

Observational Study of Recurrent Heart Attacks and Barriers to Participation in Exercise Training Cardiac Rehabilitation: A Serial Case Report

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Abstract: Acute coronary syndrome (ACS) is the most common cause of mortality in Coronary Artery Disease (CAD) patients, 20% of ACS survivors will experience a recurrent heart attack. Exercise training as a part of cardiac rehabilitation increases the quality of life, functional capacity, prevents recurrent heart attack and reduces mortality but the participation rate is still very low. Among 36 patients who were admitted in July 2019 in ICU Ward, RSCM, 14 patients had recurrent heart attacks where 11 patients did not follow phase II cardiac rehabilitation while 2 patients took part in cardiac rehabilitation. Recurrent heart attacks are influenced by modifiable and unmodifiable factors and exercise training as a core of cardiac rehabilitation is important to prevent this cardiac event because it has cardioprotective mechanisms. Patients who got recurrent heart attacks had barriers to participate in exercise training included lack of education, difficulty to arrange schedule, transportation or distance, no rehabilitation center and lack of awareness. Exercise training in cardiac rehabilitation has beneficial effects in preventing recurrent heart attacks and barriers to participate in it are challenges that we must overcome.

1 INTRODUCTION

In 2016, the American Heart Association (AHA) reported 15.5 million Americans with age more than 20 years had coronary heart disease, where per 42 seconds a person has suffered from myocardial infarction (Heart Disease Fact, 2017). In Indonesia, coronary heart disease is the second leading cause of death after stroke, which is as much as 3.6% of the age group most often occurs in the age group of 65-74 years followed by the age group of 75 years and over (3.2%), age group 55-64 years (2.1%) and age group 35-44 years (1.3%) (Penyakit Jantung Penyebab Kematian Tertinggi, 2017). According to the European Association for Cardiovascular Prevention and Rehabilitation, coronary heart disease remains a leading cause of mortality and morbidity, although mortality of coronary heart disease has declined considerably in the past 20 years.¹ However, the 1-year mortality rate is around 20% in patients with myocardial infarction (MI). Among the patients who survive, 20% will experience a recurrent MI within 1 year. It is

estimated that recurrent events caused by progression of coronary and systemic atherosclerosis. Secondary prevention including cardiac rehabilitation (CR) is therefore essential to improve the long-term prognosis of patients with MI and to improve their quality of life and functional capacity (Hald, 2018).

The cardiac rehabilitation program for coronary heart disease is a class 1 recommendation according to the American Heart Association, the American College of Cardiology and the European Society of Cardiology (Kachur, 2017). In 1994, the AHA declared that cardiac rehabilitation should not be limited to an exercise training program but also should include multifaceted strategies aimed at reducing or controlling modifiable risk factors so it can reduce morbidity and mortality. Cardiac rehabilitation as secondary prevention programs currently include baseline patient assessments, nutritional counseling, aggressive risk factor management (such as lipids, hypertension, weight, diabetes, and smoking), psychosocial and vocational counseling, and physical activity counseling and exercise training, in addition to the

appropriate use of cardioprotective drugs that have evidence-based efficacy for secondary prevention (Leon, 2005).

However, an exercise in cardiac rehabilitation is commonly underused throughout this process only 30% to 50% of eligible patients are typically referred to outpatient cardiac rehabilitation, with fewer still completing programs (Giuliano, 2017). The low participation in cardiac rehabilitation is influenced by many things including transportation problems or long distance to the heart rehabilitation center, time problems such as difficulty in arranging schedules due to work, economic factors, other health factors and lack of awareness about the importance of cardiac rehabilitation (Haddadzadeh, 2011)

From this study, we predicted that patients who participated in the exercise program of cardiac rehabilitation had a lower risk for recurrent cardiac events.

2 METHODS

This is an observational study of patients who were admitted to the Intensive Cardiology Care Unit (ICCU) at Cipto Mangunkusumo National General Hospital for recurrent heart attacks. Data were obtained from patients' register in July 2019, medical record and information by phone. Information about patients' characteristics, risk factors, heart attack frequency, and cardiac rehabilitation program were gotten from patients' registration, medical records and confirmation by phone.

3 RESULT

Among 36 patients who were admitted in July 2019 in ICCU ward, RSCM because heart attacks, 14 patients had recurrent heart attacks consisted of 10 men and 4 women with age range 42-74 years old. One patient had 8 times recurrent heart attacks, 2 patients had 4 times recurrent heart attacks, 1 patient had 3 times recurrent heart attacks and 10 patients had 2 times recurrent heart attacks (Table 1). Among them, 9 patients had uncontrolled hypertension, 5 patients had uncontrolled diabetes mellitus, 8 patients had overweight or obesity, 9 patients have a history of the smoking habit, 11 patients had a sedentary lifestyle and 8 patients had genetic history.

Twelve (85.7%) of 14 patients who got recurrent heart attacks did not a joint exercise in cardiac rehabilitation because of many reasons. Five Patients (41.7%) said that there were no information or education about exercise in cardiac rehabilitation, 2 (16.7%) patients because difficulty to arrange schedule, 2 (16.7%) patients because lack of awareness, 1 (8.3%) patient had other medical problems, 1 patient did not participate exercise in cardiac rehabilitation because there was no rehabilitation center and 1 patient because transportation problem.

Among 14 patients who got recurrent heart attacks, 2 patients followed cardiac rehabilitation but 1 patient was not compliance in phase II cardiac rehabilitation because a musculoskeletal problem that is limb pain because the history of neglected fracture of the right femur and 1 patient did not continue to phase III cardiac rehabilitation because of lack of motivation.

Table 1: Patients' Characteristic.

Characteristic	Number (%)
Age	42 – 74 y. o
Gender	
Female	4 (28.6 %)
Male	10 (71.4 %)
Risk Factor	
Hypertension	9 (64.3 %)
Diabetes	5 (35.7 %)
Obesity	8 (57.1 %)
Dyslipidemia	9 (64.3 %)
Smoking	9 (64.3 %)
Sedentary Lifestyle	11 (78.6 %)
Number of recurrent heart attack	
2 times	10
3 times	1
4 times	2
>4 times	1
Phase II and III Cardiac Rehabilitation Exercise Participation	
Yes	2 (14.3%)
No	12 (85.7%)
Reasons not following CR	
Lack of education	5 (41.7 %)
Lack of awareness	2 (16.7%)
Schedule problem	2 (16.7%)
Distance/transport problem	1 (8.3%)
No Rehabilitation center	1 (8.3%)
Other medical problems	1 (8.3%)

4 DISCUSSION

Recurrent heart attacks are influenced by unmodifiable risk factors such as genetics, age, gender and modifiable risk factors such as hypertension, diabetes mellitus, obesity, smoking, dyslipidemia, and physical inactivity or sedentary lifestyle (Humal, 2012) All of the patients who got recurrent heart attacks was more than 40 years old with higher prevalence in man than woman with ratio 5:2 and 8 (57.1%) patients had genetic risk factor. All of these increased unmodifiable risk factors of patients to get recurrent heart attacks (Foussas, 2016). More than 50% of patients had uncontrolled modifiable risk factors such as hypertension, diabetes mellitus, dyslipidemia, smoking, overweight or obesity, and a sedentary lifestyle. All of these also increased the risk of getting recurrent heart attacks.

Exercise training as a core of cardiac rehabilitation is really important to prevent these recurrent cardiac events (Leon, 2005). Exercise in cardiac rehabilitation has 3 phases that are a phase I for inpatient, phase II for outpatient as long as 8-12 weeks and phase III as a maintenance phase for lifetime exercise (Basuni, 2016). Exercise training, as part of a comprehensive rehabilitation program, has cardioprotective mechanisms that can slow the progression or partially reduce the severity of coronary atherosclerosis. Multiple factors directly or indirectly appear to contribute to this anti-atherosclerotic effect. Increased flow-mediated shear stress on artery walls during exercise results in improved endothelial function which is associated with enhanced synthesis, release, and duration of action of nitric oxide. Nitric oxide is responsible for endothelium-dependent vasodilatation and inhibits multiple processes involved in atherogenesis and thrombosis. Chronic inflammation plays a major role in the pathogenesis of CAD and plaque stability. The plasma level of C-reactive protein, a nonspecific biomarker of inflammation, is associated with an increased risk of CAD. Aerobic exercise training and improved cardiorespiratory endurance are associated with reduced C-reactive protein levels, which suggests that exercise training has anti-inflammatory effects. Besides, exercise training and regular physical activity can result in moderate losses in body weight and adiposity (Leon, 2005).

Endurance exercise also can promote decreases in blood pressure and serum triglycerides, increases in high-density lipoprotein cholesterol and improvements in insulin sensitivity and glucose homeostasis which along with modest weight

reduction have been shown to reduce the risk of type 2 diabetes mellitus in individuals with glucose intolerance. Endurance exercise training also has potential anti-ischemic effects. It can reduce myocardial ischemia decreasing myocardial oxygen demands during physical activity and exercise thereby raising the ischemic threshold. Also, exercise training can increase coronary flow by improving coronary artery compliance or elasticity and endothelium-dependent vasodilatation and by increasing the luminal area of conduit vessels through remodeling or arteriogenesis and myocardial capillary density by angiogenesis (Leon, 2005).

Many meta-analyses studies showed the effectiveness of exercise in cardiac rehabilitation in coronary heart disease. Existing data indicated that comprehensive cardiac rehabilitation after myocardial infarction will reduce mortality by 15% to 28% and the mortality rate of patients undergoing an exercise in cardiac rehabilitation decreases 26% to 31% when compared to patients who do not participate in cardiac rehabilitation. Guidelines issued by the American Heart Association and the American College of Cardiology recommend cardiac rehabilitation in patients after a heart attack (Stephens, 2009).

Exercise in cardiac rehabilitation is safe to do. The incidence of side effects in supervised exercises is very small, namely 1/50,000 to 1/120,000 (Leon, 2005). Cardiac rehabilitation is a class I recommendation for all patients with CAD based on a growing body of evidence that participation can reduce hospital bed usage, cardiovascular mortality, as well as improve functional capacity and quality of life but participation rate of exercise is still very low at around 30% - 50%, and influenced by various factors (Giuliano, 2017). This agrees with this study where among 14 patients who got recurrent heart attacks, 12 (85.7%) patients did not participate in phase II cardiac rehabilitation and 2 (14.3%) patients participated in phase II cardiac rehabilitation but 1 patient was not compliance in phase II cardiac rehabilitation because musculoskeletal problem and 1 patient did not continue to phase III cardiac rehabilitation because lack of motivation.

The low participation in cardiac rehabilitation is influenced by many things including transportation problems or long distance to the heart rehabilitation training center, time such as difficulty arranging schedules due to work, economic factors, other health problems and lack of awareness that the importance of cardiac rehabilitation (Haddadzadeh, 2011). In this study, lack of information or education (41.7%) as being the most reason patients did not

participate in cardiac rehabilitation, followed by difficulty to arrange schedule (16.7%), lack of awareness (16.7%), no rehabilitation center (8.3%) and transportation or distance problem (8.3%) and other medical problem (8.3%).

5 CONCLUSION

Exercise training in cardiac rehabilitation has beneficial effects in preventing recurrent heart attacks and barriers to participate in it are challenges that must be overcome.

REFERENCES

- Central For Disease and Control Prevention. 2017. Heart Disease Facts. <https://www.cdc.gov/heartdisease/facts.htm>. Cited 26 September 2019 (15:23)
- Kesehatan Kesehatan Republik Indonesia. 2017. Penyakit Jantung Penyebab Kematian Tertinggi, Kemenkes Ingatkan CERDIK. <http://www.depkes.go.id>. Cited 26 September 2019. (16.00)
- Hald, K., Nielsen, MK., Nielsen, CV., Meillier, LK. 2018. Expanded cardiac rehabilitation in socially vulnerable patients with myocardial infarction: a 10-year follow-up study focusing on mortality and nonfatal events. *BMJ Open*. 8:019307.
- Kachur, S., Chongthammakun, V., Lavie, CJ., Arena, R., Milani, R V., et al. 2017. Progress Cardiovascular Disease. <http://dx.doi.org/10.1016/j.pcad.2017.07.002>. Cited 26 September 2019 (16.30)
- Leon, AS., Franklin, BA., Costa, F., Balady GJ. 2005. Cardiac Rehabilitation and Pencegahan sekunder of Coronary Heart Disease. *Circulation*. 111,pp.369-376.
- Giuliano, C., Parmenter, BJ., Baker, MK., Mitchell BL. 2017. Cardiac Rehabilitation for Patients With Coronary Artery Disease: A Practical Guide to Enhance Patient Outcomes Through Continuity of Care. *Clinical Medicine Insights: Cardiology* 11,pp.1-7.
- Haddadzadeh, MH., Maiya1, AG., Padmakumar, R., Shad B. 2011. Effect of Exercise-Based Cardiac Rehabilitation on Ejection Fraction in Coronary Artery Disease Patients: A Randomized Controlled Trial. *Heart Views*. 12,pp.51-7.
- Humal, S., Tariq, R., Amin1, F., Mahmood, KJ. 2012. Modifiable and Non-modifiable predisposing Risk Factors of Myocardial Infarction -A Review. *Sadia Huma et al /J. Pharm. Sci. & Res.* 4(1),pp.1649-1653.
- Foussas, S. 2016. Obesity and Acute Coronary Syndromes. *Hellenic J Cardiol* 57(1), pp.63-65.
- Basuni, DT., Putra, HL. 2016. *Rehabilitasi Kardiovaskular*. 1st ed. PB PERDOSRI
- Stephens, MB. 2009. Cardiac Rehabilitation. *American Family Physician*. 80(9):955-959, 960.