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Physical Activity and Associated Factors in Indonesian Patients with Acute Myocardial Infarction

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Abstract

Background: Acute Myocardial Infarction (AMI) patients generally report persistent symptoms such as pain, fatigue, depression, and disorders in fulfilling daily needs. Physical activity has a beneficial effect on cardiopulmonary rehabilitation and remodeling of dysfunction after AMI.

Aim: This study was performed aimed to identify physical activity and related factors in AMI patients.

Method: This cross-sectional study was performed on 150 post-treatment AMI patients who were discharged from a central hospital in Indonesia from February to March 2019. The physical activity data were collected using the International Physical Activity Questionnaire. Depression was measured using the PHQ-9 Patient Depression Questionnaire, and self-efficacy using the Cardiac Self-Efficacy Scale. Data were analyzed by SPSS software (version 26.0) and Chi-square and fisher's exact tests. $P<0.05$ was considered statistically significant.

Results: After hospitalization, majority of patients were in adult age (<60 years old) category (73.3%), were male (78.8%), had passed 7 to 30 days post-discharge (75.3%), and had comorbidities (64.7%). The majority of patients had mild physical activity (82%), in the mild depression category (69.3%), and had negative self-efficacy (86.7%). Factors related to low physical activity were age (P=0.002), gender (P=0.0001), days after hospitalization (P=0.03), comorbidities (P=0.02), depression (P=0.003), and self-efficacy (P=0.0001). The logistic regression test showed that age, gender, and self-efficacy improve physical activity in post-discharge AMI patients.

Implications for Practice: Age, gender, and self-efficacy can enhance physical activity in post-discharge AMI patients. It is suggested that a pre-discharge and follow-up education be performed to evaluate physical activity.

Keywords: Acute myocardial infarction, Indonesia, Physical activity

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Introduction

Acute Myocardial Infarction (AMI) is one of the leading causes of death in the developed countries (1,2). AMI is a disease which occurs at a high level of incidence, morbidity, and mortality and causes physical deficiencies and functional limitations (3). American Heart Association (AHA) noted the incidence of heart disease in 2016, as many as 15.5 million people aged ≥ 20 years in the United States experience AMI (4). The incidence of AMI in Indonesia is 0.5% or estimated to be about 883 447 people in 2013 (5). In Jambi province, the AMI incidence rate based on a doctor's diagnosis was 0.5% (5).

An MI results in irreversible damage to the heart muscle due to a lack of oxygen and may impair diastolic and systolic function and make the patient prone to arrhythmias. In addition, an MI can lead to several serious complications (6). AMI patients generally report persistent symptoms such as pain, fatigue, depression, and disorders of fulfilling daily needs that reduces the patient's quality of life (7).

AMI patients will suffer from physiological disorders following the level of problems experienced, so patients may experience interruption inactivity and meet their daily needs (8). Some physical symptoms which patients may experience are shortness of breath, fatigue, and discomfort in the chest (9), that in turn will reduce the ability to physical activity and a decrease the body's ability to carry out its functions (10).

Physical activity is recommended by the European Society of Cardiology (ESC) as long-term therapy for recurrent prevention in AMI patients (11). Physical activity is also secondary prevention recommended by AHA, which aims to reduce symptoms of the disease, increase functional capacity, and reduce risk factors such as insulin resistance (12). Moreover, physical activity, functional status, providing education in the form of dietary regulation, no smoking, and other risk factors, medication therapy, and control scheduling are considered effective in improving the quality of life of AMI patients after treatment in the hospital (13).

Physical activity is associated with the incidence of re-admission in patients with ACS, and the lower body activity triggers relapse in these patients (14-16). One meta-analysis study concluded that physical activity based on cardiac rehabilitation decreases mortality and re-admission in ACS patients and improves patients' quality of life (10,17). Understanding the factors associated with physical activity in AMI patients can help develop appropriate interventions to increase physical activity and consequently quality of life. However, the physical activity of AMI patients and its related factors are poorly investigated in Indonesia. Therefore, this study was performed aimed to identify physical activity and related factors in AMI patients at Raden Mattaher Hospital, Jambi, Indonesia.

Methods

This cross-sectional study was performed on 150 patients from attending Cardiac Polyclinic Cardiac Hospital Raden Mattaher Hospital Jambi from February to March 2019 were consecutively recruited by the nurses. Raden Mattaher Hospital is a central referral hospital in one of the provinces in Indonesia. The inclusion criteria were the patients aged ≥18 years who were diagnosed with post-treatment AMI, ability to read and write, and willing to be involved in the research. The exclusion criteria were patients who had grade IV heart failure, chest pain, and/or experienced shortness of breath with RR> 24 x / minute.

The sampling method was purposeful sampling. The sample size was determined by the calculation of the number of samples using the proportion estimation formula with $Z1\alpha2$: Z value based on the degree of confidence (1.96), P: the value of the proportion in STEMI patients in Jambi Province (0.5), and d: absolute precision (0.08), so that the total number of participants was 150 people. Before participating in the study, all AMI patients who met inclusion were informed of the study's purpose and method. Patients were also informed of the right to decline to participate in this study. A consent form was obtained from all participants. The patients were also assured for confidentiality of data. The ethical approval of this study was obtained from the Ethical Committee of the Faculty of Nursing, Universitas Indonesia.

Measures

Demographic and medical variables

Demographic characteristics of patients including age, sex, length of days post-treatment, and

comorbidities were collected and recorded.

Physical Activity

The International Physical Activity Questionnaire (IPAQ) was used to measure physical activity (18). IPAQ is designed for use in adults aged 18-65 years with two versions, namely the short version (7 items) to provide information about time spent running, in solid and moderate-intensity activities and sedentary activities, and the extended version (31 items) to collect detailed information in the domain of household work activities, transportation, and leisure physical activity and sedentary activities (19). A research's result shows the convergent validity of the overall IPAQ in each physical activity category (20).

Seven items of the questionnaire are used to assess the activity level, namely the level of heavy activity (vigorous activity), moderate level of physical activity (moderate activity), walking activity, and finally, sitting activity. First, assessment is measured for seven days of activity which has been done before. Next, the assessment is carried out by calculating the Metabolic Equivalent of Task (MET) value. Finally, the level of physical activity is classified into three levels of activity, namely low, medium, and severe levels. The r-value of the results of all questionnaire items is above the r-table value (0.306), so the seven questions on the IPAQ are declared valid. Also, an alpha r-value of 0.879 was obtained, so that the seven statements on the IPAQ were reliable.

Depression

Depression in AMI patients is measured using the PHQ-9 Patient Depression Questionnaire (21). PHQ-9 consists of nine questions to diagnose and manage depression. The answers consist of 4 choices: "0 = not at all," "1 = several days," "2 = more than half a day," and "3 = almost every day." The total score indicates the category based on the severity of depression, namely minimal depression (score 0-4), mild depression (score 5-9), moderate depression (score 10-14), moderate-severe depression (score 15-19), and major depression (score 20-27) (22). The r-value of the results of all questionnaire items is above the r table value (0.306), so the nine questions on the PHQ-9 questionnaire are declared valid. Also, an alpha r-value of 0.863 was obtained, so that the PHQ-9 questionnaire was reliable.

Self – Efficacy

Self-efficacy is defined as a person's beliefs about the ability to produce predetermined levels of performance affecting an individual's life (23). To examine the role of self-efficacy in cardiovascular disorders, Sullivan et al. developed the Cardiac Self-Efficacy Scale (CSE-Scale) (24). The CSE scale consists of two dimensions: the first represents a person's belief to control symptoms (eight items), and the second represents confidence in maintaining a function (five items). CSE was used in this study to measure one's belief in maintaining a function consisting of five questions. This dimension is commonly used to predict the incidence of readmission, health status, and other predictors. This questionnaire evaluates the patients' self-efficacy, so that they are asked to rate: 'how confident are you that you know or can ...' on a five-point Likert scale (0=not at all, 1 = somewhat confident, 2 = quite confident, 3 = very confident, 4 = fully confident). The r-value of the results of all questionnaire items is above the r table value (0.306), so the CSE questionnaire was valid. Also, an alpha r-value of 0.844 was obtained, so that the CSE questionnaire was reliable.

Statistical analysis

Data were analyzed by SPSS (version 26.0). Descriptive data were analyzed by using presentation/proportion. Bivariate analysis to identify factors related to physical activity was performed using the chi-square test or Fisher's exact test if the chi-square test conditions were not met. Finally, the multivariate analysis uses logistic regression.

Results

Based on the results presented in table 1, the majority (73.3%) of AMI post-treatment patients were in the adult age category (<60 years), and most of the patients were male (78.8%). Moreover, the majority of patients had passed 7 to 30 days post-treatment (75.3%), and had 64.7% comorbidity and the most disease suffered by the patients was hypertension (48.4%). The majority of AMI post-

Table 1. Demographic and clinical characteristics of patients (n = 150)

Characteristics		Frequency (Percentage)
Age	Adult (<60)	110 (73.3%)
	Elderly (>60)	40 (26.7%)
Gender	Male	118 (78.7%)
	Female	32 (21.3%)
Long days after hospitalization	7-30 days	113 (75.3%)
	>30 days	37 (24.7%)
Comorbidities	Hypertension	47 (48.4%)
	Diabetes mellitus	33 (34%)
	Hyperlipidemia	17 (17.6%)
	total	97 (64.7%)
Physical activity	Low	123 (82%)
	Moderate-severe	27 (18%)
Depression	Mild	104 (69.3%)
	Moderate-severe	46 (30.7%)
Self-efficacy	Negative self-efficacy	130 (86.7%)
	Positive self-efficacy	20 (13.3%)

treatment patients (82%) had mild physical activity in the mild depression category (69.3%), and had negative self-efficacy (86.7%).

The bivariate analysis was conducted to measure physical activity as dependent variable. Age and gender as sociodemographic variables were associated with physical activity ($p < 0.05$, CI 95%). Besides, long days after hospitalization and comorbidities were also associated with physical activity ($p < 0.05$, CI 95%). Depression and self-efficacy were related to physical activity ($p < 0.05$, CI 95%). The results of the bivariate statistical analysis can be seen in table 2. The modeling results obtained from the logistic regression test indicated that age, gender, and self-efficacy contribute to improving physical activity in post-discharge AMI patients (table 3).

Table 2. Correlations between age, gender, long days after hospitalization, comorbidities, depression, self-efficacy, and physical activity (n=150)

Variable	P value	OR (95% CI)
Age	0.002	0.08 (0.01-0.63)
Gender	0.0001	5.08 (2.07-12.49)
Long days after hospitalization	0.03	2.56 (1.06-6.19)
Comorbidities	0.02	2.79 (1.19-6.54)
Depression	0.003	0.14 (0.03-0.64)
Self-efficacy	0.0001	68 (16.99-272.08)

Table 3. Logistic regression analysis on age, gender, comorbidity, depression, and self-efficacy variables with physical activity (n=150)

Variables	β	Wald	P *value*	OR	95% CI min	95% CI max
Age	-2.07	8.31	0.004	0.13	0.03	0.51
Gender	1.55	4.09	0.04	4.7	1.05	21.05
Comorbidities	0.34	0.21	0.64	1.4	0.33	5.85
Depression	-1.75	2.51	0.11	0.17	0.02	1.52
Self-efficacy	3.79	21.12	0.0001	44.47	8.82	224.32
Constant	-1.03	0.22	0.64	0.36		

Discussion

Physical activity is a crucial component in heart disease patients that is beneficial in reducing the risk of relapse (25). The AHA recommends that physical activity is a secondary prevention measure to reduce the risk of relapse in AMI patients (26). The findings of the present study showed that 82% of patients had mild physical activity, 15.3% moderate activity, and 2.7% severe activity. The results of this study were similar to the study conducted by Matthias (2017) in Sri Lanka, where 56.7 % of participants had mild physical activity (27). Low physical activity triggers myocardial infarction because slow process of arteriosclerosis formation decreases inflammation and prevents the formation of thrombosis (28). Endothelial dysfunction is an early stage in the development of atherosclerosis. Physical activity and physical exercise can change the speed of blood flow and increase the tension of endothelial cells of blood vessels, releasing endothelial nitric oxide. Increased nitric oxide can affect the vasodilation ability and vasomotor function of blood vessels (29).

The aging process has implications for the incidence of coronary heart disease. The results of the present study showed that 90% of patients gaged > 40 years. This result was consistent with the literature describing the incidence of coronary heart disease in Indonesia, where coronary heart disease occurs at age> 40 years (30). Furthermore, the results obtained by the data in the present study showed a relationship between age and physical activity. Some literature explains the similarity of the results of previous research that present the proportion of people who do physical activity is immensely decreasing with age (31). The study performed in Sweden reported that in myocardial infarction patients aged above 65 years, the decrease in physical activity is influenced by physical function and symptoms caused by disease (32). Pathophysiologically, in old age, coronary artery changes occur due to thickening of the intima, causing a decrease in capillary membrane permeability, thereby reducing the O2 concentration in myocyte and increasing the need for ATP, which depends on the metabolism of anaerobic synthesis and causes myocyte cells death (33,34).

The results of the present study indicated that the majority of participants were male. The AHA states that many factors affect the condition, where men tend to have more negative behaviors than women, such as smoking, lack of physical activity, and alcohol consumption (35). Gender is rated as one of the factors related to physical activity. The results of this study are consistent with the research conducted by Kim and colleagues in 2010 in South Korea. Their results showed that only 6.1% of women participated in the recommended physical activity program, while 23.3% of men performed the physical activity program (36). Other literature also explains that women tend to prefer activities with scheduled times and in the same age group. In contrast, men prefer activities that require skills and practice (31).

The results of the present study showed that 75.3% of AMI patients had passed 7-30 days post-treatment. Also, there was a relationship between the length of days after hospitalization and physical activity after treatment of AMI patients ($p = 0.032$). A study reports that the longer a patient completes the treatment process in the hospital, the more physical activity he does (37). The research conducted by Kronish et al. indicated a relationship between the length of days after hospitalization and the level of physical activity of patients with coronary heart disease, where there is a change in the level of physical activity from mild in the first week to severe on the 35th day (38). Other literature explains that physical activity can begin after one or two weeks after myocardial infarction depending on the patients' condition (39). While still in the treatment process in the hospital, AMI patients are encouraged to gradually do physical activity 72 hours after the attack.

Based on the results of univariate analysis in the present study, 67.4% of participants had comorbidities. Several epidemiological studies also showed similar results where AMI patients have comorbidities as a contributing factor and aggravate the diseases, such as hypertension, diabetes, hyperlipidemia, atrial fibrillation, and stroke (40). Hypertension is associated with the incidence of myocardial infarction in which blood pressure greater than 140/90 mmHg is a risk of experiencing a myocardial infarction (12). Diabetes mellitus is also associated with myocardial infarction and the incidence of cardiac arrest (41). Persistent hyperglycemia in patients with diabetes mellitus triggers biochemical changes, causing glycosylation of proteins in the walls of the coronary arteries that contribute to diabetic atherosclerosis (42). A study mentioned that multimorbidity in elderly female patients results in reduced physical function, which will impact the activities carried out by these patients. In STEMI patients with diabetes mellitus, decreased glucose energy uptake and fatigue were identified as physiological factors influencing changes in physical activity in these patients (43).

The results of the present study showed that 69.3% of patients had mild depression, and the rest of the patients had moderate depression and had a relationship with physical activity. Kanel and Begre revealed that 40% of post-treatment AMI patients experience depression, both major and minor depression (44). The relationship between depression and physical activity in myocardial infarction shows that acute myocardial patients who experience depression tend to smoke, do low physical activity, and consume alcohol (45). In addition, psychological conditions can cause poor health behavior, one of which is physical activity. Several studies developed appropriate nursing interventions to reduce depression in patients with myocardial infarction aimed to improve their health status and recovery.

This study found that 83.3% of patients had negative self-efficacy related to physical activity. Similar to this study, the study performed in Korea (46) found that 75.2% of men with an average age of 50 years had negative cardiac self-efficacy. The results of the other study (47) which supported the results of this study concluded that low self-efficacy could reduce the level of physical activity in patients with coronary heart patients. A cohort study which assessed the effect of self-efficacy on cardiac lifestyle in 125 heart patients who had received self-management intervention and measured cardiac lifestyle after one year concluded that increased self-efficacy was accompanied by an increase in cardiac lifestyle, in the form of an increase in recommended physical activity and the selection of food consumed (48).

This study had the limitations of a small sample of a single-center study. The present study had some limitations. First, this study had the boundaries of a small sample of a single-center study. Also, purposive sampling and the relatively small sample size limit the generalizability of the results of the present study.

Implications for practice

Factors related to the patient's physical activity were age, gender, long days after hospitalization, comorbidities, depression, and self-efficacy. It is recommended that pre-discharge education, follow-up of physical activity after discharge, and interventions, including community-based cardiac rehabilitation be performed to increase physical activity in AMI patients.

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Conflicts of interest

The authors declared no conflict of interest.

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