

# Research Journal of Pharmaceutical, Biological and Chemical Sciences

## Effect of cardiac rehabilitation on endothelial function and HbA1c in diabetic patients with ischemic heart disease (IHD).

Assareh Ahmadreza<sup>1</sup>, Akiash Nehzat<sup>2</sup>, and Mohammadirad Masoume<sup>3\*</sup>.

<sup>1</sup>Associated Professor of Interventional Cardiology, Department of Cardiology, Atherosclerosis Research Center, Ahvaz Jundishapur University of Medical Sciences, Ahvaz.

<sup>2</sup>Assistant Professor of Cardiology, Fellowship of Echocardiography, Department of Echocardiography, Atherosclerosis Research Center, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.

<sup>3</sup>Resident of Cardiology, Department of Cardiology, Atherosclerosis Research Center, Ahvaz Jundishapur University of Medical Sciences, Ahvaz.

### ABSTRACT

Endothelial dysfunction imagined that is an independent agent that increase mortality in patients encountered with cardiovascular events. Diabetes mellitus is another factor that fortifies these effects. There is not obvious evidence that cardiac rehabilitation and improve endothelial dysfunction in non-smoker diabetic patients. We accomplished a two months controlled trial in 53 diabetic non-smoker patients with recent history of prior CABG or PCI, doing regular exercise as cardiac rehabilitations in 28 people of participants and others had usual care as control group, before and after trial HbA1C and Ankle Brachial Index (ABI) was measured and mean differences in the middle of two groups was assessed. After 24 sessions of exercise, changes and reduction in HbA1c was significant in patients under rehabilitation than control group, (p value = 0.002). others variable such as METS score, ABI and HDL was decrease statically significant in intervention group. But blood pressure, GFR and LDL was not significantly differing between groups.

**Keywords:** Cardiac Rehabilitation, Ankle Brachial Index, HbA1c, Diabetes

*\*Corresponding author*

**INTRODUCTION**

About 7 percent of people more than forty years old affected peripheral artery disease (1) that can be a predisposing factor for cardiac mortality (2).this phenomenon called PAD is more spread in patients that have type 2 of diabetesmellitus (3).atherosclerosis that known as dysfunction of endothelium layer, toughed that not affected with usual activity and diet controlling. But impact of regular and particular physical activity called cardiac rehabilitation on the AS and PAD in not approved (4, 5, 6). Thus, goal of this clinical randomized trial is to evaluate effect of this rehabilitation on the ABI as an index of measuring PAD severity, and METS score in non-smoker diabetic patients with history of recent ischemic heart disease.

**MATERIAL AND METHODS**

This researchcarried out in Cardiac center of Ahvaz Imam Khomeini Hospital in 2015. 53 patients with recent history of prior proven ischemic heart disease (history of recent CABG or PCI) enrolled in trial. All of them were diabetic and non-smoker.28 patients underwent regular exercise as cardiac rehabilitation. 25 patients followed as customary medical care as control group. Rehabilitation was done as a two continuous months in manner of 3 sessions in a week every other day, total was 12 to 24 sessions. Before intervention and at the end of it, FBS, all lipid profile, A1C haemoglobin, ankle brachial index (ABI) and METS was measured and its mean differences between two groups were considered. That is necessary to mentioned ABI measured by Vascular Screening Device with VaSeraVS-1500N model that contains 4 cuffs that 2 of themes belongsuperior limb and others to inferior limbs that have ECG monitoring. For MET calculating we used of twelve section questionnaires’ of Duke Activity Status Index.

**Statistical analysis**

Quantitative variables from beginning to end of trial were measured by Paired t test .for comparisonat the middle of groups we utilized Independent Samples T test and qualitative variables were deliberated by chi-square tests. After gathering all data’s we used SPSS software version 22 for assessment of data.

**RESULTS**

Through all participants, 34 patients (64.2%) was male, and 19 (35.8 %) was female .range of age of patients was 50 to 75 years old with medium age of 60.73± 6.19. baseline characteristics of two patients group was presented in table 1.mean differences in ABI after 2 months of cardiac rehabilitation was 0.123 in right sided and 0.124 in left sided of limbs. This equivalent values was 0.012 and 0.108.this differences was significant in the light of statics between intervention and control groups.(P value =0.000) results after intervention and mean differences at the end of study were exhibited in table 2 and 3 in details. Mean differences of HbA1 was -0.546 in rehabilitation group and -0.264 in the control group that this was marked difference statically between them. (P value= 0.000)

Variables	Control group	Rehabilitation group	P value
MET’S	5.64	3.31	0.000
ABIRight	1.022	0.985	0.120
ABILeft	1.16	0.99	0.028
BMI	26.15	26.32	0.771
Systolic BP	126.80	117.14	0.012
Diastolic BP	78.20	71.42	0.018
LDL	98.72	82.03	0.007
HDL	51.36	38.50	0.000
TG	158.44	42.137	0.187
FBS	154.20	151.46	0.771
GFR	71.88	80.60	0.038

Table1. Baseline characteristics of two groups before intervention

Variables	Control group	Rehabilitation group	P value
MET'S	5.72	6.28	0.103
ABIRight	1.025	1.094	0.012
ABILeft	1.040	1.073	0.218
BMI	26.08	25.94	0.775
Systolic BP	121.80	110.71	0.000
Diastolic BP	75.40	70.53	0.053
LDL	95.96	79.89	0.007
HDL	52.16	42.50	0.003
TG	155.60	119.96	0.015
FBS	148.76	130.50	0.013
GFR	71.95	82.17	0.018

**Table 2. Results at the end of trial**

Variables	Control group	Rehabilitation group	P value
MET	0.084	+3.003	0.000
BMI	-0.064	-0.375	0.033
Systolic BP	-5.00	-6.42	0.379
Diastolic BP	-2.80	-0.89	0.193
LDL	-2/76	-2.14	0.214
HDL	+0.80	+4.00	0.000
TG	-2.84	-17.46	0.002
FBS	-5.44	-20.96	0.000
GFR	+0.06	+1.56	0.07

**Table 3. Details of mean differences in the middle of control and rehabilitation groups**

**DISCUSSION**

This research was a randomized controlled trial to investigate the impact of cardiac rehabilitation on ABI as an important index for predicting morbidity and mortality between patients with recent precedent of cardiovascular disease. This study had 2 major outcomes. One of them was increasing in ABI after intervention and another was decreasing in A1C haemoglobin in diabetic patients after two months of intervention. This result was extracted in some other studies before. For example Gibbs and et al showed that regular exercise in diabetic patients in a range of 40 to 65 years old, can improve ABI about 0.004 in mean differences. This improvement was steady after omission of other variables (7). These findings were compatible with our results. In this study following patients showed that even these rehabilitations can reduce mortality among these diabetic patients in long term. This effect of particular exercise on the mortality was approved in other studies too (8). Another study that was done by Januszek R and et al showed that 12 weeks of special exercise with treadmill can ameliorate claudication and ABI in such patients (9). In other trial that was performed upon Dobrosielski and et al proved that 6 months of special exercise for patients with recent cardiovascular history did not effect on their blood pressure (10), in our study despite decrease in average of blood pressure, but this diminish was not significant. These results correlate with our study, these results were opposite of the conclusions of Moriguchi and et al that such cardiac rehabilitations decrease in mean total blood pressure that was significant with a view to statics (11). A cardinal limitation of this study that should be mentioned is that because of short follow up of patients effect of this exercise on long term mortality and morbidity cannot be achieved.

**CONCLUSION**

Cardiac rehabilitations as form of regular particular exercise in non-smoker diabetic patients, at duration of 30 minutes every other day within 2 months, can decrease A1C haemoglobin, and improve ABI as a predictive index for cardiac mortality and tragic cardiac events.

## ACKNOWLEDGMENTS

We express appreciation to the patients with recent ischemic heart disease involved in the study as well as other health workers in the cardiac department of Imam Khomeini Hospital, Ahvaz, Iran who assist us in collection of data.

This research was approved by Ahvaz Jundishapur University of Medical Sciences. (Grant No.). Confirmation of this clinical trial was done by the Ethics of Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran, and registered in the Iranian Registry of Clinical Trials (IRCT number IRCT).

## REFERENCES

- [1] Allison MA, Ho E, Denenberg JO, Langer RD, Newman AB, Fabsitz RR, et al. Ethnic-specific prevalence of peripheral arterial disease in the United States. *Am J Prev Med* 2007 Apr;32(4):328e33.
- [2] McDermott MM, Greenland P, Liu K, Guralnik JM, Celic L, Criqui MH, et al. The ankle brachial index is associated with leg function and physical activity: the Walking and Leg Circulation Study. *Ann Intern Med* 2002 Jun 18; 136(12):873e83.
- [3] Selvin E, Erlinger TP. Prevalence of and risk factors for peripheral arterial disease in the United States: results from the National Health and Nutrition Examination Survey, 1999-2000. *Circulation* 2004 Aug 10; 110(6):738e43.
- [4] N.M. Edwards, S.R. Daniels, R.P. Claytor, P.R. Khoury, L.M. Dolan, T.R. Kimball, et al., Physical activity is independently associated with multiple measures of arterial stiffness in adolescents and young adults, *Metabolism* 61 (2012) 869e872.
- [5] B.C. Bock, R.E. Carmona-Barros, J.L. Esler, P.L. Tilkemeier, Program participation and physical activity maintenance after cardiac rehabilitation, *Behav. Modif.* 27 (2003) 37e53.
- [6] M.P. Pase, N.A. Grima, J. Sarris, The effects of dietary and nutrient interventions on arterial stiffness: a systematic review, *Am. J. Clin. Nutr.* 93 (2011) 446e454.
- [7] Gibbs BB, Dobrosielski DA, Althouse AD, Stewart KJ. The effect of exercise training on ankle-brachial index in type 2 diabetes. *Atherosclerosis*. Elsevier; 2013;230(1):125–30.
- [8] Coll-Fernández R, Coll R, Pascual T, Muñoz-Torrero JFS, Sahuquillo JC, Manzano L, et al. Cardiac rehabilitation and outcome in stable outpatients with recent myocardial infarction. *Arch Phys Med Rehabil*. Elsevier; 2014;95(2):322–9.
- [9] Januszek R, Mika P, Konik A, Petriczek T, Nowobilski R, Niżankowski R. The effect of treadmill training on endothelial function and walking abilities in patients with peripheral arterial disease. *J Cardiol*. Elsevier; 2014;64(2):145–51.
- [10] Dobrosielski DA, Gibbs BB, Ouyang P, Bonekamp S, Clark JM, Wang N-Y, et al. Effect of Exercise on Blood Pressure in Type 2 Diabetes: A Randomized Controlled Trial. *J Gen Intern Med*. 2012 May 19;27(11):1453–9.
- [11] Moriguchi J, Itoh H, Harada S, Takeda K, Hatta T, Nakata T, et al. Low frequency regular exercise improves flow-mediated dilatation of subjects with mild hypertension. *Hypertens Res*. 2005 Apr;28(4):315–21.