

Effect of aerobic and anaerobic exercises on removal of toxins in CKD patients: our experience from Telangana

Sunil Kumar A Rayan¹, Satish S Patil^{2*}

¹Associate Professor, Department of Physiology, Government Medical College, Suryapet, Telangana, INDIA.

²Assistant Professor, Department of Physiology, Mahadevappa Rampure Medical College, Kalaburagi, Karnataka, INDIA.

Email: sunilarayan@gmail.com

Abstract

Background: Patients with Chronic kidney disease are often associated with lower quality of life, burden of cardiovascular system and numerous co-morbidities. CKD has high prevalence in India with about 17% of total Earth's population. Haemodialysis is a life saving treatment for end stage renal disease patients. Intradialytic exercises are the exercises performed during the dialysis. **Objective:** To compare the level of toxin removal in intra-dialytic aerobic and anaerobic exercise. **Methodology:** It is an experimental single blinded study on CKD patients with sample size of 30 in each: aerobic and anaerobic exercises group with random allocation of subjects in two groups. The mean serum creatinine levels were evaluated and compared at the subsequent follow ups. **Results:** Mean serum creatinine in aerobic group was 3.95 ± 1.16 and in anaerobic group was 4.85 ± 7.41 ($p > 0.05$) at first follow up. Mean serum creatinine in aerobic group was 2.5 ± 1.11 and in anaerobic group was 4.13 ± 1.77 at second follow up. When we compared the mean values of serum creatinine, the difference was found to be statistically significant ($p < 0.05$). Mean serum creatinine in aerobic group was 1.86 ± 1.14 and in anaerobic group was 4.01 ± 1.85 at third follow up. When we compared the mean values of serum creatinine, the difference was found to be statistically significant ($p < 0.05$). **Conclusion:** Our study concluded that aerobic exercises to CKD patients during dialysis improves the toxin removal effectively than anaerobic exercises

Key Words: CKD, creatinine, aerobic and anaerobic exercise

*Address for Correspondence:

Dr. Satish S Patil, Assistant Professor, Department of Physiology, Mahadevappa Rampure Medical College, Kalaburagi, Karnataka, INDIA.

Email: sunilarayan@gmail.com

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INTRODUCTION

Patients with end-stage renal disease are characterized by severe functional limitations.^{1,2} Although renal replacement treatment options, such as hemodialysis (HD) or peritoneal dialysis, reduce morbidity and mortality, end-stage renal disease patients still experience significantly low physical fitness, psychosocial problems

and poor quality of life.³⁻⁵ Studies in the field of renal rehabilitation support the fact that exercise training in patients on HD is capable of ameliorating many of the morphological and functional disorders that accompany end-stage renal disease and improve physical fitness, behavioural characteristics, as well as their quality of life.^{6,7} Patients with Chronic kidney disease are often associated with lower quality of life, burden of cardiovascular system and numerous co-morbidities. CKD has high prevalence in India with about 17% of total Earth's population. Haemodialysis is a life saving treatment for end stage renal disease patients. Intradialytic exercises are the exercises performed during the dialysis. Aerobic exercises are mostly composed of cycle ergometer or bicycle training. Anaerobic exercises are mostly composed of weights and resistance training. ⁸Aerobic exercise in hemodialysis patients has been reported to enhance insulin sensitivity, improve lipid profile, increase hemoglobin, increase strength, decrease

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blood pressure, and improve quality of life. Resistance training, in the general population, decreases C-reactive protein, increases insulin sensitivity, decreases body fat content, increases insulin-like growth factor-1 (IGF-1), and decreases microalbuminuria. In the nondialysis CKD population, resistance training has been reported to reduce inflammation, increase serum albumin, maintain body weight, increase muscle strength, increase IGF-1, and increase GFR. Resistance training in hemodialysis increases muscle strength, increases physical functionality, and improves IGF-1 status. Combined aerobic exercise and resistance training during dialysis improves muscle strength, work output, cardiac fitness, and possibly dialysis adequacy. There is a need for more investigation on the role of exercise in CKD. If the benefits of aerobic exercise and strength training in non-CKD populations can be shown to apply to CKD patients as well, renal rehabilitation will begin to play an important role in the approach to the treatment, prevention, and slowed progression of CKD. So, the present study was undertaken to see the effect of exercises on intradialytic patients and which exercise is better.

RESULTS

Table 1: Comparison of mean creatinine between Aerobic and anaerobic group at first follow up

	Group	N	Mean	Std. Deviation	t	p	Inference
Follow up 1st creatinine posttreatment	Aerobic	30	3.95	1.16	-1.134	.26	Not significant
	Anaerobic	30	4.85	7.41			

Mean serum creatinine in aerobic group was 3.95 ± 1.16 and in anaerobic group was 4.85 ± 7.41 . When we compared the mean values of serum creatinine, the difference was found to be statistically not significant ($p > 0.05$). It means there is no much variation in the mean values in both groups

Table 2: Comparison of mean creatinine between Aerobic and anaerobic group at second follow up

	Group	N	Mean	Std. Deviation	t	p	Inference
Follow up 2nd creatinine posttreatment	Aerobic	30	2.50	1.11	-5.354	.018	Significant
	Anaerobic	30	4.13	1.77			

Mean serum creatinine in aerobic group was 2.5 ± 1.11 and in anaerobic group was 4.13 ± 1.77 . When we compared the mean values of serum creatinine, the difference was found to be statistically significant ($p < 0.05$). It means aerobic exercises has effect in reducing the serum creatinine as compared to anaerobic exercises

Table 3: Comparison of mean creatinine between Aerobic and anaerobic group at third follow up

	Group	N	Mean	Std. Deviation	t	p	Inference
Follow up 3rd creatinine posttreatment	Aerobic	30	1.86	1.14	-3.363	.03	Significant
	Anaerobic	30	4.01	1.85			

Mean serum creatinine in aerobic group was 1.86 ± 1.14 and in anaerobic group was 4.01 ± 1.85 . When we compared the mean values of serum creatinine, the difference was found to be statistically significant ($p < 0.05$). It means aerobic exercises has effect in reducing the serum creatinine as compared to anaerobic exercises

DISCUSSION

In our study it was observed that the serum creatinine level was gradually reduced in both aerobic and anaerobic exercises. It was also observed that serum creatinine level at first follow up was not significantly reduced, but

OBJECTIVE

To compare the level of toxin removal in intra-dialytic aerobic and anaerobic exercise.

METHODOLOGY

- Type of study: experimental study
- Study duration: 12 weeks
- Inclusion criteria: >18 years old volunteers on dialysis and willing to participate
- Sampling technique: Random sampling method.
- Sample size: total 60 subjects. Group A- 30 receiving aerobic and Group B- 30 receiving anaerobic exercises
- Study center: Dialysis Department, GMCH, Suryapet
- Study duration: May 2019 to August 2019
- Statistics used: SPSS software used for data analysis and unpaired t test was used to compare the mean serum creatinine between two groups
- Aerobic exercises: Cycle ergometer or bicycle training.
- Anaerobic exercises: Weights and resistance training.

subsequently it was reduced in aerobic group significantly as compared to anaerobic group. It shows that aerobic exercises during dialysis helps the CKD patients more effectively than anaerobic exercises. Caesar Calvo Lobo *et al*¹¹ showed that mean creatinine level before aerobic

exercises was 3.41 ± 1.35 and after exercise was 3.53 ± 1.58 . Here creatinine level was reduced after aerobic exercises, but not statically significant change seen. Kosmadakis *et al*¹² study obtained improvements after 1 month of aerobic exercise; the same was observed regarding the quality of life and uremic symptom scores. On the other hand, Chang *et al*.¹³ did not observe any improvements in the physical component score of the KDQoL-SF36 after 3 months of intervention. Intradialytic aerobic exercise has been shown to be safe in the first 2 hours of dialysis; after 2 hours, cardiac decompensation may preclude exercise.¹⁴ Intradialytic cycling, with normalization of hematocrit, has been shown to improve peak oxygen consumption and quality of life.¹⁵ Storer and colleagues¹⁶ showed that intradialytic cycling increases peak oxygen consumption, power, endurance time, and quadriceps strength and improves fatigability. Macdonald and colleagues¹⁷ reported increased power and increased physical function with intradialytic cycling but were unable to show a change in lean mass or insulin-like growth factor. Dialysis efficacy and physical functioning improve with intradialytic cycle ergometer exercise.¹⁷ Anderson and co-workers¹⁸ reported that intradialytic exercise bicycle training resulted in decreased blood pressures; however, this effect waned with detraining.

CONCLUSION

Our study concluded that aerobic exercises to CKD patients during dialysis improves the toxin removal effectively than anaerobic exercises

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