

Effects of training on cardiac autonomic neuropathy and metabolic profile in patients with diabetes under hemodialysis

Aim: To examine the effects of home-based exercise training on Cardiac Autonomic Neuropathy (CAN) and metabolic profile in patients with type 2 diabetes and Diabetic Kidney Disease (DKD) undergoing hemodialysis (HD).

Methods: This study was a prospective, interventional study that included 28 patients with type 2 diabetes, CAN and DKD undergoing HD. Patients were recruited from public and private dialysis units of the Prefecture of Thessaloniki, Greece. All patients were randomly assigned to a 6-month home-based training program (EX group) or to no training (CO group). All patients were examined at baseline and the end of the study. Study outcomes included: cardiopulmonary exercise testing (CPET), glucose and lipid profile, and 24-h electrocardiographic monitoring for heart rate variability (HRV) analysis and heart rate turbulence (HRT). The training program included a combination of aerobic and low-dose strength exercises 3-times a week.

Results: Following 6-months of home-based training, the EX group had an increase in serum high-density lipoprotein (27.7%; $p=0.01$), peak oxygen uptake (VO_{2peak}) (9.3%; $p<0.05$), the standard deviation of R-R intervals (SDNN) (34.3%; $p=0.03$), percentage of successive RR intervals higher than 50 ms (51.1%; $p=0.02$), turbulence slope index (18.4%; $p=0.01$) and a decrease in HbA1c (12.5%; $p=0.04$) and low-frequency power (ms^2) (29.7%; $p=0.01$). In a linear regression analysis VO_{2peak} correlated to SDNN ($r=0.55$, $p=0.03$) and high-frequency power ($r=0.72$, $p=0.02$) following training.

Conclusions: 6-months of home-based training may improve cardiac autonomic function and metabolic profile in DKD patients undergoing HD.

Comments. Cardiovascular autonomic neuropathy is a predictor of cardiovascular disease and mortality (Pop-Busui R et al *Diabetes Care*. 2017;40:136-154). Currently the exact underlying mechanism is unknown, and treatment options are limited to symptomatic relief. Training in CAN and HD patients has previously been described to improve HRV and VO_{2peak} and to reduce risk factors for cardiovascular mortality. Aerobic and strength training is also known to improve insulin sensitivity, neural control, motor function and metabolic markers in individuals with diabetes and diabetic neuropathy.

This interventional study showed improvements for glucose and lipid profiles after six months of unsupervised combined home-based aerobic and strength training. This study revealed a positive correlation between VO_{2peak} and SDNN and HF after exercise training, which may be an indicator of improved cardiorespiratory efficiency levels affecting the cardiac autonomic nervous system function. The study strengths include a randomised design and a long intervention period. However, the study has limitations as there was large participation dropout rate (32%), and there was no information on allocation concealment, assessment of diabetic neuropathy, and nutritional status during the study. Future studies should consider larger sample sizes, including both type 1 and type 2 diabetes individuals and a control group without CAN and HD.

This study provides additional evidence for the possible benefits of exercise in individuals with type 2 diabetes, CAN and HD that can be applicable at patients home.

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Reference Michou V, Liakopoulos V, Roumeliotis S, Roumeliotis A, Anifanti M, Tsamos G, Papagianni A, Zempekakis P, Deligiannis A, Kouidi E. Effects of Home-Based Exercise Training on Cardiac Autonomic Neuropathy and Metabolic Profile in Diabetic Hemodialysis Patients. *Life (Basel)*. 2023 Jan 13;13(1):232. doi: 10.3390/life13010232. PMID: 36676181; PMCID: PMC9866875.

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