankhani and J. Mills (2011). "Experience of Iranian persons receiving hemodialysis: A descriptive, exploratory study." Nursing & health sciences 13(1): 88-93.

[15]. Kopple, J. D., T. Storer and R. Casburi (2005). "Impaired exercise capacity and exercise training in maintenance hemodialysis patients." Journal of renal nutrition 15(1): 44-48.

[16]. Lee, T., C. Chang, M. Li, T. Chen, and Y. Liu (2014). "Factors associated with the activities of daily living, fatigue, and well-being of hemodialysis patients." International Journal of Evidence-Based Healthcare 12(3): 190-191.
[17]. Lekha, J. (2016). The effectiveness of intradialytic stretching exercises on prevention and reduction of muscle cramps among patients undergoing hemodialysis at PSG hospitals Coimbatore, PSG College of Nursing, Coimbatore, Tamil Nadu, India.
[18]. Lindsay, R. M., P. A. Heidenheim, G. Nesrallah, A. X. Garg, R. Suri and D. H. S. G. L. H. S. Centre (2006). "Minutes to recovery after a hemodialysis session: a simple health-related quality of life question that is reliable, valid, and sensitive to change." Clinical Journal of the American Society of Nephrology 1(5): 952-959.
[19]. Liu, H. (2006). "Fatigue and associated factors in hemodialysis patients in Taiwan." Research in nursing & health 29(1): 40-50.
[20]. Mokabel, F. (2000). The quality of life of women with end-stage renal disease in Egypt. Published in the 7th international scientific conference toward the advancement of the nursing profession in the third millennium.
[21]. Mollaoglu, M. (2011). "Disability, activities of daily living and self-efficacy in dialysis patients." TAF Preventive Medicine Bulletin 10(2): 181-186.
[22]. Monera EL Shemy, E. A. E., RadwaELkually (2016). "Efficacy Of Exercise Program In IntraHemodialysisOnpatients'Quality Of Life." IOSR Journal of Nursing and Health Science (IOSR-JNHS) Volume 5, Issue 1 Ver. IV
[23]. Motedayen, Z., B. Nehrir, A. Tayebi, A. Ebadi and B. Einollahi (2014). "The effect of the physical and mental exercises during hemodialysis on fatigue: a controlled clinical trial." Nephro-urology monthly 6(4).
[24]. Parker, K. (2016). "Intradialytic exercise is medicine for hemodialysis patients." Current sports medicine reports 15(4): 269-275.
[25]. Sakkas, G. K. and C. Karatzaferi (2012). "Hemodialysis fatigue: just "simple" fatigue or a syndrome in its own right?" Frontiers in physiology 3.
[26]. Seong, E. Y. (2015). "Acute intradialytic exercise and oxidative stress in hemodialysis patients." Kidney research and clinical practice 34(1): 1.
[27]. Soliman, H. M. M. (2015). "Effect of intradialytic exercise on fatigue, electrolytes level and blood pressure in hemodialysis patients: A randomized controlled trial." Journal of Nursing Education and Practice 5(11): 16.
[28]. Subish Jose, B. D., 3Eilean Victoria (2014). "EFFECTIVENESS OF INTRADIALYTIC LEG EXERCISE (ILE) ON FATIGUE AND ACTIVITIES OF DAILY LIVING AMONG PATIENTS SUBJECTED TO HEMODIALYSIS." Subish Jose et al. / Journal of Science / Vol 4 / Issue 1 / 1 3-1 8.
[29]. Williams, A. D., R. G. Fassett and J. S. Coombes (2014). "Exercise in CKD: Why is it important and how should it be delivered?" American Journal of Kidney Diseases 64(3): 329-331.

Mona Mohamed Ibrahim. "Leg Exercise: Effect on Reducing Fatigue and Improving Activities of Daily Living For Hemodialysis Patients." IOSR Journal of Nursing and Health Science (IOSR-JNHS) , vol. 7, no.3 , 2018, pp. 11-19.