

Effects of a comprehensive cardiac rehabilitation program on quality of life in patients with coronary artery disease

Marzieh Saeidi⁽¹⁾, Samaneh Mostafavi⁽²⁾, Hosein Heidari⁽³⁾, Sepehr Masoudi⁽⁴⁾

Original Article

Abstract

BACKGROUND: Health-related quality of life is an important factor to evaluate effects of different interventions in cardiovascular diseases. Improvement in quality of life (QOL) is an important goal for individuals participating in cardiac rehabilitation (CR) programs. The purpose of this study was to assess the impact of comprehensive CR on QOL in patients with cardiovascular disease (CAD).

METHODS: In this quasi-experimental before-after study, the files of 100 patients with CAD who were referred to rehabilitation department of Isfahan Cardiovascular Research Institute were studied using a consecutive sampling method. Data collection was performed from the patient's files including their demographics, ejection fraction, functional capacity, and resting heart rate. All patients participated in a comprehensive CR program and completed the validated questionnaire Short-Form 36 Health Status Survey (SF-36), before and after CR program. Data was analyzed based on sex and age groups (≥ 65 and < 65 years) using independent t-test and paired t-test (to compare variables between groups and before and after CR, respectively).

RESULTS: After CR, scores of all physical domains of the SF-36 including physical function (PF), physical limitation (PL), body pain (BP) and vitality (V) in addition to general health (GH) were significantly improved in all patients ($P < 0.05$) compared to the baseline. Patients with age < 65 years had greater improvements in mental health (MH) and social function (SF) than patients with age ≥ 65 years ($P < 0.05$). Women had greater improvement in PF, V and MH compared to men ($P < 0.05$).

CONCLUSION: These results indicated that CR can improve QOL in cardiac patients especially in women. Elderly patients get benefit the same as other patients in physical domains.

Keywords: Quality of Life, Cardiac Rehabilitation, Cardiovascular Diseases

Date of submission: 11 Sep 2012, *Date of acceptance:* 30 Jan 2013

Introduction

Cardiac rehabilitation (CR) is an important intervention after myocardial infarction (MI).¹⁻³ Comprehensive CR not only improves physical and physiological status of cardiac patients but also it influences their psychological conditions⁴⁻⁸ and decrease mortality and cardiovascular disease (CAD) risk factors which can improve their life style.^{9,10} Today, quality of life (QOL) is used as important criteria for evaluating the influence of different interventions in different diseases. It indicates personal perception of life in different aspects such as physical and psychosocial function which is in accordance to

the patient's standards and expectations.¹¹ Improving QOL is one of the important goals of patients for participating in CR program.¹²

In traditional CR programs, it was emphasized on improving physiological status and exercise endurance as well as modifying CVD risk factors in state of patients' QOL.¹³ There are many investigations about impact of CR on QOL. Duration and characteristics of these CR programs have been different and there has been considerable diversity in studied populations, resulting in different findings.⁴⁻⁷ Several studies have shown that because of lower exercise capacity in older patients, they have

1- MSc Student, Department of Physiotherapy, School of Rehabilitation, Isfahan University of Medical Sciences AND Physiotherapist of Shariati Hospital, Treatment Management of Isfahan Social Security Organization, Isfahan, Iran

2- Isfahan Cardiovascular Research Center, Isfahan Cardiovascular Research Institute, Isfahan University of Medical Sciences, Isfahan, Iran

3- Cardiac Rehabilitation Research Center, Isfahan Cardiovascular Research Institute, Isfahan University of Medical Sciences, Isfahan, Iran

4- Student, School of Pharmacy and Pharmaceutical Sciences, Isfahan University of Medical Sciences, Isfahan, Iran

Correspondence to: Marzieh Saeidi, Email: pt_msaeidi@yahoo.com

more disability, so their cardiovascular status improves more than other patients after CR.^{14,15}

In Iran, there are several studies which have shown improvement of cardiovascular and psychological status of cardiac patients after CR,¹⁶⁻²² but there are little studies about influence of CR on improving QOL.^{23,24} Although a few studies have shown that home exercise and walking program improve QOL in cardiac patients, there is not enough studies on influence of comprehensive CR on QOL. In this study we investigated the impact of 8 weeks comprehensive CR on QOL in cardiac patients.

Materials and Methods

In this semi-experimental before-after study, according to the formula $N = [2(Z_{\alpha} + Z_{\beta})^2 S^2]/d^2$; and $\alpha = 95\%$, $\beta = 20\%$, $d = 0.16$, and $S = 0.4$, a sample size of 98 subjects were calculated. We evaluated the files of 100 cardiac patients who were referred to Isfahan Cardiovascular Research Institute in 2008-2010 using consecutive convenience sampling method. We included patients with history of MI, percutaneous transluminal coronary angioplasty (PTCA), coronary artery bypass graft (CABG), and CAD. If the files were not complete in terms of duration of cardiac rehabilitation course and any other measurements [ejection fraction (EF), functional capacity, resting heart rate, QOL, and signed consent form], patients were excluded from the study.

Data collection included demographics, past disease history, clinical examination, medications and cardiac history. All patients had participated in an 8 weeks comprehensive CR program. They also received a step II of cardiac diet by a nutritionist. To evaluate the risk of cardiac disease and to determine the exercise intensity, they performed a symptom limited exercise test using a treadmill (Track Master made in US) by Naughton protocol without stopping medication.²⁵ All patients took angiotensin converting enzyme (ACE) inhibitors and beta-blockers. To evaluate EF, echocardiography was performed by a cardiologist. According to American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR) 1999 guideline for cardiac rehabilitation,²⁶ risk of cardiac disease was determined. The intensity of exercise was based on 60-80% of maximum heart rate obtained from exercise test.²⁷

CR included 24 sessions (3/week) exercise training; each session consisted of 10-20 minutes warm-up, 20-40 minutes aerobic training using

treadmill, arm ergometer and stationary bicycle, 10 minutes cool-down and 20 minutes relaxation as well as 8 education sessions (weekly) to modify CVD risk factors. CR program was supervised by a team (physician, cardiologist, trained nurse and physiotherapist) and high risk patients were monitored if it was necessary.

Persian version of validated questionnaire Short-Form 36 Health Status Survey (SF-36) was used by a trained person to evaluate QOL before and after CR.^{28,29} This questionnaire consisted of 2 sections, physical and psychological health. Physical section included 4 subsections: Physical function (PF), physical limitation (PL), body pain (BP) and vitality (V). Psychological health subsections included social function (SF), emotional limitation (EL), mental health (MH), and general health (GH). All questions were scored on a scale from 0 to 100, with 100 representing the highest level of possible functioning. Aggregate scores were compiled as a percentage of the total points possible, using the RAND-36 scores. The scores from those questions that addressed each specific area of functional health status were then averaged together, for a final score within each of the 8 dimensions measured.

Data distribution was normal. Therefore, to compare variables before and after CR, paired t-test was used and to compare variables between sex groups and age groups (< 65 years and \geq 65 years), independent t-test was used. Data was analyzed by SPSS version 16 (SPSS, Inc., Chicago, IL) at significant level of $P < 0.05$.

Results

Data of 100 patients was evaluated. There were 31 females (mean age: 60.6 ± 10.9 years) and 69 males (mean age: 58.8 ± 10.8 years). The age groups included 36 patients with age of 65 years and more (mean age: 70.1 ± 4.5 years) and 64 patients with age less than 65 years (mean age: 53.3 ± 8.3 years). Table 1 shows the characteristics of the studied population. All patients showed improvement in PF ($P = 0.002$), PL ($P < 0.001$), V ($P = 0.02$), BP ($P = 0.009$) and GH ($P = 0.009$) (Table 2). In terms of the sex groups, females improved in PF ($P = 0.004$), V ($P = 0.003$), and MH ($P = 0.006$) subsections significantly more than males (Table 3). In age groups, patients with age less than 65 years had more improvements in MH ($P = 0.02$) and SF ($P = 0.002$) subsections than older patients (with age \geq 65 years) (Table 4). Table 5 shows that exercise capacity, EF, and resting heart rate were improved in total population ($P < 0.01$).

Table 1. Characteristics of studied population

	Total (n = 100) Mean ± SD	Male (n = 69) Mean ± SD	Female (n = 31) Mean ± SD
Age (year)	58.9 ± 11.0	58.4 ± 10.9	60.2 ± 11.3
Weight (kg)	74.7 ± 12.1	76.3 ± 10.5	67.8 ± 13.4
Education (%)			
Less than diploma	41.4%	21.7%	86.70%
Diploma	59.6%	44.9%	13.30%
University	23.2%	33.0%	0.0%
Married	96%	72.6%	24.4%
Disease			
CAD	16.0%	22.2%	46.2%
PTCA	36.4%	63.9%	31.6%
CABG	45.5%	77.8%	22.2%
MI	4.0%	5.8%	0.0%
Risk of disease			
Low	75.5%	68.9%	31.3%
Intermediate	13.3%	69.2%	30.8%
High	11.2%	81.8%	18.2%
< 65 years	64%		
≥ 65years	36%		

PTCA: Percutaneous transluminal coronary angioplasty; CABG: Coronary artery bypass graft; CAD: Coronary artery disease; MI: Myocardial infarction

Table 2. Quality of life scores before and after cardiac rehabilitation program in total population

SF-36 subscale	Before Mean ± SD	After Mean ± SD	P
Physical function	61.05 ± 23.3	68.20 ± 22.3	0.002
Physical limitation	33.25 ± 39.1	53.25 ± 38.6	< 0.001
Emotional limitation	55.67 ± 41.8	59.00 ± 42.7	0.480
Vitality	55.15 ± 20.7	60.50 ± 33.2	0.020
Mental health	65.28 ± 21.3	67.04 ± 20.1	0.340
Social function	71.67 ± 22.2	72.67 ± 23.4	0.670
Body pain	65.80 ± 22.7	72.38 ± 23.1	0.009
General health	57.45 ± 18.3	61.92 ± 19.3	0.009

Table 3. Mean percent of changes in quality of life items in males and females

SF-36 subscale	Male Mean ± SD	Female Mean ± SD	P
Physical function	9.62 ± 10.3	42.69 ± 10.1	0.004
Physical limitation	18.08 ± 25.7	61.58 ± 21.3	0.170
Emotional limitation	6.50 ± 3.6	8.73 ± 32.3	0.910
Vitality	8.80 ± 25.8	45.62 ± 30.6	0.003
Mental health	3.42 ± 18.0	42.89 ± 24.9	0.006
Social function	7.46 ± 33.1	18.77 ± 32.7	0.330
Body pain	19.02 ± 63.3	17.70 ± 44.7	0.910
General health	18.24 ± 19.1	12.42 ± 19.5	0.580

Table 4. Comparison of mean percent of changes in quality of life items in patients aged more than 65 years and younger patients

SF-36 subscale	< 65 years (n = 64)	≥ 65 years (n = 36)	P
	Mean ± SD	Mean ± SD	
Physical function	20.78 ± 27.6	17.87 ± 24.2	0.790
Physical limitation	41.66 ± 34.5	-2.60 ± 34.0	0.080
Emotional limitation	16.32 ± 34.1	-9.62 ± 33.7	0.210
Vitality	25.78 ± 26.4	10.31 ± 28.9	0.200
Mental health	25.32 ± 21.8	-1.52 ± 18.2	0.020
Social function	21.31 ± 24.1	-7.43 ± 44.5	0.002
Body pain	21.06 ± 65.0	14.17 ± 44.2	0.530
General health	17.18 ± 18.4	15.24 ± 21.6	0.840

Table 5. Exercise capacity, ejection fraction, and resting heart rate before and after cardiac rehabilitation

		Before	After	P
		Mean ± SD	Mean ± SD	
Exercise capacity	Total	8.55 ± 2.8	10.81 ± 2.9	< 0.001
	Female	6.54 ± 2.1	8.36 ± 2.4	< 0.001
	Male	9.31 ± 2.6	11.74 ± 2.6	< 0.001
Ejection fraction	Total	51.06 ± 11.2	54.78 ± 10.0	< 0.001
	Female	53.62 ± 11.0	56.74 ± 9.9	< 0.001
	Male	50.03 ± 11.1	53.99 ± 10.0	< 0.001
Resting heart rate	Total	81.10 ± 17.1	76.51 ± 14.3	< 0.001
	Female	87.78 ± 15.9	79.74 ± 11.8	0.010
	Male	79.48 ± 17.4	75.16 ± 15.2	< 0.001

Discussion

In this study, QOL was significantly improved in subsections of PF, PL, V, BP, and GH after 8 weeks comprehensive CR. Females were improved more than males in PF, V, and MH subsections. Patients with age less than 65 years were improved more than older patients in MH and SF subsections. Some studies have shown that physical activity influence on QOL so that increasing physical activity improves QOL.³⁰ On the other hand, increasing exercise capacity improves patients' ability for daily living activities, work and leisure activities, which in turn results in improving QOL. In the present study, exercise capacity increased after CR significantly in total population and each sex group. Improving physical status of the patients also influences on their psychological condition and increases ability of return to work and participating in social activities as well as improving well being.

There are a few studies in Iran in this area which are different in their intervention and the studied populations. In a study by Abbasi et al. which evaluated the effect of walking program at home on quality of life and functional ability in patients with heart failure using Minnesota questionnaire.²⁴ Mohammadi and colleagues have shown the effects of home-based cardiac rehabilitation on quality of life in patients with myocardial infarction²³ using MacNew questionnaire. Both studies compared

QOL between case and control groups but at the present study, we compared age and sex groups after a comprehensive CR. Zwisler et al. showed that QOL were improved after CR but anxiety and depression did not significantly change after CR.³¹ The findings of our study were the same as the results of the study by Jegier in 2009 which in both study the duration was 8 weeks.³² Arrigo et al. have shown that a comprehensive CR improves QOL even one year after the program.³³

An investigation by Grace et al. on females showed that QOL and anxiety were improved after CR.³⁴ Although we did not evaluate anxiety and depression, but SF-36 for QOL consists a subsection for mental health. A systematic review article in 2010 indicated that home-based CR and center-based CR both improve QOL.^{35,36} CR can decrease psychological stress of cardiovascular diseases and improve QOL in cardiac patients.³⁶ Izawa et al. pointed out that 12 months CR improves physical index and QOL of cardiac patients.⁶ Mohammadi and colleagues studied impact of 3 months home-based CR on QOL in patients with MI.²³ They reported that CR improved physical and mental aspects of QOL but did not change social aspect of QOL. The results of present study were the same as their findings. Some studies showed that patients with more complex psychological distress benefited from CR more than others.³⁷ However, there were some investigations

with different findings; in Serber et al. study, impact of CR on patients with severe psychological distress was more than others in physical, mental and social aspects of QOL,³⁸ while Hevey et al. showed that QOL was related to primary level of psychological distress of the patients and CR could improve QOL and anxiety just in these group of patients.³⁹

The impact of CR was the same in both age groups in our study. In Marchionni et al. study, CR improved QOL in patients with 65 years or more as well as those with less than 65 years.⁴⁰ At present study, most of patients participated in the program after CABG and PTCA but a few after MI (4%), while in study by Marchionni et al. all the patients had suffered from MI.⁴⁰ Seki et al. showed that elder patients were improved more than others.⁴¹ In our study, QOL was improved in female more than males in mental health, vitality, and physical function, although their age was the same. It can be related to low level of their exercise capacity and QOL in the beginning of the study.^{42,43}

Conclusion

The results of our study showed that CR can improve QOL in PF, PL, BP and V after 8 weeks comprehensive CR. Because this study did not have control group, its results is not strong enough, however, because there are few studies in Iran about impact of CR on QOL in sex and age groups, its results are important. It is recommended to evaluate the impact of different models of CR in different population for example CABG, PTCA, heart failure, etc.

Conflict of Interests

Authors have no conflict of interests.

References

1. Fletcher GF, Balady G, Blair SN, Blumenthal J, Caspersen C, Chaitman B, et al. Statement on exercise: benefits and recommendations for physical activity programs for all Americans. A statement for health professionals by the Committee on Exercise and Cardiac Rehabilitation of the Council on Clinical Cardiology, American Heart Association. *Circulation* 1996; 94(4): 857-62.
2. Goto Y, Itoh H, Adachi H, Ueshima K, Nohara R. Use of exercise cardiac rehabilitation after acute myocardial infarction. *Circ J* 2003; 67(5): 411-5.
3. Oldridge NB, Guyatt GH, Fischer ME, Rimm AA. Cardiac rehabilitation after myocardial infarction. Combined experience of randomized clinical trials. *JAMA* 1988; 260(7): 945-50.
4. Goto Y, Sumida H, Ueshima K, Adachi H, Nohara R, Itoh H. Safety and implementation of exercise testing and training after coronary stenting in patients with acute myocardial infarction. *Circ J* 2002; 66(10): 930-6.
5. Niebauer J, Hambrecht R, Velich T, Hauer K, Marburger C, Kalberer B, et al. Attenuated progression of coronary artery disease after 6 years of multifactorial risk intervention: role of physical exercise. *Circulation* 1997; 96(8): 2534-41.
6. Izawa K, Hirano Y, Yamada S, Oka K, Omiya K, Iijima S. Improvement in physiological outcomes and health-related quality of life following cardiac rehabilitation in patients with acute myocardial infarction. *Circ J* 2004; 68(4): 315-20.
7. Jette DU, Downing J. Health status of individuals entering a cardiac rehabilitation program as measured by the medical outcomes study 36-item short-form survey (SF-36). *Phys Ther* 1994; 74(6): 521-7.
8. Lindsay GM, Hanlon WP, Smith LN, Belcher PR. Experience of cardiac rehabilitation after coronary artery surgery: effects on health and risk factors. *Int J Cardiol* 2003; 87(1): 67-73.
9. Morrin L, Black S, Reid R. Impact of duration in a cardiac rehabilitation program on coronary risk profile and health-related quality of life outcomes. *J Cardiopulm Rehabil* 2000; 20(2): 115-21.
10. Hevey D, Brown A, Cahill A, Newton H, Kierns M, Horgan JH. Four-week multidisciplinary cardiac rehabilitation produces similar improvements in exercise capacity and quality of life to a 10-week program. *J Cardiopulm Rehabil* 2003; 23(1): 17-21.
11. The World Health Organization Quality of Life Assessment (WHOQOL): development and general psychometric properties. *Soc Sci Med* 1998; 46(12): 1569-85.
12. Ades PA, Coello CE. Effects of exercise and cardiac rehabilitation on cardiovascular outcomes. *Med Clin North Am* 2000; 84(1): 251-xi.
13. Ades PA. Cardiac rehabilitation and secondary prevention of coronary heart disease. *N Engl J Med* 2001; 345(12): 892-902.
14. Pinsky JL, Jette AM, Branch LG, Kannel WB, Feinleib M. The Framingham Disability Study: relationship of various coronary heart disease manifestations to disability in older persons living in the community. *Am J Public Health* 1990; 80(11): 1363-7.
15. Williams MA, Fleg JL, Ades PA, Chaitman BR, Miller NH, Mohiuddin SM, et al. Secondary prevention of coronary heart disease in the elderly (with emphasis on patients > or =75 years of age): an American Heart Association scientific statement from the Council on Clinical Cardiology Subcommittee on Exercise, Cardiac Rehabilitation, and Prevention. *Circulation* 2002; 105(14): 1735-43.

16. Saeidi M, Rabiei K, Mohammadifard N. Effects of cardiac Rehabilitation on lipid profile in high-risk cardiac patients. *Pajouhesh Dar Pezeshki* 2003; 8(4): 20-4. [In Persian].
17. Roohafza HR, Saeidi M, Sadeghi M, Boshtam M, Rabiei K. Effect of cardiac Rehabilitation on psychological stresses in an Iranian population. *Pajouhesh Dar Pezeshki* 2003; 8(3): 94-7. [In Persian].
18. Saeidi M, Rabiei K, Najafiyani J. Outcomes of cardiac rehabilitation after angioplasty (PTCA), bypass surgery (CABG) and myocardial infarction (MI). *Armaghane-danesh* 2005; 9(36): 47-54. [In Persian].
19. Rabiei K, Saeidi M. Obesity in cardiac patients. *J Isfahan Med Sch* 2004; 71: 20-4. [In Persian].
20. Rabiei K, Boshtam M, Mirzaei H, Saeidi M, Sadeghi M. Cardiac rehabilitation, Exercise capacity and mental status after myocardial infarction. *Urmia Med J* 2004; 15(2): 92-9. [In Persian].
21. Ghalghamash R, Goosheh B, Keyhani M, Bazrafshan AR, Barzegari M, Hosseini A. Importance of phase 2 of cardiac rehabilitation. *J Med Counc I R Iran* 2006; 24(2): 123-32. [In Persian].
22. Saeidi M, Rabiei K. Cardiac rehabilitation in patients with diabetes mellitus. *ARYA Atheroscler* 2005; 1(3): 202-6.
23. Mohammadi M, Taherian A, Hoseini M, Rahgozar M. Effects of home-based cardiac rehabilitation on quality of life in patients with myocardial infarction. *Rehabilitation* 2006; 7(3): 11-9. [In Persian].
24. Abbasi A, Fayyazi S, Ahmadi F, Haghighizade MH. The efficacy of home walking exercise program on functional performance and quality of life in patients with heart failure. *J Gorgan Univ Med Sci* 2007; 9(1): 49-54. [In Persian].
25. Pashkow FJ, DaFoe WA. *Clinical Cardiac Rehabilitation: A Cardiologist's Guide*. Philadelphia, PA: Williams & Wilkins; 1999. p. 458-63.
26. American Association of Cardiovascular & Pulmonary Rehabilitation. *Guidelines for Cardiac Rehabilitation and Secondary Prevention Programs: Promoting Health & Preventing Disease*. 3rd ed. London, UK: Human Kinetics; 1999.
27. Pashkow P, Ades PA, Emery CF, Frid DJ, Houston-Miller N, Peske G, et al. Outcome measurement in cardiac and pulmonary rehabilitation. AACVPR Outcomes Committee. American Association of Cardiovascular and Pulmonary Rehabilitation. *J Cardiopulm Rehabil* 1995; 15(6): 394-405.
28. Asghari-Moghadam M, Faghihi S. Reliability and validity of Short Form-36 health survey in two Iranian samples. *Daneshvar Raftar* 2003; 10(1): 1-10. [In Persian].
29. Kiebzak GM, Pierson LM, Campbell M, Cook JW. Use of the SF36 general health status survey to document health-related quality of life in patients with coronary artery disease: effect of disease and response to coronary artery bypass graft surgery. *Heart Lung* 2002; 31(3): 207-13.
30. Rejeski WJ, Mihalko SL. Physical activity and quality of life in older adults. *J Gerontol A Biol Sci Med Sci* 2001; 56 Spec No 2: 23-35.
31. Zwisler AD, Soja AM, Rasmussen S, Frederiksen M, Abedini S, Appel J, et al. Hospital-based comprehensive cardiac rehabilitation versus usual care among patients with congestive heart failure, ischemic heart disease, or high risk of ischemic heart disease: 12-month results of a randomized clinical trial. *Am Heart J* 2008; 155(6): 1106-13.
32. Jegier A, Jegier A, Szmigielska K, Bilinska M, Brodowski L, Galaszek M, et al. Health-related quality of life in patients with coronary heart disease after residential vs ambulatory cardiac rehabilitation. *Circ J* 2009; 73(3): 476-83.
33. Arrigo I, Brunner-LaRocca H, Lefkovits M, Pfisterer M, Hoffmann A. Comparative outcome one year after formal cardiac rehabilitation: the effects of a randomized intervention to improve exercise adherence. *Eur J Cardiovasc Prev Rehabil* 2008; 15(3): 306-11.
34. Grace SL, Grewal K, Arthur HM, Abramson BL, Stewart DE. A prospective, controlled multisite study of psychosocial and behavioral change following women's cardiac rehabilitation participation. *J Womens Health (Larchmt)* 2008; 17(2): 241-8.
35. Taylor RS, Dalal H, Jolly K, Moxham T, Zawada A. Home-based versus centre-based cardiac rehabilitation. *Cochrane Database Syst Rev* 2010; (1): CD007130.
36. Artham SM, Lavie CJ, Milani RV. Cardiac rehabilitation programs markedly improve high-risk profiles in coronary patients with high psychological distress. *South Med J* 2008; 101(3): 262-7.
37. Lavie CJ, Milani RV, Cassidy MM, Gilliland YE. Effects of cardiac rehabilitation and exercise training programs in women with depression. *Am J Cardiol* 1999; 83(10): 1480-3, A7.
38. Serber ER, Todaro JF, Tilkemeier PL, Niaura R. Prevalence and characteristics of multiple psychiatric disorders in cardiac rehabilitation patients. *J Cardiopulm Rehabil Prev* 2009; 29(3): 161-8.
39. Hevey D, McGee HM, Horgan J. Relationship of initial level of distress to changes in health-related quality of life during cardiac rehabilitation or usual care. *Psychosom Med* 2007; 69(8): 793-7.
40. Marchionni N, Fattiroli F, Fumagalli S, Oldridge N, Del LF, Morosi L, et al. Improved exercise tolerance and quality of life with cardiac

rehabilitation of older patients after myocardial infarction: results of a randomized, controlled trial. *Circulation* 2003; 107(17): 2201-6.

41. Seki E, Watanabe Y, Sunayama S, Iwama Y, Shimada K, Kawakami K, et al. Effects of phase III cardiac rehabilitation programs on health-related quality of life in elderly patients with coronary artery disease: Juntendo Cardiac Rehabilitation Program (J-CARP). *Circ J* 2003; 67(1): 73-7.
42. Unsar S, Sut N. Depression and health status in elderly hospitalized patients with chronic illness. *Arch Gerontol Geriatr* 2010; 50(1): 6-10.
43. Kennedy MD, Haykowsky M, Daub B,

van Lohuizen K, Knapik G, Black B. Effects of a comprehensive cardiac rehabilitation program on quality of life and exercise tolerance in women: A retrospective analysis. *Curr Control Trials Cardiovasc Med* 2003; 4(1): 1.

How to cite this article: Saeidi M, Mostafavi M, Heidari H, Masoudi S. **Effects of a comprehensive cardiac rehabilitation program on quality of life in patients with coronary artery diseases.** *ARYA Atheroscler* 2013; 9(3): 179-85.