ORIGINAL ARTICLE

Effectiveness of Phase 1 Cardiac Exercise on Maximum Oxygen Volume Improvement in Post Myocardial Infarction patients

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ABSTRACT

Exercise can increase functional capacity and reduce clinical symptoms in coronary heart patients. Exercise can improve the useful ability of the lungs as well as an increase in cardiac compensation which can be seen through maximum VO_2. Researchers have not yet found the effectiveness of phase I cardiac exercise against an increase in maximal VO_2, which is one indicator of an increase in cardiac compensation in patients with acute myocardial infarction. The purpose of this study was to determine the effectiveness of the cardiac exercise phase against maximal VO_2 increase in post-acute myocardial infarction patients. This study will find methods for performing active phase 1 cardiac exercise for patients after myocardial infarction. This research is a quantitative study using a quasi-experimental design with a post-test control group design approach. This study carried out the maximum VO_2 measurement in the treatment and control groups. The test is done by measuring the maximum VO_2 using the Harvard step test measuring instrument, involving two groups: the control group and the intervention group with 32 samples. The results obtained are significant differences in maximum VO_2 in the treatment group, with a p-value of 0,000. By giving heart training to patients after a heart attack, especially in patients with the acute coronary syndrome can improve the quality of life of patients.
Keywords: Cardiac exercise, oxygen volume, myocardial infarction, volume

INTRODUCTION

Heart and blood vessel disease are the main health problems in developed and developing countries, including Indonesia. Epidemiological data suggest that cardiovascular disease is a public health problem. Cardiovascular rehabilitation (CR) is the process of developing and maintaining an optimal level of physical, social, and psychological well-being in order to promote recovery from cardiovascular (CV) illness.(Kachur et al., 2017).One of the heart and blood vessel disease that affects many adults is myocardial infarction. Acute myocardial infarction refers to the process of heart tissue damage due to inadequate blood supply so that coronary blood flow is reduced.

According to WHO, in 2002, 12.6% of deaths in the world were caused by acute myocardial infarction. This disease ranks third cause of death in developing countries and Every year in the United States approximately 478,000 people die from heart attacks, 1.5 million people get heart attacks (Zohreh, Alireza, Seyed, and Masoumeh, 2009). Based on the 2008 World Health Statistics report, there were 17.1 million people died worldwide due to coronary heart disease, and it is estimated that this number will continue to increase until 2030 to 23.4 million deaths in the world (WHO, 2004). Based on the Household Health Survey (SKRT) in 2004, the mortality rate due to heart and blood vessel disease in Indonesia was 26.3%. Riskesdas data for 2007 stated that ischemic heart disease was the third leading cause of death, which was around 5.1%. (Riskesdas, 2013). In Central Java Province based on reports from the Hospital, the highest case of Coronary Heart Disease was in Semarang City which was 4,784 cases (26%) compared to the total number of myocardial infarction cases in other districts/cities in Central Java. Data from research conducted by Barclay in 2009 states that

without cardiac exercise, about 5-10 per cent of patients will experience mortality and reinfarction within the first 30 days and more than 12% in the first six months.

Exercise can improve functional capacity and reduce clinical symptoms in coronary heart patients. Exercise also provides the advantage of facilitating the patient to get used to daily physical activities at a safe level that will continue when the patient is at home later. The appropriate given training capacity of both pre-discharge and post-discharge adjusted to the patient's condition can be the best exercise media or exercise to reduce the death of patients post-myocardial infarction attack (Borjesson and Dellborg, 2005). Exercise can increase pulmonary functional capacity and increase cardiac compensation which can be seen through maximum VO_2. Maximum VO_2 is the maximum volume of O_2 that can be processed and consumed by the human body during physical activity or intensive activities until finally, fatigue occurs. This maximum O_2 volume is delivered from the lungs to the muscles and has litre units per minute or millilitres/minute/kg body weight. The maximum VO_2 in adults is generally between 34-52 L / min (Guyton, 2009). Whereas for acute myocardial infarction patients, there has been no research related to this matter. Patients with coronary artery disease generally show decreased oxygen consumption or increased oxygen absorbed and have a tolerance to exercise. The amount of decrease varies depending on the severity of the disease and also the coronary disease that is tolerated by the patient (American college of sports medicine, 1994).

In an international journal written by Haddazhadeh (2011) states that cardiac rehabilitation can increase LVEF (Left ventricular ejection fraction) within 12 weeks after cardiac rehabilitation exercises. In another journal written by Wise in 2011 states that resistant heart training can be one form of intervention to prevent the recurrence of heart

disease and blood vessels. Meanwhile, according to Rotsein in 2000 in his study entitled "Estimation of% VO2 reserve from heart rate during arm exercise and running" states that an increase in heart rate in respondent patients with the physical exercise of hands that corresponds to the rise in maximum VO$_2$. Research conducted by Brehm et al. (2009) aims to determine the effectiveness of training to increase the mobilization and functional activities of AMI patients (STEMI) and the results obtained are an increase in the migration capacity of CPCs (Progenitor Cell Circulation) after regular exercise. After ET, the left ventricular ejection fraction increases, and cardiorespiratory improves with an increase in maximal VO$_2$ (Brehm, 2009).

Thus it is necessary to conduct research related to cardiac rehabilitation as early as possible to ensure the importance of cardiac rehabilitation programs as soon as possible as one way to increase cardiac compensation which is characterized by an increase in the patient's maximum VO$_2$.

METHOD

This research is a quantitative study using a quasi-experimental design with a posttest control group design approach. This study aims to determine the effectiveness of cardiac exercise against maximal VO2 increase (Dharma, 2011). This type of research used in this study is Quasy experimental design with a posttest with control group design because, in this study, the maximum VO2 measurements were taken before being given treatment and after being given medication. The test is done by measuring the maximum VO2 using the formula. This study involved two groups: a group of post-MCI patients who were given cardiac exercise treatment as a treatment group and a control group of post-MCI patients who received therapy according to hospital standard operating procedure.

The research sample is a portion of the entire object studied and is considered to represent the whole population. The sample in this study were patients with post-MCI without complications who were treated. The sampling technique in this study is included in the non-probability sampling by consecutive sampling, which is a sample selection technique that is done by selecting all individuals who meet and meet the selection criteria until the desired number of samples are reached (Dharma, 2011). The number of samples in this study was 32 respondents who were divided into two groups: the treatment group and the control group. Research inclusion criteria: Respondents in post-MCI patients, no dangerous arrhythmias, not post PCI and CABG patients, able to communicate verbally well, able to read, write and speak Indonesian, are willing to become research respondents. Exclusion criteria in this study posted MCI patients with hemodynamically unstable conditions.

RESULT AND DISCUSSION

Table 1 shows that some respondents were male, amounting to 14 for the treatment group and 13 for the control group while the rest were female for both the treatment and control groups. This is in line with previous studies conducted by Franklin on cardiac exercise in patients with acute coronary syndromes who mostly suffer from cardiovascular disease in male sex (Franklin et al., 2013).

Table 1 Characteristics of research respondents by gender

Gender	Status		Total
	Case	Control	
Male	14	13	27
Female	2	3	5
Total	16	16	32

Table 2: Characteristics of research respondents by age

Age	Status		Total
	Case	Control	
46	1	0	1
47	0	1	1
48	1	1	2
49	2	1	3
52	1	1	2
53	1	1	2
54	1	1	2
55	1	1	2
58	0	1	1
60	0	2	2
61	2	2	4
62	1	1	2
63	2	1	3
64	2	1	3
65	1	1	2
Total	16	16	32

Table 3 Characteristics of research respondents by education level

Education	Status		Total
	Case	Control	
No School	1	6	7
Elementary School	5	5	10
Junior/Senior high school	10	5	15
Total	16	16	32

Table 4: Characteristics of research respondents by occupation

Profession	Status		Total
	Case	Control	
Does not work	3	6	9
Farmer	1	0	1
Enterpreneur	10	10	20
Government Employees	2	0	2
Total	16	16	32

Table 5 characteristics of study respondents based on a history of acute coronary syndrome

History of myocardial infarction	Status		Total
	Case	Control	
No	10	10	20
Yes	6	6	12
Total	16	16	32

Table 2 characteristics of respondents by age seen from the distribution, 16 respondents aged over 60 years both from the treatment group and the control group. And as many as 16 respondents aged less than 60 years. Table 5.2 can be seen that the minimum age of respondents is 46

years, while the maximum period of respondents is 65 years.

This is in line with research conducted by (Perez-Terzic, 2012; Sumide et al., 2009) that most coronary heart sufferers are patients with more than 40 years of age. And in this study, it was also found that all study respondents both from the control group and the treatment group were aged over 40 years.

Table 3 characteristics of research respondents based on education level can be concluded that as many as 15 respondents had junior or senior high school education, 10 respondents were primary school education, 7 respondents did not attend school. Of all respondents, there were no respondents who had an education above high school. This is in line with research conducted by (Dorosz, 2009; Montorsi et al., 2006) who also stated in their research on cardiac rehabilitation in patients with heart disease than heart attacks or acute coronary chondromas do not only strike in patients with low education levels and higher education level. But coronary heart disease can strike anyone who has a bad lifestyle. So it has no effect on one's education level.

Table 4 characteristics of research respondents based on work can be concluded that the majority of respondents work as private workers, as many as 20 respondents from both the treatment and control groups. The rest work as civil servants, farmers, and some do not work.

Table 5 characteristics of research respondents based on a history of the acute coronary syndrome can be seen that as many as 20 respondents did not have an account of acute coronary syndrome before the data of this study were taken. And the remaining 12 respondents had a history of the acute coronary syndrome. This is in line with research conducted by (Brügemann et al., 2007; Dorosz, 2009) which states that patients who do cardiac exercise at the time of the first attack can reduce the risk of recurrence while respondents who previously had a history of the acute coronary syndrome had never had a cardiac exercise program like this.

Table 6 shows the results that there is a significant difference in maximum VO2 in the treatment group, namely the group given intervention in the form of cardiac exercise for five days and the procedures in the hospital with the control group, namely the group that was not given cardiac exercise and only followed the procedures in force at the hospital with p-value 0,000.

This is in line with previous research on cardiac rehabilitation which states that providing heart training to patients after a heart attack, especially in patients with the acute coronary syndrome can improve the quality of life of the patient. Improving the quality of life of patients in line with the optimal administration of cardiac exercise in patients with heart disease. Patients with cardiac use starting from phase 1 to phase 3 can increase the tolerance level of the patient's activity compared to patients who did not get a cardiac exercise program at all or did not perform cardiac exercise optimally. Besides patients with a cardiac exercise program can also minimize complaints of sexual dysfunction after having a heart attack (Brügemann et al., 2007; Conraads et al., 2013; Franklin et al., 2013; Gandaglia et al., 2014a, 2014b; Lie et al., 2012; Steinke et al., 2011).

Table 6: Results of paired tests in the control group and treatment group

		PairedDifferences					t	df	Sig. (2-tailed)
					95% Confidence Interval oftheDifference				
		Mean	Std. Deviation	Std. ErrorMean	Lower	Upper			
Pair 1	Pre Post	- -1.3124842 82E1	1.56151394 9E1	2.76039275 6	- 1.87547009 6E1	- 7.4949846 74	-4.755	31	.000

CONCLUSION

Characteristics of respondents seen from gender are that most respondents were male as many as 27 people, the age of respondents were all over 40 years both from the treatment and control groups, and as many as 16 respondents said they had never had the experience of being treated with the same diagnosis or current conditions this is the first attack of an acute coronary syndrome. VO2 after exercise in the control group, some respondents experienced an insignificant increase. In contrast, VO2 in the intervention group of all respondents experienced a significant improvement so it can be concluded that there is a difference in maximum VO2 before and after exercise in the control and intervention groups with a significance of 0,000.

In hospital institutions, SOPs can be made about Cardiac exercise phase 1 so that it can be done immediately on patients after an acute coronary syndrome attack to be able to increase the level of activity tolerance and increase motivation in patients after a heart attack.

Suggestions for further research is to research phase 2 cardiac exercise with respondents who have already gotten phase 1 cardiac exercise.

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