Effect of Cardiac Rehabilitation Program on Physiological Risk Parameters of Patient with Coronary Heart Disease.

By

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Abstract:

Coronary heart disease (CHD) has been the most common cause of death for both women and men. CHD is a chronic condition needing long-term rehabilitation measures to decrease mortality, morbidity and improve quality of life. Cardiac rehabilitation (CR) is a long- term multifactor rehabilitation program aimed at the secondary prevention of cardiovascular events. Therefore, the aim of the study was examine the effect of cardiac rehabilitation program on cardiac physiological risk parameters of patients with coronary heart disease. *Methods* Quasi-experimental research design was conducted in the inpatient & outpatient for follow up unit in cardiology department of the Specialized Medical Hospital at Mansoura University Hospital. Convinces sample of this study composed of 74 adult patients of both sexes who corresponded to inclusion criteria and divided alternatively into two equal groups study and experimental. Results the result indicates significant improvement in physiological risk parameters in study group after rehabilitation sessions. Conclusion positive effect of cardiac rehabilitation program on improvement of cardiac physiological risk parameters of CHD patients.

Key words: Cardiac Rehabilitation, Rehabilitation Program, Physiological risk parameters, Coronary heart disease.

Introduction:

Coronary heart disease (CHD) is the leading cause of mortality & it is the most common type of cardiovascular disease in adults. Cardiovascular diseases (CVD) are responsible for 16.7 millions of deaths around the world each year[1].CHDs have been known to be preventable through healthy lifestyle modifications and Consistent maintenance of chronic diseases[2].

Compelling evidence has demonstrated the role of cardiac behavioral and physiological risks in the development and progression of coronary heart disease (CHD). Cigarette smoking, high-fat high-cholesterol diet and physical inactivity constitute the major cardiac behavioral risks; and serum dyslipidaemia, high blood pressure (BP) and being overweight are the major cardiac physiological risks being modifiable[3]. Thus, Cardiac rehabilitation in coronary heart disease (CHD) emphasizes on control of major modifiable coronary risk factors- smoking, high blood pressure, low-density lipoprotein (LDL) , cholesterol, triglyceride , weight and sedentary lifestyle.

A combination of lifestyle modification and pharmacological interventions are available for control of most of these factors. Regular physical activity helps in control of multiple cardiovascular risk factors[4,5].

Cardiac rehabilitation is an important continuing care program for patients with CAD that targets risk reduction by means of education, individual and group support, and physical activity. The goals of rehabilitation for the patient who has had myocardial infarction are to extend life and improve the quality of life. The immediate objectives are to limit the effects and progression of atherosclerosis, return the patient to work and pre illness lifestyle, enhance the psychosocial and vocational status of the patient, and prevent another cardiac event[6].

The cardiac rehabilitation program provides the opportunity to each person to more positive lifestyle behaviors and sustained healthy habits enabling a person in cardiac rehabilitation to change what will be ingrained lifestyle behaviors may be a difficult yet rewarding experience. Many of the lifestyle behaviors will have been developed over years and will be reinforced

by the social and community settings in which the person lives[7].

Aim of study:

The aim of the study was to examine the effect of cardiac rehabilitation program on physiological risk parameters of patients with coronary heart disease.

Research hypothesis:

Cardiac patients attending cardiac rehabilitation program will exhibit less physiological risk parameters than non attending.

Subjects & Methods:

Study Design:-

Quasi-experimental research designs were used in this study.

Setting:-

This study was conducted at the inpatient & outpatient for follow up unit in cardiology department of the Specialized Medical Hospital at Mansoura University Hospital.

Subjects

Sample of this study comprised 74 adult patients of both sexes. Who diagnosed as angina pectoris and myocardial infarction. The sample size was calculated by using European Patent Institute EPI information program version 6.02; calculating sample size at confidence level 95%, power value 80%, percent 50% and error 10%.

The study subjects were divided randomly into two equal groups; study group, consisted of 37 adult patients who received the routine hospital care and the planned cardiac rehabilitation program, Control group, consisted of 37 adult patients who received the routine hospital care only.

The patients were selected based on the following criteria

Inclusion criteria:

Adult patients diagnosed with angina pectoris or myocardial infarction since 6 months or more, Willing to participate in the study , Both sex, Aged from 20 to lower than 60 years old, Able to speak, read, and write , and Available for telephone follow-up.

Exclusion criteria:

- Planning for surgical treatment

- With diagnosed psychosis or currently undergoing antipsychotic treatment.
- Heart failure or other co-morbid disease as renal failure.

Tools:

The following tools will be utilized to collect data pertinent to the study

Socio-demographic characteristics and medical information: To assess, age, sex, marital status, occupation, educational level, and history of disease.

Cardiac physiological risk parameters questionnaire :   Three categories of cardiac physiological risk parameters were assessed in this study: serum lipids, body weight and BP. Body weight was examined using a balance scale, with patients in light clothing, shoes removed. Arterial BP on the right arm in a sitting position was measured by the auscultatory method. Lipid Testing (total cholesterol TC, triglyceride TG, low density lipoprotein LDL, high density lipoprotein HDL) was carried out in the Blood Biochemistry Laboratory. Patients were instructed to take nothing orally except water and medication for 12 hours before the test.

Methods :

Official written permission to conduct the study will be obtained by the researcher from responsible authorities of cardiology department of specialized Medical hospital, Mansoura University.

Developed tools I& II revised by 7 experts in the field of the study to ensure Content validity of tools and the necessary modification was done.

Verbal explanation of the nature and aim of the study will be performed to medical &nursing staff.

The cardiac rehabilitation program was developed by the researcher based on review of literature .It comprised two main parts; educational and training components. A booklet containing the content of the program was designed by the researcher and tested for content validity and the necessary modification was done. It is written in a simple Arabic language and supplemented

by photos and illustrations to help the patient understanding of the content [7]

A pilot study was conducted on 10 patients from cardiology department in Specialized-Medical Hospital in order to examine the clarity and applicability of the tools. These patients were not included in the study sample.

Human rights and Ethical consideration, prior to the pilot of this study, verbal consent approval was obtained from each participating patient prior to his /her inclusion into the study. Clarification of the nature and purpose of the study will done on the interview with each client .The investigator emphasized participation is absolutely voluntary. Anonymity, privacy, safety and confidentiality were assured the right to withdraw from the study at any time.

Once the necessary approvals granted to proceed with the proposed study, subject who met sampling criteria & agreed to participate in the study, interviewed by the researcher to collect the necessary data and implement the rehabilitation program after explanation for the purpose of the study.

According to the previous mentioned study criteria. The patients was divided randomly to two equal groups; one study or intervention group who will submit to cardiac rehabilitation program, and control group who receive routine care only.

Each patient (both control and study group) will be interviewed individually before applying the planned cardiac rehabilitation program in order to collect the baseline patient's data using the study tools.

Total cholesterol and triglycerides were obtained from patients repots but High density lipoprotein (HDL)was carried out in the Blood Biochemistry Laboratory and LDL cholesterol was calculated by formula: LDL= total cholesterol - (triglycerides/5+HDL).

Also measuring body weight using a balance scale, and measuring height using measuring tap , patient weight recorded in kilogram As regards height, it was measured against the wall, instructing the elderly person to stand straight, bare shoes, heel together, back straight against the wall. The reading was recorded to the nearest centimeters.

After measuring patients weight and height ,body mass index is derived using measured height and weight with the following formula : BMI= weight (kg) / height ^{2} (m).Parameters have been established to delineate underweight ,normal weight and overweight. Body mass index categories: - <20 under weight, 20 to 25 desirable or normal weight >25 to 30 overweight > 30 to 40 obese.

At the end of the assessment phase, the researcher measured the blood pressure using sphygmomanometer for each patient in both groups.

The developed cardiac rehabilitation program was implemented for the study group individually. It was conducted in 4 sessions; each session took about 30 to 45 minutes (according to the activities required in each session and attention span of the patients).

Educational sessions: were carried out in 3 sessions. They included the following:

First session (Overview about CHD and self-management principles).

Second session (medication adherence and Behavior and lifestyle modification (part 1):

Third session: (health Behavior and lifestyle modification (part 2):

Training session: was carried out in one session.

Before starting exercise training , the researcher should ascertain certain parameters as diagnosis, blood pressure, pulse, and dyspnea.

This session include individualized exercise prescription for aerobic training, structured with 10 minutes of warm-up - period should include graduated low intensity aerobic exercise and 20-30 minutes of graduated aerobic training , Low to moderate intensity exercise (walking) ,The conditioning phase should be followed by a minimum of 10 minutes cool-down.

Exercise sessions should be followed by a period of relaxation

Moreover, the instructional booklet was given to each patient in the study group

Telephone visits were provided during 3 months after discharge from hospital by the researcher for patients in the study group to check with them their adherence with the program. Problems and concerns in performing the exercise training were discussed.

Evaluation after three months from hospital discharge and applying the cardiac rehabilitation sessions , evaluation for both study and control groups were done (post test)to determine the effect of program on physiological risk parameters (lipid profile test, blood pressure and body weight). Using the study tool II.

Comparison between control and study group's finding were done to evaluate the effect of cardiac rehabilitation program on physiological risk parameters.

Results:

The data collected were analyzed statistically and the results are categorized into 3 main parts which are: Assessment part, effect of implementing cardiac rehabilitation sessions part, relation part.

Table (1): Socio-demographic characteristics of the study and control groups:

Items	Study group		Control group		Total		Pearson Chi-Square X2 test (P)
	No=37	%	No=37	%	No=74	%	
Age (in years)							
30-39	5	13.5	5	13.5	10	13.5	1.000
40-49	14	37.8	18	48.6	32	43.2	(0.607)
50-60	18	48.6	14	37.8	32	43.2	
Mean± SD	50.32± 7.71		48.49± 7.62				
Sex							0.230
Male	24	64.9	22	59.5	46	62.2	(0.632)
Female	13	35.1	15	40.5	28	37.8	
Marital status							
Married	29	78.4	28	75.7	57	77.0	0.094
Widow	6	16.2	7	18.9	13	17.6	(0.954)
Divorced	2	5.4	2	5.4	4	5.4	
Educational level							
Read& write	15	40.5	16	43.2	31	41.9	
Primary	12	32.4	15	40.5	27	36.5	1.432
Secondary	4	10.8	2	5.4	6	8.1	(0.698)
University &over	6	16.2	4	10.8	10	13.5	

Table 1: Shows the socio-demographic characteristics of the study and control groups. The majority of the study group (48.6%) ranged from 50 to 60years, with a mean age 50.32± 7.71 years, while the majority in the control group(48.6%) ranged from 40 to 49 years, with a mean age 48.49± 7.62 years. No statistical significant differences were detected between two groups regarding their age (x^2=1.000, p=0.607).

Males were more prevalent in the studied sample. They constituted (64.9%) of the study group, and (59.5%) of the control group, with no significant differences between the two groups (x^2= 0.230, p= 0.632).

The majority of patient in the study and control groups (78.4% and 5.7%) respectively were married. No significant difference was detected between the two groups regarding marital status (x^2=0.094, p= 0.954)).

Concerning level of education, read and write was prevailing among 40.5% of the study group and 43.2% of the control group .While 32.4% of the study group and 40.5% of the control group were primary education . No significant difference was detected between the two groups regarding education level (x^2= 1.432, p= 0.698).

Table (2): health related data of the study and control groups:

Health related Items	Study group		Control group		Total		Pearson Chi-Square X2 test (P)
	No=37	%	No=37	%	No=74	%	
Diagnosis							
-Angina	28	75.7	29	78.4	57	77.0	0.076
-Myocardial infarction	9	24.3	8	21.6	17	23.0	(0.782)
Duration of CHD(in years)							
Less than 1 year	0	0	3	8.1	3	4.1	3.690
1-5 years	28	75.7	23	62.2	51	68.9	(0.158)
5+ years-10years	9	24.3	11	29.7	20	27.0	
Mean± SD	2.243±0.434		2.216±0.583				
Felling of symptoms							
-Chest pain							
-Chest pain radiate to shoulder &neck	5	13.5	5	13.5	10	13.5	1.564
	13	35.1	18	48.6	31	41.9	(0.457)
-Chest pressure &difficult in breathing	19	51.4	14	37.8	33	44.6	
Treatment regimen							
-Medication							
-Medication+ diet	2	5.4	4	10.8	6	8.1	1.725
-Medication , diet & avoid risk factor	17	45.9	20	54.1	37	50.0	(0.631)
	8	21.6	6	16.2	14	18.9	
-Medication , diet , avoid risk factor& exercise	10	27.0	7	18.9	17	23.0	

Table 2: Shows health related data among the study and control groups. It is noticed that, angina was the most common diagnosis among study and control groups (75.7% and 78.4% respectively). With No significant difference was detected between the two groups (x^2 = 0.076, p=0.782) .

Regarding duration of disease, (75.7%) of the study group and (62.2%) of control group had CHD since 1 to less than 5 years, while (24.3%) of the study group and (29.7%) of the control group had CHD since 5 years to 10 years or more. With No significant difference was detected between the two groups (x^2 =3.690, p=0.158).

Concerning the present complaints , it was evident that Chest pressure &difficulty in breathing was the main presenting symptoms in the study group (51.4%) . while Chest pain radiate to shoulder &neck was the main presenting symptoms in the control group (48.6%).

Medication and dietary modification was the main components of treatment regimens of CHD for study and control group (45.9% and 54.1% respectively). Medication, diet, avoids risk factor& training exercise were considered the second treatment regimen for study and control group (27.0% and 18.9% respectively)

Table (3): Effect of cardiac rehabilitation sessions on blood pressure and BMI of the study and control groups:

Cardiac physiological risk parameters	Study group		Control group		T test (p) [a]	T test (p) [b]
	Pre-rehab.	3months post rehab.	On admission	After 3months		
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD		
Systolic blood pressure	151.89±12.88	135.54±10.85	153.24±18.60	147.03±13.31	-0.363 (0.717)	-4.069 (0.000)*
T test (p)[1]	7.590 (0.000)*		4.128 (0.000)*			
Diastolic blood pressure	97.16±6.51	87.97±5.46	96.62±7.46	92.43±10.11	0.332 (0.741)	-2.360 (0.022)*
T test (p)[1]	6.809 (0.000)*		4.459 (0.000)*			
Body mass index	28.19±1.97	27.24±1.95	28.03±2.10	27.91±1.79	0.342 (0.733)	-3.600 (0.001)*
T test (p)[1]	7.575 (0.043)*		1.113 (0.273)			

Paired-sample t-test (p) [1]: comparing pre-rehab (on admission) and after 3 months in each group.
Student t-test (p) [a]: comparing study and control groups pre-rehab.
Student t-test (p) [b]: comparing study and control groups 3 months after-rehab.
* Significant, at p ≤0.05

Table(3): Describes blood pressure and BMI of the study and control groups pre and post cardiac rehabilitation sessions. In the study group, systolic blood pressure, diastolic blood pressure and body mass index levels decreased post rehabilitation and the decrease were statistically significant post rehabilitation. On the other hand, systolic blood pressure, diastolic blood pressure and body mass index levels of patients in the control group also decreased post rehabilitation and the decrease were statistically significant post rehabilitation in control group except for body mass index.

There were no statistical significant differences were detected between two groups before applying cardiac rehabilitation sessions regarding systolic blood pressure, diastolic blood pressure and body mass index levels. On the other hand, significant change was detected post rehabilitation sessions between two groups
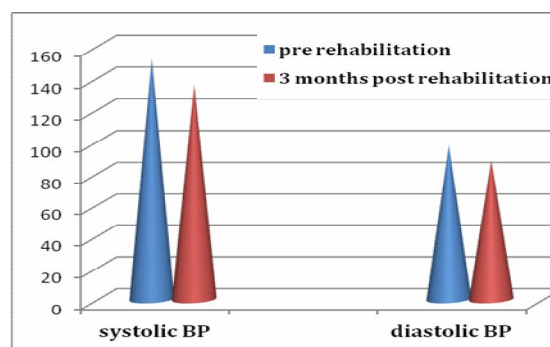

Figure .1: level of blood pressure of the study group *pre* and post the cardiac rehabilitation session.
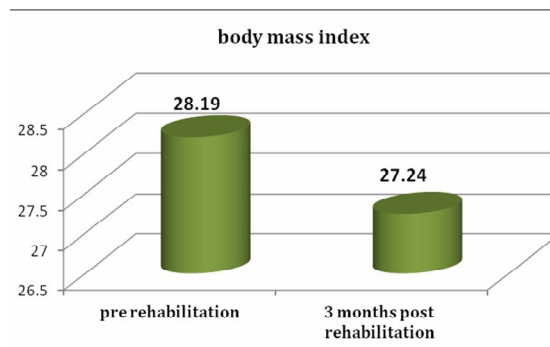

Figure 2: body mass index of the study group *pre* and post the cardiac rehabilitation session.

Table (4): Effect of cardiac rehabilitation sessions on lipid profile of the study and control groups:

Lipid profile	Study group		Control group		T test (p) [a]	T test (p) [b]
	Pre-rehab.	3 months post rehab.	On admission	After 3months		
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD		
Cholesterol	203.46±34.08	188.16±42.03	201.81±33.79	203.27±44.44	0.209 (0.835)	-1.502 (0.137)
T test (p) [1]	4.822 (0.000)*		-0.440 (0.663)			
Triglyceride (TG)	195.11±54.53	189.68±60.35	188.38±49.96	192.81±59.31	0.554 (0.582)	-0.225 (0.822)
T test (p) [1]	2.157 (0.038)*		-1.309 (0.199)			
HDL	27.76±4.78	30.14±7.60	37.97±9.51	38.46±11.39	-5.837 (0.000)*	-3.699 (0.000)*
T test (p) [1]	-3.224 (0.003)*		-0.468 (0.643)			
LDL	136.54±34.15	120.08±42.41	126.14±33.85	125.84±43.78	1.316 (0.192)	-0.574 (0.567)
T test (p) [1]	5.321 (0.000)*		0.083 (0.935)			

Table.4: Describes lipid profile of the study and control groups pre and post cardiac rehabilitation sessions. In the study group, cholesterol, triglyceride TG, and LDL levels decreased post rehabilitation and the decrease was statistically significant post rehabilitation while HDL levels increased and the differences were significant post rehabilitation. On the other hand, cholesterol, triglyceride TG , and HDL levels of patients in the control group increased after three months, while LDL levels decreased and the differences were not statistically significant after three months in control group.

Except for HDL level, all results of lipid profile did not show any significant differences between study and control group either pre or post rehabilitation program.
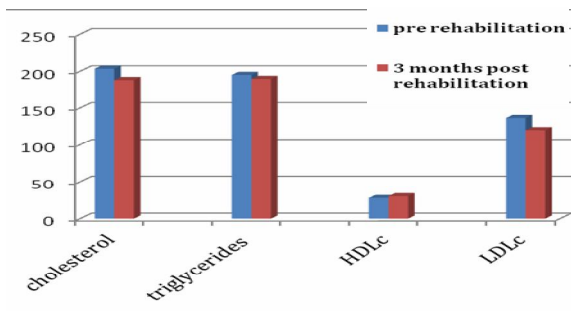

Figure 3: lipid profile of the study group *pre* and post the cardiac rehabilitation session.

Discussion:

Coronary heart disease (CHD) has been the most common cause of death for both women and men [8]. CHD is a chronic condition needing long-term rehabilitation measures to decrease mortality, morbidity and improve quality of life[9]. Cardiac rehabilitation (CR) is a long- term multifactor rehabilitation program aimed at the secondary prevention of cardiovascular events[10].

Cardiac rehabilitation is the art and science of integrating methods, techniques, and processes to assist patients, who have suffered from heart disease, in having better health and improving their quality of life. It is now widely accepted that it is important for patients with heart disease to be trained in cardiac rehabilitation. Cardiac rehabilitation is a process consisting of two major components: training exercises and behavioral change in order to reduce risk factors for cardiovascular diseases [11]. Therefore, the aim of this study was to determine the effects of a cardiac rehabilitation program on cardiac physiological risk parameters of patients with coronary artery disease.

Discussion of the study results will be presented under the following: The socio-demographic background of the present study showed that, the mean age of the study group was 50.32± 7.71 years, while

the mean age of the control group was 48.49± 7.62 years. Males were more prevalent in the studied sample. The majority of patient in the study and control groups were married. Read and write was prevailing among 40.5% of the study group and 43.2% of the control group. About one third of the study group 35.1% was house wife and 45.9% of the control group was practical work. above one half (56.8%) of the study group have enough monthly income. while above one half (54.1%) of the control group didn't have enough monthly income and there were No significant difference were detected as regards socio-demographic characteristics between the two groups.

In relation to age group, the present study findings revealed that more than three-quadrate of the study subjects were in the age group of 40 &50 years and .This in agreement with Sadeghzadeh , (2012) who reported that the majority of the samples were between 45 and 65 years and the most cases the disease is seen in people older than 40 years old[12].American Heart Association (2010) reported that, most cases of CHD occur in adults[1] .

The present study revealed that CHD affected males more than females. This may be attributed to the fact that the estrogen hormone of female provides a consistent protective effect against CHD, the same finding were reported in other epidemiological studies [12,13]. And other study carried out in Seoul, Korea by Kang et al., (2010)who reported that three-quarter of the study sample (75.2%) were male[14]. On the other hand a study carried out in zagazig university hospital by hamed, (2008) who found that more than half of the study subjects were females[15] .

level of education in the present study revealed that most of the study subjects had read and write and primary level of education , this is may be related to the fact that, majority of the study subject came from rural area with low socioeconomic level, interested in manual and farmer work.

In the present study about three-quarter of the study subjects were diagnosed as angina pectoris. The same finding were reported on study carried out in Chengdu, China (2007) reported that over two third of the subjects diagnosed angina pectoris[13].

Concerning cardiac physiological risk parameters , the results of the present study showed that patients in study group had significant improvement in all domains of physiological risk parameters than in control group including (blood pressure , body mass index, and lipid profile). Additionally, the improvement was more marked in the blood pressure and lipid profile (p=0.000) than body mass index (p= 0.043). This may be due to improvement in body mass index take longer to be decline than other physiological parameters in cardiac rehabilitation program. In the same direction , a study done in Jordan by Eshah & Bond (2009) reported that Cardiac rehabilitation program provided significant improvement in participants' quality of life, exercise capacity, lipid profile, body mass index, body weight, blood pressure, resting heart rate, survival rate, mortality rate and decreased myocardial infarction (MI) risk factors[5]. On the same line Jiang et al (2007) in Chengdu, China mentioned that a nurse educational program can significantly improve the health behaviors and cardiac physiological risk parameters in coronary heart disease patients. The change of health behaviors (walking performance, diet adherence, medication adherence, smoking cessation) and physiological risk parameters (serum lipids, blood pressure, body weight) were assessed to evaluate the program effect. Patients in the intervention group demonstrated a significantly better performance in walking, diet adherence, medication adherence; a significantly greater reduction in serum lipids was only observed in triglyceride, total cholesterol, low-density lipoprotein but not in high density lipoprotein, and significantly better control of systolic and diastolic blood pressure at three months[13].

This study also demonstrated a significant positive effect of the program on systolic and diastolic blood pressure at three months. This may be related to better adherence to medication and life style modification. This finding was in accordance with mostafa , (2013) found that blood pressure were significantly improved after twelve weeks of cardiac rehabilitation program[16]. Also study by AlSayed, (2013)reported that highly significant reduction in blood pressure after cardiac rehabilitation program[17] . Other study carried out in Alexandria by Haidar

(2005)   who reported that mean value of systolic and diastolic blood pressure among study group were decreased after application of the program after three months compared to the mean value of systolic and diastolic blood pressure of the control group were increased[18] . on the same direction studies carried out by Kelly et al (2001) & Vale et al (2003) reported similar result[19,20]. In contrast, study carried out by Carlson et al.(2000)was a six month exercise program , reported that no significant effect of the program on blood pressure . This may be attributed to the fact that program were less comprehensive as lack of intervention to medication and lifestyle modification[21].

This study also demonstrated a significant positive effect of the program on body mass index in study group than in control group. The positive results may be related to the fact that program was initiated at the hospital and follow-up after discharge with regular telephone call to adhere to the recommended instruction. On the same line, *AlSayed,   (2013)*reported that highly significant reduction in body mass index after cardiac rehabilitation program[17] . and hamed, (2008) reported that the mean value of BMI of the study subjects was decreased after application of rehabilitation program[15] . also study carried out in Alexandria by Haidar (2005)   who reported that mean value of weight among the study group was decreased after application of the program for three months compared with mean value of weight among the control group was increased, In addition, BMI of the study group was decreased from 33 to 30 kg/m$^{2(18)}$.   also study carried out in Bangkok,   Thailand by Intarakamhang (2013) reported that, patients had decreased their body mass index in comparison with the pretest score after comprehensive cardiac rehabilitation program[11] .Other study carried out by Yu-Poth et al. (1999) demonstrated that, dietary interventions with exercise resulted in a significantly greater weight loss than those without exercise[22]. In contrast study carried out in Ain Shams university by mostafa , (2013) who reported that BMI did not reach to target levels .this may be due to short term of follow up of patients[16].   Also Jiang et al (2007) in Chengdu, China mentioned that body weight appears not to have been significantly affected by the intervention. Moreover, at three months the rehabilitation participants

had gained weight 0.06 kg. The result is rather   unexpected   because   of   the significantly better diet adherence and walking   performance   found   in   the intervention group. One possible reason might be that while reducing their fat and cholesterol intake the patients had paid insufficient   attention   to   restricting carbohydrate intake or even had eaten more[13]. On the other hand study carried out in   Portugal   by   Magalhaes   et   al (2013)reported that There was a statistically significant improvement (p<0.05) in all risk factors of CHD , with the exception of body mass index (no statistical significance at 6-month assessment, p=0.92)[23].

Regarding lipid profile, the current study found that significant improvement in lipid profile (TC, TG, HDL, LDL) in study group than in control group, study shared a similar result to this study by mostafa, (2013) found that LDL were significantly improved after twelve   weeks   of   cardiac   rehabilitation program[16] . And Alsayed , (2013) found highly significant reduction in LDL with increase in HDL after RP[17]. Furthermore , hamed, (2008)reported that the mean value of triglycerides level and total cholesterol level of the study subjects was decreased after application of RP[15]. also Irmak (2010) showed that at the end of the 4-month program, total and LDL cholesterol levels of the patients decreased, whereas HDL cholesterol increased. However, negligible change occurred in triglycerides[24]. In the same direction, study carried out by Jiang et al (2007) in Chengdu, China mentioned that, except for HDL, the intervention was successful in reducing TG, TC and LDL at both three months and six months[13]. Also study carried out in Alexandria by Haidar (2005)   who reported that significant improvement in mean value of TC, TG, HDL, LDL of the study group for three months period compared to mean value of the control group[18]. On the contrary, study by Yoshida et al. (1999) who reported an insignificant finding or minor effect in serum lipid management. This may be related to do not present dietary information[25].

Conclusion:

The results of this study clearly indicate the benefits of cardiac rehabilitation program on improvement   of   physiological   risk parameters of CHD patients. Moreover, the

implementation of cardiac rehabilitation program based on their profiles and needs was successful in improving patient's knowledge and practice score of the study group.

Recommendation

Based on the results of the present study the following recommendations are suggested:-

- Coronary heart disease patients should be given written instruction plan for daily self management measures.
- In –services training to all nurses in cardiology department and out patients clinics to update their knowledge and increase their ability to care patients with coronary heart disease.
- Cardiac rehabilitation program should be integrated within the plan of care for CHD patients. theses program should emphasize on patients education about disease process , medication, healthy behaviors and lifestyle modification, aerobic exercise training , psychosocial support, and effective coping behaviors that the patients can incorporate in to their lifestyle.
- Mass media can play a vital role in providing the public with information about prevention, early detection , and treatment of coronary heart disease.
- Establish of cardiac rehabilitation centers in cardiology department is essential to provide patient with coronary heart disease and different heart disease that require rehabilitative care.

For further research:

- Further studies with a large number of patients are needed to confirm these findings and that such studies should include other outcome measures, such as the cost benefits of home-based cardiac rehabilitation program.

- More studies are needed to evaluate effectiveness of long –term follow up of cardiac rehabilitation program.

- Further studies to assess the benefits of early cardiac rehabilitation program for CHD patients are required.

Conflict of interest:

The authors declare that they have no conflict of interests.

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