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The Effect of Phase I of Cardiac Rehabilitation on Length of Stay for Coronary Heart Disease Patients at Mardi Waluyo Hospital, Blitar City

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ABSTRACT

Coronary Heart Disease (CHD) is a specific term for a cardiovascular disease characterized by narrowing coronary artery tissue mainly due to atherosclerosis that causes microangiopathy. CHD patients in the treatment, in addition to receiving treatment, also receive rehabilitation to help speed up the recovery from physical, psychological, and social conditions. The rehabilitation program should be given since admission to the hospital, known as phase I of Cardiac Rehabilitation. One of the components of phase I of Cardiac Rehabilitation is a physical activity aimed at speeding up the recovery of the patient's condition to return to regular activities. This study aims to determine the relationship between cardiac phase I rehabilitation for the length of patient care for CHD in Mardi Waluyo Hospital Blitar City. This study used a quasi-experimental design with the post-test only non-equivalent group. The sample in this study consisted of 14 respondents from the intervention group and 14 patients for the control group respondents who were diagnosed with CHD in Mardi Waluyo Hospital, Blitar City, matching the specified inclusion criteria. The results showed a significant correlation between heart phase I rehabilitation on the duration of care (p-value = 0.007). The statistical test used a bivariate correlation test with the Mann-Whitney Test. This result yielded that it needs to be given early on to CHD patients as it can help the healing process and shorten hospitalization. Furthermore, the shorter length of care will further save the operational costs of CHD patient care.

Keywords: coronary heart disease, phase I of cardiac rehabilitation, length of stay

Background

Coronary Heart Disease (CHD) is a coronary artery disorder caused by a blockage or plaque due to atherosclerosis. Atherosclerotic disease affecting the coronary arteries is a significant cause of morbidity and mortality (1). CHD is divided into unstable angina pectoris, myocardial infarction without ST-segment / NSTEMI elevation and myocardial infarction with ST-segment / STEMI elevation (2). Coronary heart disease causes a reduction in the amount of oxygen needed by the myocardium. Conditions like this, if they continue to occur, will reduce the ability of the heart to contract and cause changes in the body's hemodynamics. This results in decreased cardiac output with reduced stroke volume. A decrease in cardiac output results from insufficient blood supply to the body, which makes the patient need bed rest. However, bed rest that is too long can cause a decrease in organ function capacity, muscle strength, anxiety, and orthostatic hypotension (3).

The reduced physical function capacity can further prolong the length of stay of AMI

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patients. Phase I of Cardiac Rehabilitation which helps deal with the adverse effects of IMA and prevent its recurrence, can be given starting from the initial hospitalization to continuing care when returning from the hospital. Cardiac rehabilitation programs are all steps used to help people with heart disease return to activity, achieve optimal life, and prevent the recurrence of heart disease (4). Cardiac rehabilitation includes physical exercise, health education, stress reduction counselling, and helping patients speed up their recovery (5).

The National Heart Foundation of Australia divides cardiac rehabilitation into four stages. Stage I, or the in-hospital stage, is carried out as soon as possible after the patient's hemodynamics are stable since entering the ICU / ICCU and is continued every day during treatment in the hospital. Phase I rehabilitation aims to minimize the effects of immobilization and ends when the patient is discharged from the hospital. Stage II to stage IV is carried out after the patient returns from the hospital (4).

The benefits of phase I cardiac rehabilitation were conducted on research by Weberg et al. with the title inpatient rehabilitation and changes in self-reported health-related quality of life. The pilot study showed an increase in the quality of life in AMI patients participating in phase I of the Cardiac Rehabilitation program (6). Improving the quality of life includes improving the physical, psychological, vitality and emotional conditions necessary for the patient's life. The research about exercise-based cardiac rehabilitation and cardiorespiratory fitness improved cardiopulmonary function capacity in AMI patients with phase I of Cardiac Rehabilitation early on (7).

From the results of the preliminary study, it was found that patients with IMA at Mardi Waluyo Hospital, Blitar City, according to Standard Operating Procedures (SOP), will be placed in the intensive care Unit (ICU) room for initial treatment. Then they will be transferred to a regular ward or sent home if they meet the criteria for discharge. In the ICU room and the regular ward, phase I of Cardiac Rehabilitation had not been carried out. No program in patient care specializes in early mobilization by doctors, nurses or other health workers. Patient mobilization is only done by mobilizing the right or left side while in bed to prevent decubitus.
Until now, there are still few research reports related to the results of phase I of Cardiac Rehabilitation, especially in the Blitar area. Besides that, based on previous observations and research data, further studies are needed on the effect of implementing phase I of Cardiac Rehabilitation on the length of stay of patients with coronary heart disease at Mardi Waluyo Hospital, Blitar City.

Methods

This study was designed to determine the effect of a cause-and-effect relationship from a treatment of research subjects. The research design used a quasi-experimental design with a post-test- only non-equivalent control group. This study used an affordable population, namely all patients with coronary heart disease in the intensive care Unit (ICU) of Mardi Waluyo Hospital, Blitar City.

The sample in this study were some coronary heart patients at Mardi Waluyo Hospital, Blitar City, who met the inclusion and exclusion criteria. A sampling of the research was carried out using non- probability sampling, namely the technique of taking samples from members of the population in a non- random manner. The technique used for sampling was consecutive sampling, which is a sample selection method that selects all the individuals found based on the selection criteria (8). According to the established inclusion criteria, the sample size was 14 patients in the intervention group and 14 in the control group. Inclusion criteria were patients with a diagnosis of CHD who were treated in the ICU, stable hemodynamics (systolic BP <200mmHg, diastolic BP <110mmHg, pulse < 130 x /minute), and willing to be

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respondents. Patients can understand the instructions given, CHD patients without complications such as functional Congestive Heart Failure (CHF) class III–IV, and CHD patients without musculoskeletal problems.

Patient exclusion criteria were Experiencing uncontrolled angina experiencing severe ventricular or atrial arrhythmias, and respondents were discharged before the fifth day. Data collection was carried out from June to August 2017. The maximum oxygen uptake (VO2max) data collection tool was measured after a 6-minute walk test conducted on the fifth day the patient was admitted. The 6-minute walk test was performed after the patient completed phase I of the Cardiac Rehabilitation procedure. The VO2 max was measured using the Nury formula. Blood pressure (systolic and diastolic) measurements were taken after phase I of Cardiac Rehabilitation therapy was administered using a digital tensimeter. Pulse frequency was calculated post-phase I of Cardiac Rehabilitation therapy was given. The blood pressure measurements use a digital tensimeter; oxygen saturation is measured using digital oximetry. Measurements were made post-phase I of Cardiac Rehabilitation was given, and body weight was measured using a digital scale. Measurements were taken after phase I of Cardiac Rehabilitation was given, and height was measured using a height meter. Measurements were made post-phase I of Cardiac Rehabilitation. The length of stay began from the first day the patient was admitted to the hospital until he was discharged after treatment. During treatment, the patient received phase I of Cardiac Rehabilitation therapy.

Results

Table 1. Characteristics of Respondents Distribution of Respondents Based on the Age of Respondents in Each Research Groupat Mardi Waluyo Hospital, Blitar City (n1=n2=14)

Variable	Group	Means	SD	Min – Max
Age	Intervention	60.00	6.93	48–70
	Control	60.14	7.87	42–71

Table 1 shows that the average age of the respondents in the intervention group is 60 years.

Table 2 Distribution of Respondents Based on Gender, Smoking History, and Obesity in EachStudy Group at Mardi Waluyo Hospital, Blitar City (n1=n2=14)

Variable	Intervention	Control
Gender		
Man	10 (71.43%)	11 (78.57%)
Woman	4 (28.57%)	3 (21.43%)
Smoking History		
Smoker	8 (57.14%)	9 (64.28%)
Not a smoker	6 (42.86%)	5 (35.72%)
Obesity		

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Obesity	1 (7.14%)	1 (7.14%)
Not Obese	13 (92.86%)	13 (92.86%)

Table 2 above shows the gender of the respondents in the intervention group, and most of the control group were men. For respondents' smoking history, in the intervention and control groups, most of the respondents had a history of smoking. Table 2 also shows that 13 respondents in both the controlgroup and the intervention group were not obese.

Table 3 Distribution of Respondent Characteristics Based on the Average Post InterventionCardio-respiratory Capacity Variables on the fifth day of Respondents in the Intervention Group and Control Group (n1=n2=14)

Sub Variable	Group	Means	Min-Max
Systolic	Intervention	120.89	104 – 128
	Control	122.71	110–132
Diastolic	Intervention	74.64	58–81
	Control	76.93	62–84
Frequenc y	Interventio n	80.97	68 – 88
Pulse	Control	84.93	72–94
saturation	Interventio n	98.36	97 – 99
Oxygen	Control	97.64	97 – 99
VO2 max	Intervention	13.64	11.03 – 17.48
	Control	11.23	10.39 – 14.32

Table 3 above shows the mean post-intervention systolic blood pressure on the fifth day in the intervention group of 119.35 mmHg. While the mean value of systolic blood pressure in the control group after the fifth day of intervention was 122.71 mmHg. Table 3 also shows the mean post- intervention diastolic blood pressure on the fifth day in the intervention group of 74.64 mmHg. While the mean value of diastolic blood pressure in the control group after the fifth day of intervention was 76.93 mmHg. In table 3, it can also be seen that the average post-intervention pulse frequency on the fifth day in the intervention group was 80.7 x/minute. The lowest post-intervention day five pulse frequency value was 68 x/minute, and the highest was 88 x/minute. While the mean value of the pulse frequencyof the control group after the fifth day of intervention was 84.93 x/minute.

Table 3 also shows the average post-intervention oxygen saturation on the fifth day in the intervention group of 98.36%. On the fifth day, the lowest oxygen saturation value of the post- intervention intervention group was 97%, and the highest was 99%. While the mean value of oxygen saturation in the control group after the fifth day of intervention was 97.64%. The lowest oxygen saturation value of the control group was 97%, and the highest was 99%.

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The mean post-intervention VO2 max value on the fifth day in the intervention group was 13.64 ml/Kg/minute. The lowest VO2max value of the post-intervention intervention group on the fifth day was 11.03 ml/kg/minute, and the highest was 17.48 ml/kg/minute. While the mean VO2max value of the control group after the fifth day of intervention was 11.23 ml/kg/minute. The lowest VO2 max value in the control group was 10.39 ml/kg/minute, and the highest was 14.23 ml/kg/minute.

Table 4 Distribution of Respondent Characteristics Based on the Average Length of Post- Intervention Treatment on the fifth day of Respondents in the Intervention Group and ControlGroup (n1=n2=14)

Variable	Group	Means	SD	Min-Max
Day Length	Intervention	5.14	0.36	5 – 6
treat	Control	5.57	0.69	5 – 7

Table 4 shows that the average length of stay for respondents at Mardi Waluyo Hospital, Blitar City, after the fifth day of intervention in the intervention group was 5.14 days. The shortest stay in the intervention group after the fifth day of intervention was five days, and the longest day of stay was six days. The mean length of stay in the control group was 5.57 days. The shortest stay in the control group was five days, and the longest was seven days.

Table 5 Distribution Analysis of Mean Systolic Blood Pressure, Diastolic Blood Pressure,Pulse Frequency, and Maximum Oxygen Uptake After the Fifth Day of Intervention in the Intervention Group and Control Group (n1=n2=14)

Variable	Group	n	Means	p-*value*
svstolic	Intervention	14	122.54	0.269
	Control	14	125.35	
Diastolic	Intervention	14	76.07	0.411
	Control	14	78.28	
Frequency Pulse	Intervention	14	80.93	0.078
	Control	14	84.59	
VO2 max	Intervention	14	14.03	0.006*
	Control	14	12.22	

*significant at $\alpha < 0.05$ with *independent T-test.*

Table 5.shows the results of the analysis of the differences between the mean systolic blood pressure, diastolic blood pressure, pulse frequency, and VO2 max between the intervention group and the control group after the fifth day of the intervention. From the table above, it is known that there was

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no significant difference between the mean systolic blood pressure, diastolic blood pressure, and pulse frequency of the intervention group and the control group after the fifth day of the intervention. While the mean VO2max between the intervention group and the control group after the fifth day of the intervention, there was a significant difference (p=0.269 ;p =0.411;p=0.078;p=0.006, α<0.05)

Table 6 Distribution Analysis Average Oxygen Saturation After the Fifth Day of Intervention inthe Intervention Group and the Control Group

Variable	N	Z	p-*value*
Oxygen Saturation	28	-2.45	0.014*

*significant at α < 0.05 with the *Mann-Whitney Test*

Table 6 analyses the differences in mean oxygen saturation after the fifth day of intervention in the intervention group and the control group. The table shows a significant difference in the mean oxygen saturation in the intervention group and the control group after the intervention on the fifth day (p = *0.014*, α < 0.05).

Table 7. Distribution Analysis of Mean Length of Stay After the Fifth Day of Intervention in theIntervention Group and the Control Group

Variable	N	Z	p-*value*
Length of Treatment	28	-2.71	0.007*

*significant at α < 0.05 with the *Mann-Whitney Test*

Table 7. analyses differences in the average length of stay after the fifth day of intervention in the intervention group and the control group. From the average length of stay table, there was a significant difference in the average length of stay between the intervention group and the control group (p = *0.007*,α < 0.05).

Discussion

The average age of the respondents in this study, the intervention group and the control group, was more than 40 years old. This is in line with research by Oda et al., who obtained the average age of patients with coronary heart disease (CHD) who received clinical manifestations of attacks in men was between 53.9 to 78.7 years and in women 66.9 years to 85.1 years (9). Juarez et al., in their research, found that the average age of people with coronary heart disease (CHD) is 69 years. The increased risk of developing CHD with increasing age is associated with the incidence of dyslipidemia (10).

In this study, it was found that the average age of the female respondents was 56.2 years, while the average age of the male respondents was 68.4 years. Women tend to experience CHD at an older age than men. Nicoll et al. found that CHD symptoms could be found in almost all age groups in male respondents, while women tended to experience CHD 10 years later than men. The sex difference, which indicates that men are more at risk of developing CHD than women, is possible due to the presence of the female hormone estrogen. This estrogen has a positive correlation with the content of HDL (High-Density Lipoprotein) cholesterol in the blood. Women who are not yet menopausal have high levels of estrogen and high HDL levels in their blood. As is known, HDL is protective against the risk of

atherosclerosis. HDL binds to fat in the blood to be carried to the liver, reducing the fat content in the blood. Lowering blood fat reduces the chance of atherosclerosis (11).

This study shows that most of the respondents have a history of smoking. Smoking history is an essential factor that increases the risk of CHD. In Indonesia, 64.9 % of male active smokers are aged 16 years and over, while in women, it is 2.1%. The number of smokers is the highest ratio of people who smoke in the Southeast Asia region (12). In this study, it was found that most of the respondents were in the non-obese category. Respondents in the obesity category, there are two respondents. Obesity is the abnormal body fat content measured using the Body Mass Index (BMI), which results from measuring body weight in kilograms divided by the height in meters squared. If BMI is more than 30, then it is categorized as obese. Obesity is always associated with increased blood fat, blood sugar and blood pressure. Obesity is a risk factor for increasing the incidence of CHD, diabetes mellitus, stroke, hypertension, cancer, liver and kidney dysfunction, sleep disorders, and gynaecological complications. In patients with CHD, obesity also increases the risk of death (13).

However, Hamer & Stamatakis said in their research that obesity is not always a risk factor for CHD. People with good metabolic health, even though they are obese, have the same risk of CHD as people who are not obese. Good metabolic health means normal blood pressure, standard blood cholesterol numbers, and regular blood sugar (14). Statistical analysis results on the average length of stay of patients in the intervention group and the control group showed a significant difference. The average stay in the intervention group was shorter than the control group, which was 5.14 days compared to 5.57 days. Phase I of Cardiac Rehabilitation based on physical activity training can stimulate adaptation and increase the cardio-respiratory capacity of the intervention group respondents, which accelerates the healing process and shortens the respondent's length of stay. The study by Tickoo et al. also stated that patients with Acute Coronary Syndrome who received better quality of care according to the protocol, including phase I of Cardiac Rehabilitation, had a shorter stay than patients who received less treatment according to the protocol (15).

Patients undergoing early ambulation phase I of Cardiac Rehabilitation can shorten their stay by only five days (16). One indication that CHD patients can leave the hospital is without complaints of chest pain and stable vital signs (17). One of the goals of phase I of Cardiac Rehabilitation is to restore or maintain CHD patients in a physiological state and improve their functional capacity. CHD patients who receive phase I of Cardiac Rehabilitation are expected to have vital signs such as blood pressure, pulse rate, and oxygen saturation to be stable. Likewise, the patient's functional capacity, namely the ability to do activities seen from the VO2 max, is expected to improve. With improved and stable vital signs and increased VO2 max, CHD patients can shorten their length of stay in the hospital.

Conclusions and Recommendations

This study illustrates that phase I of Cardiac Rehabilitation significantly relates to the length of stay in CHD patients. Although statistically, the difference in length of stay between the intervention group and the control group was significant, clinically, the difference did not exceed one day of treatment. The number of samples could be more extensive and more varied. If the population is more numerous and diverse, clinical differences in length of stay may be more visible. Phase I of Cardiac Rehabilitation is also significantly related to maximal oxygen uptake in CHD patients, where VO2 max is a standard reference for determining a person's fitness. The results of this study can also form the basis for further research on phase I of Cardiac Rehabilitation interventions and their continuation when patients are discharged from the hospital. In addition, it can become a reference for new research on the benefits of physical activity as part of efforts to prevent CHD.

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