General health improves with home-based cardiac rehabilitation program

Sarieh Poortaghi, MSc, Shirin B. Atri, MSc, Abdolrasoul Safayian, MSc, Ali Baghernia, MD.

ABSTRACT

الأهداف: التحقق من أهمية استمرار برامج تأهيل مرضى القلب في المنزل، وما إذا كان لها تأثير إيجابي على الصحة العامة والنفسية لدى المرضى المشاركين في مجموعة التدخل مقارنةً بمجموعة التحكم.

الطريقة: أُجريت هذه الدراسة المُراقبة العشوائية في مركز تبريز لإعادة التأهيل، تبريز، إيران وذلك خلال الفترة من فبراير 2009م إلى يناير 2010م، حيث شملت 80 مريضاً تم تحويلهم إلى مركز إعادة التأهيل، وفي الدراسة تم تقسيمهم عشوائيا إلى مجموعتين وهما: مجموعة التحكم، ومجموعة التدخل. لقد تلقى المرضى في كلي المجموعتين مجموعة من برامج التأهيل الروتينية والخاصة بمرضى القلب، غير أن مرضى مجموعة التدخل قد تم تثقيفهم وتدريبهم على مجموعة من برامج التأهيل، بالإضافة إلى زيارة الممرضات لهم في المنزل في فترة المتابعة. وتم استخدام استبيان الصحة العامة من أجل تقييم الصحة العامة والنفسية لدى المرضى وعمل مقارنة بين المجموعتين قبل التدخل، وفي خلال فترات المتابعة. وبعد ذلك تم تحليل البيانات المُعطاة في الاستبيان بواسطة كلاً من برنامج مينيتاب الإحصائي ونموذج تحليل التباين للقياسات المتكررة.

النتائج: لقد وصلت نسبة المشاركين الذكور في هذه الدراسة إلى 75% (العدد=60)، فيما كانت نسبة الإناث 25% (العدد=20)، وكانت الأعمار تتراوح ما بين 57.41±1.01 عاماً. أظهرت نتائج الدراسة أن هناك اختلافاً إحصائياً واضحاً بين المجموعتين وذلك فيما يخص الصحة العامة (*p*=0.000)، والقياسات الأخرى (*p*=0.000).

خاتمة: أثبتت الدراسة أن لاستمرار برامج التأهيل في المنزل تأثيراً إيجابياً على الصحة العامة لدى مرضى القلب، ولذلك يُنصح بتحويل المرضى الذين يعانون من مشاكل في القلب إلى مراكز التأهيل.

Objectives: To determine whether continuing cardiac rehabilitation programs at home has positive effects on psychological and general health of the participants' in comparison with the control group.

Method: This randomized controlled trial was conducted in Tabriz Shahid Madani rehabilitation center, Tabriz, Iran between February 2009 and January 2010. Eighty patients referred to the rehabilitation center were randomly divided into case and control groups. Both groups received routine cardiac rehabilitation program in the rehabilitation center. In addition, the case group received education and practical training in various rehabilitation measures along with home visits of a community health nurse in follow-up period. General Health Questionnaire (GHQ-28) was used to assess psychological and general health between the 2 groups at baseline and on follow-up period. Collected data from the GHQ-28 were analyzed using Minitab software and repeated measurement analysis model.

Results: In this study, 75% (n=60) of participants were male and 25% (n=20) were female with an age range of 57.41±1.01 years (mean±SE). The results showed statistical significant difference in general health (*p*=0.000) between the 2 groups and in different measurements (*p*=0.000).

Conclusion: Home-based cardiac rehabilitation has a positive effect on patients' general health, thus referring patients who suffer from heart diseases is recommended.

Coronary heart disease (CHD) is a major cause of mortality and morbidity and a growing problem worldwide. It is estimated that some 50 million people have existing CHD.[1] Although mortality from coronary heart disease has decreased in many developed countries in recent decades, morbidity is increasing as a result of improved diagnosis and more successful treatment of acute illness which has resulted in an increase in the number of people who survive heart disease.[1,2] Cardiac rehabilitation has been clearly shown to improve fitness, morbidity and mortality in persons recovering from acute cardiac illness.[3] Therefore, it should be considered as a standard of care after a myocardial infarction or coronary bypass surgery.[4,5] Today, home rehabilitation for heart patients following uncomplicated heart attack is developing as a model of care because it is more useful and appropriate and responsibility of client is appointed to him or herself, thus it increases their independence.[6,7] Trials comparing home-based cardiac rehabilitation with supervised center-based cardiac rehabilitation programs have been published.[3,8-10,16] The results comparing home based cardiac rehabilitation with center-based rehabilitation are variable. Some of these studies have similar improvements in exercise capacity, systolic blood pressure or serum cholesterol in follow-up period between home and center-based groups. In a study, there was no evidence of a difference in outcomes in patients with stable coronary heart disease who received home based or center based cardiac rehabilitation in the short term (3-12 months) or longer term (up to 24 months).[10] A home-based program reported significantly reduced hospital admissions in the home-based group during the first 6-months of follow-up compared to patients receiving usual care. In a cardiac rehabilitation program following coronary artery bypass graft (CABG), the patients in the home-based arm reported a significantly improved quality of life compared to patients attending a hospital program.[9] There are few drawbacks of center-based rehabilitation. The main reasons of the people for not accepting the invitation to attend the center based cardiac rehabilitation classes, held for groups in hospitals, gyms, or community leisure centers, were accessibility and parking at their local hospital, unwillingness to participate in a group, and work or domestic commitments. These problems can be overcome by home-based programs, which have been introduced in an attempt to widen access and participation.[11] Home-based rehabilitation of the patients is conducted by house visit of community health nurses. Community health nurses act in 3 levels of prevention, and they also have an important role in helping patients with restarting their function or increasing activity and exercise during a cardiac rehabilitation program in hospital or institute. Nurses act as a coordinator, performer of the rehabilitation program or both of them.[12] The aim of this study was to determine whether continuing cardiac rehabilitation programs at home has positive effects on general health of the participants in comparison with the control group.

Methods. This randomized controlled trial was conducted in Tabriz Shahid Madani rehabilitation center, Tabriz, Iran from Febraury 2009 to January 2010. Study population included all patients referred to ambulatory rehabilitation center 1.5 months after being discharged from the hospital. Patients were in the groups of post-CABG, myocardial infarction (MI) or percutaneous transluminal coronary angioplasty (PTCA). Baseline assessments including echocardiography and stress test/exercise tolerance test (ETT) were carried out by the cardiologist. Inclusion criteria were age between 30-75 years, lack of mobility limiting disease, mental disorders, untreated heart failure, uncontrolled arrhythmias, and stable angina. Patients not willing to participate in the study or having developed any cardiovascular or musculoskeletal problems during rehabilitation program were excluded. Sample size based on the previous studies with 95% confidence, 95% power, standard deviation of both groups (1.75 and 1.2), maximum error 1.2, using following formula was estimated 80 people, 40 in each group.

$$n = \frac{(z_{1}\text{-}\alpha/2 + z_{1\text{-}\beta})^2 \ [1/75^2 + 1/2^2]}{[1/2]^2}$$

Patients meeting the inclusion criteria and giving informed consent are randomly assigned to the intervention or control group. After matching the samples in the case and control groups by gender, age, co-morbidities and severity of illness, the General Health Questionnaire (GHQ-28) which was completely valid and reliable scale, was given to both groups in able to complete them. The GHQ-28 was used to detect psychiatric disorder in the general population as well as general medical outpatients. In the GHQ-28, the respondent was asked to compare his recent psychological state with his usual state. All items had a spectrum scoring system from 0-3. The GHQ-28 contains 28 items that, through factor analysis, have been divided into 4 subscales. The 4 scales of GHQ-28 (A: physical symptoms, B: anxiety/insomnia, C: social dysfunction, and D: depression) have been found as a 4-factor structures in the previous studies (**Appendix 1**).

Regarding previous studies, the cut-off point in the scores of GHQ-28 that allow optimal identification of people with mental health disorders was 24. By this

mean, those scoring ≥24 were designated as possible case of mental disorder. In addition, as the values in the table decrease the score of general health is better. Both groups received routine cardiac rehabilitation program in rehabilitation center and at the end of 12th session, the GHQ-28 was completed by all of them. In the case group, education regarding risk factors, nutrition, taking medication, the necessity of continuing program at home was given by nurse and nutritionist. Practical training on measuring heart rate, detecting target heart rate, doing suitable exercises at home, setting the home exercise program, walking and jogging was performed by a team including nurse and physiotherapist. Furthermore, the structure and the contents of training course were handed out to the patients in the intervention group.

At the end of the first and second months after program, the researcher, as a community health nurse, visited the patients in the case group twice at home. At home, the visiting nurse controlled the rehabilitation continuing program, and they discussed the possible problems, which is related to rehabilitation program. At both times of the home visits GHQ-28 was completed. In the control group, the GHQ-28 was completed at the same time, and the data were collected. As previously mentioned, this study was a repeated measurement, and the GHQ-28 was completed 4 times by each patient. At the end of the study, due to ethical considerations, both written and practical educations were given to the control group.

After data collection, the demographic characteristics were analyzed using the descriptive statistics including frequency and mean±SD. Differences between groups or matching were analyzed by x^2 and one way t-test. The GHQ-28 data were analyzed by Minitab software using repeated data analyzing model with the following formula: Scale variation = Personal difference + Time + Group in time + Residuals.

Results. We randomized 80 patients, 40 were assigned in the control group and 40 in the case group. The demographic and general health characteristics of both groups were similar at baseline. The mean age in the case group was 57.05 ± 1.51 years (mean±SE) versus 57.78 ±1.36 years in the control group. The T-test showed no significant differences between groups (p=0.624). The maximum age of participants was 76 and minimum was 40 years. Comparing the gender, the case group was 72.5% (n=29) male and 27.5% (n=11) female and in the control group 77.5% (n=31) male and 22.5% (n=9) female, in which the x^2 test showed no statistically significant differences between groups (p=0.398). There was no first time (before the beginning of rehabilitation program) difference regarding the general health between case (20.93±0.58) and control

(26.38±0.71) groups (p=0.10). Analysis of repeated measurement data showed that the general health scale in repeated measurements during the time of the program was improved (20.93±0.58 at the beginning versus 16.90±0.66 at the end of second month) and we found a statistically significant difference between the 2 study groups and it means that our intervention affects the scale and the patients in the case group improved the general health and showed better results (p=0.000) (**Table 1**). There were significant reaction time differences measurement (p=0.000), which means that this scale was improved within the time. Analysis was carried out separately on the subscales of the questionnaire.

General health subscales. Data analysis of physical symptoms, the first subscale of general health, anxiety and insomnia subscale, social function and depression scale showed statistically significant difference between

Table 1 - General health trend of patients continued program at home in comparison with the control.

Group and time	Case	Control
Time 1	20.593 ± 0.58	26.38 ± 0.71
Time 2	18.13 ± 0.72	23.81 ± 0.68
Time 3	17.27 ± 0.71	23.49 ± 0.62
Time 4	16.90 ± 0.66	23.90 ± 0.63
Results	P=0.000 (group)	
	P=0.000 (time)	

Time 1: beginning of program, Time 2: finishing the program in rehabilitation center, Time 3: end of the first month, Time 4: end of the second month

Table 2 - Physical symptoms trend of patients continued program at home in comparison with the control.

Group and time	Case	Control
Time 1	5.4 ± 0.37	6.88 ± 0.43
Time 2	4.85 ± 0.35	6.09 ± 0.42
Time 3	4.79 ± 0.29	5.34 ± 0.42
Time 4	4.47 ± 0.22	5.29 ± 0.38
Result	P=0.002 (group)	
	P=0.000 (time)	

Time 1: beginning of program, Time 2: finishing the program in rehabilitation center, Time 3: end of the first month, Time 4: end of the second month

Table 3 - Anxiety symptoms and insomnia trend of patients continued program at home in comparison with the control.

Group and time	Case	Control
Time 1	5.98 ± 0.33	6.81 ± 0.26
Time 2	5.30 ± 0.37	6 ± 0.45
Time 3	4.85 ± 0.37	5.34 ± 0.42
Time 4	4.73 ± 0.33	5.29 ± 0.38
Result	PV group=0.004	
	PV Time =0.000	

Time 1: beginning of program, Time 2: finishing the program in rehabilitation center, Time 3: end of the first month, Time 4: end of the second month

Table 4 - Social function trend of patients continue program at home in comparison with the control.

Group and time	Case	Control
Time 1	5.51 ± 0.28	5.74 ± 0.28
Time 2	4.72 ± 0.27	5.55 ± 0.38
Time 3	4.50 ± 0.23	5.44 ± 0.33
Time 4	4.39 ± 0.22	5.47 ±0.26
Result	P=0.006 (group)	
	P=0.000 (time)	

Time 1: beginning of program, Time 2: finishing the program in rehabilitation center, Time 3: end of the first month, Time 4: end of the second month

Table 5 - Depression trend of patients continued program at home in comparison with the control.

Group and time	Case	Control
Time 1	4.06 ± 0.25	6.94 ± 0.28
Time 2	3.24 ± 0.28	6.17 ± 0.38
Time 3	3.14 ± 0.26	6.64 ± 0.33
Time 4	3.29 ± 0.28	7.23 ± 0.26
Result	P=0.000 (group)	
	P=0.000 (group)	

Time 1: beginning of program, Time 2: finishing the program in rehabilitation center, Time 3: end of the first month, Time 4: end of the second month

2 groups (p=0.002; p=0.004; p=0.006; p=0.000) (**Table 1**). In different time measurements, there was a significant difference (all p=0.000), which means that our intervention improved the physical symptoms of the patients (**Tables 2-5**). In this study, we found that anxiety and insomnia subscales were significantly different between groups and our intervention improved this scale (p=0.004). There was also statistically significant difference in repeated measurements during the time of the program (p=0.000) (**Table 2**).

Data analysis of social function item showed significant difference between groups (p=0.006), which indicates positive effect of continuing rehabilitation programs at home. In addition, there was significant difference in repeated measurements (p=0.000), which suggests the social function improvement with continuing rehabilitation (**Table 3**). There was also significant difference between depression scale group (p=0.000) and in repeated measurements in different time (p=0.000). **Table 4** showed that our intervention, and continuing cardiac rehabilitation programs at home significantly affected depression scale.

Discussion. Analysis of demographic data showed that 75% of patients who were referred to cardiac rehabilitation program were male and 25% were female. This finding confirms that male gender is a risk factor for coronary artery disease. In addition, previous studies have showed that women and elder patients in comparison with men and younger patients are less likely to participate in the program.[13] In the present study, a statistically significant difference was observed regarding the general health scale between groups, and it means that in the case group, the nurse education, follow-up and home visit as well as continuing program at home, affected the general health and they reported better scale. Artham et al[14] determined that coronary patients with high psychological distress with cardiac rehabilitation markedly improved high risk profiles including weight (p<0.001), triglyceride (p<0.001), body mass index (p<0.01), anxiety and depression symptoms (p<0.001), and quality of life,[14] and these findings are in line with our study findings in general health scale as well as in physical symptoms, anxiety, and depression subscales. In the study of Asbury et al,[15] "cardiac rehabilitation as a treatment of psychological and physiological morbidity in women with chest pain", determined that after cardiac rehabilitation, patients demonstrated improved symptom severity (p=0.009), hospital anxiety and depression scale (p=0.04), total health anxiety questionnaire score (p=0.008), health worry (p=0.025) and interference (p=0.004), SF-36 physical functioning (p=0.006), energy (p<0.001), pain (p=0.028) and general health follow up, which are in accordance with the findings of the present study. Jolly et al[16] evaluated the effectiveness and cost-effectiveness of home-based compared to hospital-based cardiac rehabilitation, and the results showed changes in physical activity, exercise tolerance, and quality of life after 6 months in the case group,[16] and these results are in line with our study findings. In this study, we just evaluated the psychological effects of rehabilitation program on patients' general health. Further study is recommended to study other effects of home-based cardiac rehabilitation such as well-being, return to job, further complications and other outcomes.

In conclusion, the home-based rehabilitation program has a positive effect on patient's general health as well as its 4 subscales. Also, these results can confirm that appropriate and effective training of patients, continuity of care, and providing home follow-up can relieve the difficulties caused by patients not referred to ambulatory rehabilitation center. Community health nurses also play an important role in the 3 levels of prevention. Doing home visits is also one of their most important and fundamental tasks. According to the descriptions available, community health nurses are the best options for continuing education, accompanying patients, and performing follow-up at home.

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Appendix 1 - General Health Questionnaire (28 items).

Have you recently
A1: been feeling perfectly well and in good health?
A2: been feeling in need of a good tonic?
A3: been feeling run down and out of sorts?
A4: felt that you are ill?
A5: been getting any pains in your head?
A6: been getting a feeling of tightness or pressure in your head?
A7: been having hot or cold spells?

B1: lost much sleep over worry?
B2: had difficulty in staying asleep once you are off?
B3: felt constantly under strain?
B4: been getting edgy and bad-tempered?
B5: been getting scared or panicky for no good reason?
B6: found everything getting on top of you?
B7: been feeling nervous and strung-up all the time?

C1: been managing to keep yourself busy and occupied?
C2: been taking longer over the things you do?
C3: felt on the whole you were doing things well?
C4: been satisfied with the way you've carried out your task?
C5: felt that you are playing a useful part in things?
C6: felt capable of making decisions about things?
C7: been able to enjoy your normal day-to-day activities?

D1: been thinking of yourself as a worthless person?
D2: felt that life is entirely hopeless?
D3: felt that life isn't worth living?
D4: thought of the possibility that you might make away with yourself?
D5: found at times you couldn't do anything because your nerves were too bad?
D6: found yourself wishing you were dead and away from it all?
D7: found that the idea of taking your own life kept coming into your mind?

A - physical symptoms, B - anxiety/insomnia, C - social dysfunction, D - depression