Effects of Improving Physical Activity Level on Quality of Life and Functional Status of Patients Receiving Peritoneal Dialysis

Periton Diyaliz Hastalarında Fiziksel Aktivite Düzeyindeki Artışın Yaşam Kalitesi ve Fonksiyonel Duruma Etkileri

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ABSTRACT

OBJECTIVE: The aim of this study was to determine whether patients receiving peritoneal dialysis (PD) experience an improvement in physical activity, quality of life and functional status as a result of exercise training at home by motivation about benefits of exercising.

MATERIAL and METHODS: Twenty-one PD patients of 46.7±14.1 years participated in the study. Participants were encouraged by a physiotherapist to walk for 30 minutes, 3 days a week and motivated by explaining benefits of exercising. We assessed quality of life by Kidney Disease Quality of Life Questionnaire-Turkish Version (KDQOL-SF), functional status by Six Minute Walk Test (SMW), physical activity level by International Physical Activity Questionnaire – Long Form (IPAQ-LF). The antropometric measurements were performed with the bioelectrical impedance. Assessments were done at the beginning and 3 months later.

RESULTS: Total physical activity score of IPAQ-LF increased significantly 3 months later ($p<0.05$). There were no significant differences in walking, moderate-intensity, vigorous intensity and sitting subscores of IPAQ-LF, SMW distance and anthropometric measurements ($p>0.05$). Improvements in pain and emotional score of KDQOL-SF were statistically significant ($p<0.05$).

CONCLUSION: Regular exercise should be allocated in the PD standard care. Participation of the patient into such a program could be possible by explaining the benefits of exercising at the beginning of the treatment.

KEY WORDS: Peritoneal dialysis, Physical activity, Quality of life, Functional status

ÖZ

AMAÇ: Bu çalışmanın amacı, periton diyaliz hastalarının, egzersizin yararlarıyla ilgili motive edilip evde egzersiz yapmalarının fiziksel aktivite düzeylerini, yaşam kalitesi ve fonksiyonel durumlarını geliştirip geliştirmediğini belirlemektir.

GEREÇ ve YÖNTEMLER: Çalışmaya yaş ortalaması 46.7±14.1 olan 21 periton diyaliz hastası katılmıştır. Katılımcılar bir fizyoterapist tarafından haftanın 3 günü 30 dakika yürüyüş için cesaretlendirilmiş ve onlara egzersizin yararları açıklanmıştır. Yaşam kalitesi Kidney Disease Quality of Life Questionnaire-Türkçe versiyon (KDQOL-SF) ile, fonksiyonel durumları 6 Dakika Yürüme Testi (SMW) ile, fiziksel aktivite düzeyleri International Physical Activity Questionnaire – Long Form (IPAQ-LF) Türkçe versiyon ile değerlendirilmiştir. Antropometrik ölçümler biyoelektriksel empedans ile yapılmıştır. Tüm değerlendirmeler başlangıçta ve 3 ay sonra tekrarlanmıştır.

BULGULAR: IPAQ-LF total fiziksel aktivite puanı 3 ay sonunda anlamlı şekilde artmıştır ($p<0.05$). IPAQ-LF yürüme, orta şiddet, yüksek şiddet ve oturma alt puanlarında, SMW mesafesinde ve antropometrik ölçümlerde belirgin fark bulunmamıştır ($p>0.05$). KDQOL-SF'nin ağrı ve emosyonel puanlarındaki gelişmeler istatistiksel olarak anlamlıdır ($p<0.05$).

SONUÇ: Düzenli egzersiz, periton diyaliz standart tedavisinde yer almalıdır. Hastanın böyle bir programa katılımı, tedavi başlangıcında egzersizin yararlarının açıklanmasıyla mümkün olabilir.

ANAHTAR SÖZCÜKLER: Periton diyaliz, Fiziksel aktivite, Yaşam kalitesi, Fonksiyonel durum

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INTRODUCTION

Chronic renal failure (CRF) patients present not only progressive and irreversible loss of renal function but also a complex syndrome with various effect on musculoskeletal, respiratory, cardiovascular, nervous, immune, endocrine and metabolic systems (1). It has been well recognized that most CRF patients are in poor general health and physical activity and shows signs of malnutrition. A decline in physical activity begins in early stages of the disease and progress is mainly due to the loss of strength caused by renal anemia and skeletal muscle dysfunction (2). Inactivity is a common cause of muscle atrophy and could be contributing factor to the muscle abnormalities and reduce functional status of the dialysis population. In addition to musculoskeletal system, respiratory system being specifically the most impaired system according to the some authors (3, 4, 5, 6).

Dialysis patients typically tend to lead a sedentary life. Studies on physical activity levels of people with CRF have extensively examined both hemodialysis (HD) and peritoneal dialysis (PD) patients. These studies showed that, in comparison with healthy subjects, the level of physical activity in HD and PD patients have decreased. The literature on HD studies also conclude that inter and intra dialitic exercises increase the effectiveness of the treatment. Although there remains a need for studies that specifically assess the balance of risks and benefits of exercise training, there have been no reports of injury as a result of participation in physical activity programs. Whenever possible, it is recommended that dialysis units develop an in-center physical activity program (7). Availability of a center means that patient do not have to plan extra time for physical activity. Exercise training during dialysis reduces the deconditioning effects of forced inactivity during HD session (8).

However, it is not the case for PD patients who perform treatment by themselves at home. Control of physical activity performance in PD patients is not easy as HD patients treated in dialysis centers. These patients usually carry on their physical activity trainings by themselves without any professional support. Not being sure how to perform the exercises by a dialysis patient can make the patient hesitate about the contributions of the exercises. Kontos and colleagues report that talking about physiological and psychological benefits of exercise increases the motivation of HD patient to perform physical activity (9). In the literature, there is no study about long-term clinical results of peritoneal dialysis patients motivated by professional recommendations about exercising.

The primary aim of this investigation was to determine whether CRF patients who are receiving PD treatment experience an improvement in physical activity, health related quality of life and functional status as a result of exercise training at home by motivation about benefits of exercising in long-term follow-up.

MATERIAL and METHODS

Material

Patients with CRF receiving peritoneal dialysis (PD) were recruited from Gazi University Faculty of Medicine, Department of Internal Medicine, Division of Nephrology. Patients had to be on PD for a minimum of 6 months, over the age of 18, and willing to sign an informed consent form approved by Gazi University Research Ethics Committee prior to their inclusion in the study. Subjects with significant cardiovascular, neurologic, and/or orthopedic complications, as determined by the attending nephrologists, were excluded from the study.

Twenty-one PD patients with mean age 46.7±14.1 years (minimum 21 years, maximum 70 years) were taken to the study. Fourteen (66.6%) of patients were male and seven (33.3%) of them were female.

Subjects were encouraged by physiotherapist in terms of daily physical activity. Also, patient education about disease, health and positive effects of exercise as well as diet recommendations were made in outpatient clinic.

We suggested 30 minutes walk for 3 days a week to patients to improve their physical activity levels. The greatest problem was the patients' resistance to exercise at home. Basic information about the benefits of improving physical activity level was the crucial part of our recommendations. We motivated them by explaining that exercises have the potential to reduce cardiovascular mortality, the leading cause of death among CRF patients.

Dieticians determined each participant's food intake with 24-hour records. They estimated the volume and portion size picture booklet, which included 120 photographs of food, each with 3-5 different portion sizes. Nutrition education is considered to be an important tool in providing knowledge about the contents of a healthy diet and encouraging behavior change. Therefore, dietitians gave an education to patients how to improve their nutritional status.

All subjects underwent an assessment at the beginning and after a period of 3 months.

Outcome Measures

Demographic characteristics (age and gender) were recorded.

Anthropometric Measurements

Height was measured to the nearest 0.1 cm, and weight to nearest 0.5 kg in light clothing and without shoes. BMI was calculated as weight (kg)/ height (m^2). All anthropometric measurements were taken by experienced dieticians. Patients were classified according to their BMI into 3 groups as underweight (BMI<18.5 kg/m^2), normal weight (BMI: 18.5-24.9 kg/m^2) and over weight (BMI>25.0 kg/m^2) (10). The amount and distribution of body fat, fat free mass and total, extracellular, and intracellular

water content were assessed by measuring the bioelectrical impedance analysis (BIA) by Quadscan 4000 multi-frequency bioimpedance spectrum analyzer (BodyStat, Douglas, Isle of Man) (11, 12). The measurement was performed at the right calf using 4 frequencies (5, 50, 100, and 200 kHz) in the supine position after patients had emptied their abdomen (13).

International Physical Activity Questionnaire – Long Form. Physical activity level was evaluated by using International Physical Activity Questionnaire – Long Form[a] (IPAQ-LF). The IPAQ-LF is a reliable and validated instrument used to estimate levels of vigorous activity, moderate activity, walking, and time sitting during the past 7 days. It's a patient-reported questionnaire and includes questions assessing the time spent on different intensities of physical activity. Walking, Moderate-Intensity, Vigorous-Intensity and total physical activity scores are expressed as MET- minutes per week (MET- min/week) and sitting score as hour per week (hour/week) (14).

Six Minute-Walk Test. Functional capacity was assessed with 6 minute-walk test (SMW). The SMW was performed using the methodology specified by the American Thoracic Society (ATS-2002)[b] in a hard surface, covered, long, flat and walled corridor which was 30 m long; meter-by-meter marks were done and two cones signaled the walk turn. Participants were instructed to walk as fast as possible without running during 6 minutes and the total distance was recorded in meters (15).

Kidney Disease Quality of Life Questionnaire-Turkish Version (KDQOL-T). KDQOL was developed from the 36- Item Short-Form Health Survey (SF-36) and assesses quality of life on 8 generics (physical function, role limitations due to social problems, bodily pain, general health, social function, role limitations due to physical problems, energy and fatigue, mental health) and 12 disease-specific subscales (effects of kidney disease, symptom list, work status, burden of kidney disease, cognitive function, sexual function, quality of life social interaction, sleep, social support, dialysis staff encouragement, overall health, patient satisfaction). Each subscale is scored out of 100, with higher score indicating greater perceived health (16).

Statistical Analysis

Individual changes in all parameters were analyzed by comparing values at baseline with 3 months later using Wilcoxon test by using SPSS version 15. Correlation between the changing amount of physical activity level and functional capacity, antrhopometrics and quality of life were analyzed by Spearman correlation coefficient test. Physical activity level, functional capacity, quality of life and anthropometric data are presented as median and interquartile range (IQR). Descriptive statistics were calculated and reported as mean and standard deviation. A significance level was setting p value of 0.05.

RESULTS

Three months after professional recommendations about exercising, a significant improvement in the total physical activity (IPAQ-LF) scores was found as it increased from averagely 596 to 990 MET-min/week ($p<0.05$) (Table I). Analysis of subscores of IPAQ (walking, moderate-intensity, vigorous intensity and sitting) showed no significance in the study group ($p>0.05$)

Table I: Comparison of pre- and post-treatment physical activity, functional capacity and anthropometrics scores ($p>0.05$).

	Pre	Post	p
IPAQ			
Walking (MET- min/week)	377±870	495±1955	0.262
Moderate (MET- min/week)	200±217	300	0.107
Vigorous (MET- min/week)	0	0	1
Total Physical Activity (MET- min/week)	596±1013	990±2615	0.047*
Sitting (hour/week)	7,80±7,48	7,35±5,25	0.477
Functional Capacity			
6-min walk distance (m)	562±139	566±152	0.37
Anthropometrics			
BMI (kg/m^2)	25.80±6	26.70±6.10	0.75
Percentage of fat (%)	21.00±14.35	21.70±9.50	0.411
Fat (kg)	16.20±9	16.00±7.80	0.348
FFM (kg)	55.40±21.55	55.90±19.65	0.159
TBW (kg)	40.90±15.70	41.00±14.40	0.154

Pre-: before treatment, **Post-:** after treatment, **IPAQ:** International Physical Activity Questionnaire, **BMI:** Body Mass Index, **FFM:** Fat Free Mass, **TBW:** Total Body Water, **MET:** Metabolic Equivalent of Task, **min:** minute. *p<0,05

(Table I). Furthermore, 6 minute-walk distance was found to be similar at end of three months (p>0.05) (Table I).

Pain scores (Figure 1) and emotional status scores (Figure 2) of KDQOL-SF were found to improve (p<0.05) while no significant differences were found in other quality of life subscores (p>0.05).

A comparison of pre and post-treatment body composition parameters has been presented in Table I. There were no significant differences in BMI, percentage of fat, fat free mass and total body weight (p>0.05).

The changes in the physical activity level of PD patients were not related significantly to functional capacity, anthropometrics and quality of life (p>0.05).

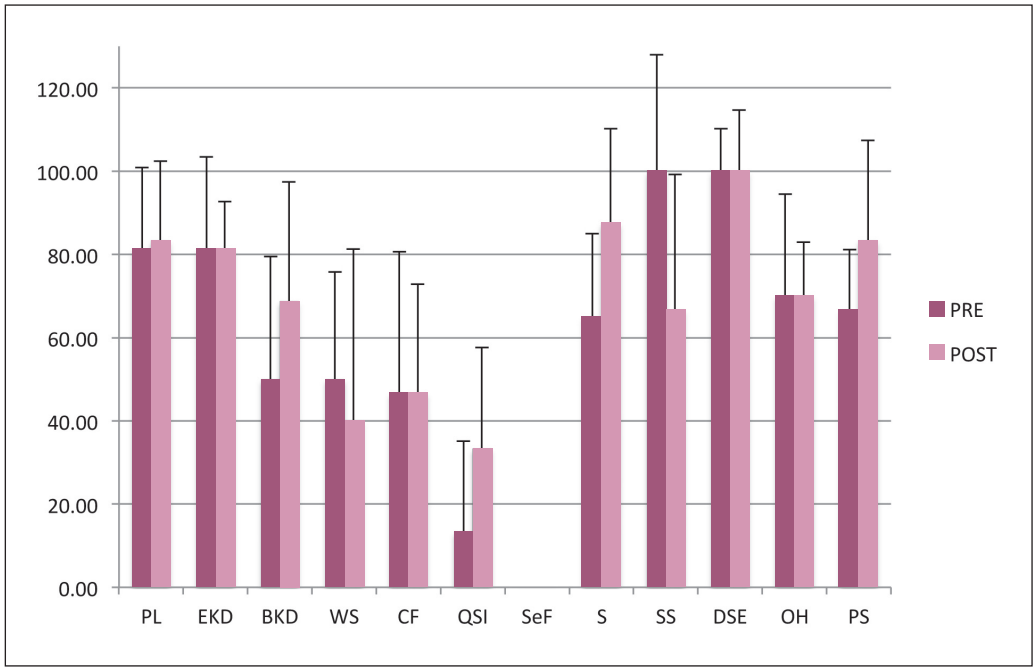

Figure 1: *Comparison of pre and post-treatment KDQoL-SF disease specific sub domain scores. (PL-problem list, EKD- effect of kidney disease, BKD-burden of kidney disease, WS-work status, CF-cognitive function, QSI-quality of social interaction, SeF- sexual function, S-sleep, SS-social support, DSE-dialysis staff encouragement, OH-overall health, PS-patient satisfaction)*

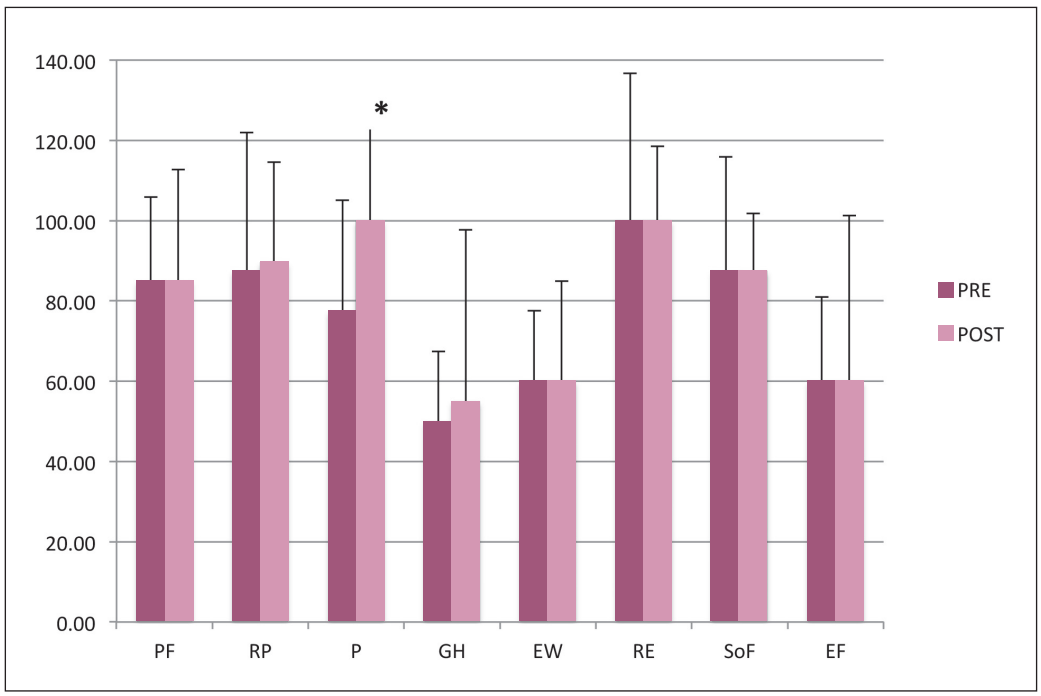

Figure 2: *Comparison of pre and post-treatment KDQoL-SF-36 specific sub domain scores. (PF-physical functioning, RF-dole physical, P-pain, GH-general health, EW-emotional wellbeing, RE-role emotional, SoF-social functioning, EF-energy fatigue) *p<0.05*

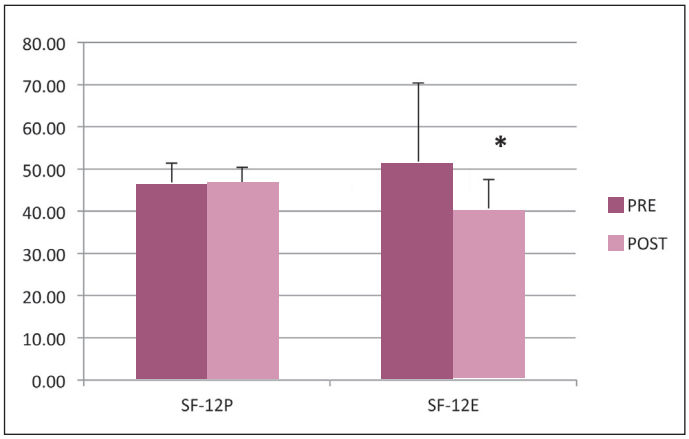

Figure 3: *Comparison of pre- and post-treatment KDQoL- SF12 physical (SF-12P) and SF12 emotional (SF-12E) score. *p<0.05*

CONCLUSION

In our study, we investigated the effects of education program planned to improve physical activity level in sedentary PD patients in 3 months follow up. The primary finding of this study was the significant increase in total physical activity level by motivating the patients with professional recommendations about benefits of physical activity. However, this increase in physical activity did not reflect in functional capacity, BMI and quality of life of the patients.

Regular physical activity can have many beneficial effects for dialysis patients just as far the general population. An excellent overview of what is known about exercise in the CRF population has recently been provided by the researchers (17). A large research literature demonstrates the benefits of physical activity on CRF population (18-25). Many of these outcomes are relevant for reducing cardiovascular mortality, the major cause of death among patients with CRF.

Whenever possible, it is recommended that dialysis units develop an in-center exercise program to improve physical activity level of CRF patients (8). Exercising during dialysis at the treatment center has advantages like availability of medical oversight, which may be reassuring for both patient and staff. Additionally, patients do not have to plan extra time for exercise and training during dialysis reduces the reconditioning effects of forced inactivity during dialysis sessions (16). Exercising during dialysis session under the supervision of health professionals is possible only for HD patients among CRF patients. For this reason, researchers can obtain reliable and current data during the HD sessions. Thus, the greater numbers of studies have been performed on HD patient population (17-23). However, it is not the case for peritoneal dialysis patients because of the difference in dialysis technique. Perhaps for this reason in the literature no studies have examined the effect of exercise training on PD patients.

Kontos and colleagues emphasized the importance of exercise in CRF patients in their study and stated that presence of regular exercise should be asked in the assessments (9). It should be recognized that regular physical activity, like medication and dialysis, is a part of dialysis treatment. Johanson notes that, 'it seems that almost any method of increasing activity in this population is likely to be beneficial' (16). In our study we recommended PD patients to walk for 30 minutes on 3 days a week to improve physical activity levels. The greatest obstacle was the resistance of patients to exercise at home. To break this resistance we take into account a sentence, a patient said in the study of Kontos et al. 'if the benefits of physical activity discussed, that would certainly motivated me'(9). Informing the patients about the benefits of improving physical activity level was the crucial aim of our study. We tried to motivate them by explaining that exercises have the potential to reduce cardiovascular mortality, which is the most common cause of death in CRF. We thought that it helped the patients to allocate some time for physical activity. As a result, not all subparameters but total physical activity scores of IPAQ of patients increased significantly at 3 months follow up.

The SMW has been used as an outcome measurement of functional capacity in a number of exercise studies in the CRF population. All these studies included intra- and interdialysis exercise program in HD patients (9, 23, 25, 26). Despite the different methods of dialysis, the goal of exercise training is same in both HD and PD patients. Clearance of the toxic molecules by exercising would minimize their destructive effects on various physiological systems and thereby enhance the skeletal muscle performance (1). Motivating the PD patients to increase the physical activity levels also resulted in improvement of physical performance. After 3 months follow up, physical performance scores of the patients improved briefly likewise other studies. This change was not statistically significant due to may be small number of our study population and shorter duration of follow up.

Regarding psychological dimensions in CRF, it seems PD patients are better adapted to the treatment than other CRF patients. This may be due to the peritoneal treatment method offering increased autonomy and control, flexibility in daily life, ease of work, doing dialysis alone, nighttime dialysis and dietary regime, as well as fewer social restrictions. PD patients have been found to have better quality of life scores than other CRF patients in specific areas like 'perceived ability to time', 'financial concerns', 'restriction in eating and drinking' and 'dialysis access problems'. Furthermore, PD patients have indicated less kidney disease burden, and being more satisfied with care (8, 27). In our study, quality of life scores have increased although the change was not significant or not changed except cognitive function at 3 months follow-up. Furthermore, increase in physical activity had no effect on quality of life scores. Literature research considering these results, showed

a lack of any studies assessing the effects of exercise training programs on quality of life in PD patients. Thus, our study is the first on this topic, and analyzing our results by comparing them with any other study was not possible.

As follow-up of in-center exercise programs of HD patients is easier, the literature on the effects of exercising in PD patients is very poor. However, the similar systemic and physical symptoms with HD in patients receiving PD are emerging.

The small number of patients in the study, limiting the follow-up period up to 3 months, lack of cycle controls for checking the participation of the patients in regular exercise are the limitations of this study. We thought that widening the exercise training program according to the patient and supervision of a physiotherapist on patients would have resulted much more striking changes. However, our study is a preliminary one carried out in this regard.

In conclusion, in spite of everything, incorporating an exercise training program into PD patient care should be a crucial part of standard care. In order to facilitate incorporation of regular exercise into standard treatment, exercise program should be individually tailored according to patient. To increase the participation of the patients in regular exercise, the benefits of exercising should be explained to the patient in detail at the beginning of the treatment.

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