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Effect of Aerobic Exercises on Lipid Profile After Renal Transplantation

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Abstract: Objective: To assess the therapeutic efficacy of aerobic exercises on Lipid Profile after Renal Transplantation. **Subject and Methods:** Thirty patients who diagnosed as chronic renal transplantation with age ranged between 30 to 45 years were selected randomly from different hospitals in Cairo. Only who agreed to be volunteers took part in the study and were randomized into two groups of equal numbers, twenty patients for each group, Group (A) received moderate intensity aerobic exercise program on electric treadmill for 30 minutes, 3 times/week for 12 successive weeks plus their medical care. Group (B) not included in any exercise program just their traditional medical care **Parameters:** Laboratory assessment (lipid profile) before the beginning of the training program and after the completion of the study (after 12 weeks). **Results***:* When compared between the two groups, the mean ± SD values after 12 weeks of therapy were 150.33 ± 6.96 and 142.93 ± 8.06 respectively, indicating a significant improvement (p= 0.012) to the benefit of group B. (MD= 7.4) and % of improvement was 5.78 %. **Conclusion:** It was concluded that aerobic exercises had significant effect on Lipid Profile after Renal Transplantation.

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Key words: (Aerobic exercise - lipid profile- Physical therapy program - Renal transplantation)

1. Introduction:

Recipients of renal transplants are at elevated risk of cardiovascular (CV) disease due to increased prevalence of hypertension, hyperlipidemia, and diabetes **[1].** Dyslipidemia including higher concentrations of total cholesterol, triglycerides (TG) and low-density lipoprotein cholesterol (LDL-C) and reduced high-density lipoprotein cholesterol (HDL-C) is one of the risk factors for increased cardiovascular risk linked with CKD and also for the progressive renal damage [**2**]. Exercise in patients with renal transplantation has beneficial effects on functional ability, anemia, and risk factors for cardiovascular disease, dyslipidemia and psychosocial issues [**3**]. Regular exercise is an essential component of patients rehabilitation from renal replacement therapy. Its impact is extremely high on physical activity, endurance, muscle strength and social and emotional status. This is expected to decrease cardiovascular risk factor. Exercise side effects are pretty rare. Aerobic exercises in patients with ESRD are critical for the anabolic effect and malnutrition [**4**]. Aerobic exercise has increased improved working ability, improved cardio respiratory fitness, increased immune function and brings in positive change in body weight and body composition, [5]. The benefits of the treadmill are to be autonomous as the speed and grade can be varied and the workload can be accurately measured. In a pulmonary rehabilitation programs, aerobic training session was a 15-minutes warm-up, 30-minutes for the aerobic exercise, and a 15-minutes cool- down. The phases of warm-up and cool-down consisted of stretching exercises for the upper and lower limbs, thoracic mobility exercises, and strengthening exercises for light-resistance. Furthermore, low intensity rhythmic movements for the upper and lower limbs, synchronized with the respiratory pattern of the person, were used to promote cardiovascular warm-up and cool-down [6]**.**

2. Material and Methods

Subjects:

- Thirty patients with chronic renal failure undergoing renal transplantation participated in this study.
- Participants were of age between 30 to 45 years old.
- All patients diagnosed as chronic renal failure (CRF).
- All patients were stable medically for a minimum of three months.

- All patients enrolled to the study had signed the informed consent form.
- Both genders participated in the study.
- All the patients examined medically by nephrologists

B. Exclusive criteria:

Participants were excluded if one of the following criteria was met:

- Patient who did not want to participate in study.
- Cardiac problems.
- Chronic chest disease.
- Uncontrolled hypertension and diabetes
- Chronic inflammatory orthopedic disorders and rheumatoid arthritis
- Severe obesity (BMI≥38)
- Patients with cognitive and psychiatric disorders.
- Patients were receiving medications to control, decrease cholesterol levels or triglycerides level

Evaluation procedures:

- All patients were evaluated pre-treatment and post-treatment for:

Laboratory investigation measuring serum lipid profile (cholesterol, TG, LDL and HDL) carried out before the initiation of the training program and after the completion of the study (i.e after 12 weeks).

Ethical Approval:

The research was accepted by the Faculty of Physical Therapy's Institutional Ethics Committee, University of Cairo, Egypt and all participants signed a consent document.

Treatment procedure:

Group A: (Aerobic exercise group)

- This group of patients composed of twenty patients who received moderate intensity aerobic exercise program during dialysis using cycle ergometer for 30 minutes, 3 times/week for 12 successive weeks in addition to their medical care.
- The program of treatment consists of three phases:

First phase: Warm-up (approximately 5 minutes) in form of walking on low speed [7].

Second phase: The main part of exercises approximately 20 minutes of walking exercise at low to moderate intensity [7].

Third phase: Cool-down (approximately 5 minutes) in form of walking on low speed [7].

Statistical tools and data analysis:

For the comparison of subject characteristics between the two groups, descriptive statistics and unpaired t-tests were carried out. Use of the Shapiro-Wilk test to check normal distribution of data. The test for homogeneity of variances by Levene was conducted to ensure homogeneity between groups. Unpaired t-test was performed to compare high-density lipoprotein (HDL) and low-density lipoprotein (LDL) mean values between group A and group B. Paired t-test was conducted in each group for comparison between pre- and post-treatment. For all statistical tests, the significance level was set at $p < 0.05$. All statistical analysis was performed using the statistical package for social studies (SPSS) version 25 for windows [8] **(Ott et al., 2001).**

3. Results:

Table (1): Comparing the mean values of High density lipoprotein (HDL) among the two groups.

High density lipoprotein (HDL)	Group (A)		Group (B)	
	Pre treatment	Post treatment	Pre treatment	Post Treatment
Mean ± SD	43.07 ± 4.03	47.2 ± 4.49	45.27 ± 4.5	53.53 ± 4.36
MD	4.13		7.26	
% of improvement	9.58 %		16.03 %	
t-value	14.12		24.2	
p-value	0.000		0.000	
Level of Significant	S		S	

Pre: Before applying the treatment Post: After twelve weeks of treatment. SD: Standard Deviation. MD: Mean Difference.

% of improvement: Percentage of improvements. t-value: Paired and Un-paired t- test value. p-value: Probability value. S: Significant

NS: Non Significant

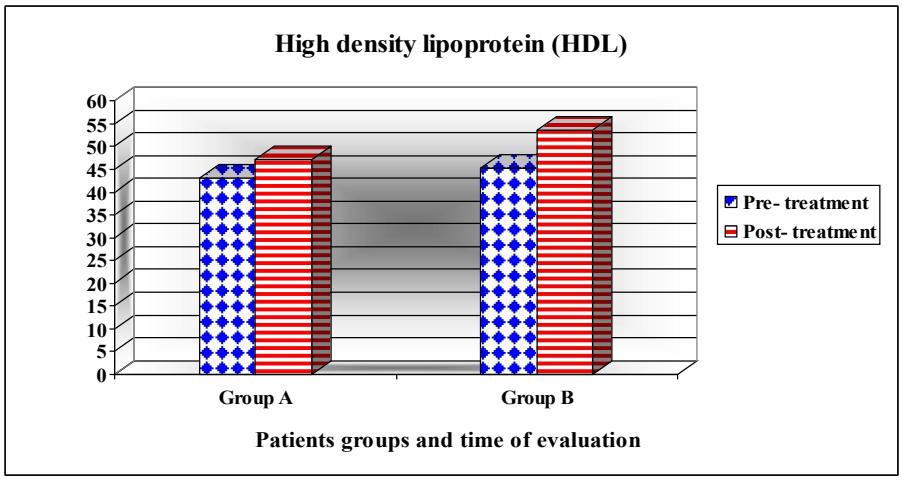

Fig. (1): Pre and post treatment mean values of High density lipoprotein (HDL) among the two groups.

Table (2): Comparing the mean values of Low density lipoprotein (LDL) among the two groups.

Low density lipoprotein (LDL)	Group (A)		Group (B)	
	Pre treatment	Post treatment	Pre treatment	Post treatment
Mean ± SD	168.8 ± 5.53	150.33 ± 6.96	169 ± 5.53	142.93 ± 8.06
MD	18.47		26.07	
% of improvement	10.94 %		15.42 %	
t-value	16.8		11.02	
p-value	0.000		0.000	
Level of Significant	S		S	

Pre: Before applying the treatment Post: After twelve weeks of treatment.
SD: Standard Deviation. MD: Mean Difference.
% of improvement: Percentage of improvements. t-value: Paired and Un-paired t- test value. p-value: Probability value. S: Significant
NS: Non Significant

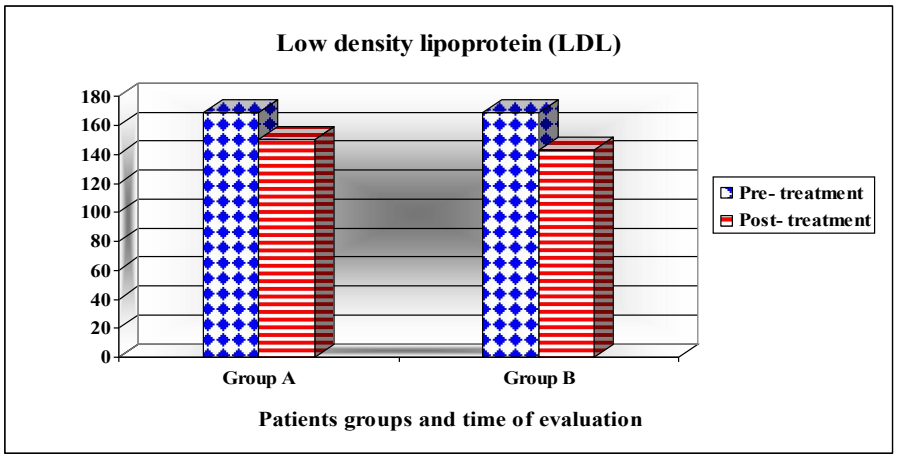

Fig. (8): Pre and post treatment mean values of Low density lipoprotein (LDL) among the two groups.

3. Discussion:

Dyslipidemia, including higher concentrations of total cholesterol, triglycerides and low-density lipoprotein cholesterol and reduced high-density lipoprotein cholesterol, is one of the risk factors for increased risk of cardiovascular disease linked with CKD and also for the progression of renal damage. As a result, early detection and careful management of not only CKD but also dyslipidemia may prevent ESRD from progressing and the development of associated morbidities, including cardiovascular disease [4].

Aucella et al. [12] reported that exercise is beneficial in ameliorating cardiovascular risk factors such as hypertension, dyslipidemia, hyperglycemia, obesity, inflammation, and oxidative stress. In addition, inactivity has been reported to be associated with the development of major CKD precursors including albuminuria, decreased glomerular filtration rate and diabetes initiation.

Awney et al. [13] investigate the effect of moderate aerobic exercise on kidney function tests and lipid profile in renal transplantation patients and concluded that there were no significant differences between pretreatment and post-treatment values of creatinine, blood urea, or glomerular filtration rate but TG, cholesterol, and LDL decreased significantly and HDL increased significantly after 3 months.

Leon and Sanchez, 2012 performed a meta-analysis of 51 aerobic exercise approaches requiring 12 weeks or more (n = 4,700). On average, HDL cholesterol has been reported to increase by 4.6 %, while triglyceride levels have decreased by 3.7 % and LDL cholesterol has decreased by 5 %. Total cholesterol was unaltered, although the HDL: LDL cholesterol ratio improved considerably, indicating that the increased intensity and structure usually linked to aerobic exercise has a more robust effect on triglycerides and LDL cholesterol than moderate levels of physical activity, and this agreed with the results of this study as well.

Nybo et al., 2014 recorded that the overall HDL cholesterol ratio was the only component of the lipid profile that substantially improved (decreasing from 3.41 to 2.92 p\0.05) by 150 minutes of weekly exercise at 65 % of previously untrained participants' maximal aerobic ability (VO2max). The investigation compared a sustained aerobic exercise protocol (150 min / week) with a protocol running intense interval (40 min / week) [n=36].

The results of **Leehey et al** [15], **Afshar et al**. [16] studies contradict with the effect of this study on lipid profile:

Leehey et al. [16] who reported that aerobic exercise training did not significantly alter blood urea nitrogen (BUN), creatinine, glomerular filtration rate (GFR), hemoglobin, serum lipid, or C-reactive protein (CRP) values, but power was limited as only seven exercise group patients and four control group patients completed the study.

Afshar et al. [17] found that aerobic exercise and resistance exercises that conducted to renal patient were significantly correlated with a reduction of serum creatinine and C-reactive protein levels, thus aerobic exercise induced more reduction, however the exercise did not affect weight, serum urea, albumin, hemoglobin or lipid levels.

Results of this study revealed a statistically significant increase in the high dense cholesterol level (HDL) and decrease in low density cholesterol level (LDL), triglycerides (TG) and cholesterol (CHO) in both groups but improvement in aerobic training group was better than resisted training.

The study was limited to physical and psychological conditions of the patients that might affect the evaluation and treatment also, inability to perform knee flexion from prone against gravity due to shortness of arterio-venous fistula of dialysis machine.

Conclusion:

It was concluded that aerobic exercises improve lipid profile of renal transplantation patients.

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