



## Original Article

## Physical activity levels of patients prior to acute coronary syndrome – Experience at a tertiary care hospital in Sri Lanka

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## ARTICLE INFO

## Article history:

Received 19 November 2016

Accepted 22 August 2017

Available online 25 August 2017

## Keywords:

Physical activity

Acute coronary syndrome

Exercise

Cardiovascular disease

Coronary heart disease

## ABSTRACT

**Objectives:** Physical inactivity is associated with high cardiovascular risk. The purpose of this study was to study physical activity levels of patients with acute coronary syndrome (ACS).

**Methodology:** A total of 504 patients, from the Professorial Unit of the Colombo South Teaching Hospital completed the International Physical Activity Questionnaire (IPAQ). IPAQ is a validated questionnaire used internationally to objectively measure physical activity. Both the total volume and the number of sessions of activity are included in the IPAQ. Populations are divided into three levels based on physical activity levels: low, moderate and high activity.

**Results:** Out of 504 patients, 128 (25.1%) were highly active, 87 (17.1%) were minimally active and 289 (56.7%) were found to be inactive. When considering mets per week 134 (26.3%) spent less than 1000 mets/week. Physical activity levels of men and women were similar ( $p = 0.06$ ). There was no significant association between body mass index (BMI) with total IPAQ score ( $p = 0.11$ ). There was no difference in the physical activity levels of patients presenting with different types of ACS: ST-Elevation Myocardial Infarction (STEMI), non-ST-elevation myocardial infarction (NSTEMI) or unstable angina (UA) ( $p = 0.36$ ). The activity levels did not affect the severity of ACS assessed by Thrombolysis In Myocardial Infarction (TIMI) scores. (NSTEMI/UA  $p = 0.24$ , STEMI  $p = 0.10$ ).

**Conclusion:** In Sri Lanka, a majority of patients with ACS were physically inactive. Physical inactivity is one of the remediable major risk factors of ACS and an active life style should be promoted.

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## 1. Introduction

Cardiovascular disease (CVD) is the leading cause of death worldwide.<sup>1</sup> It has a significant toll on the health system of the developed as well as developing countries. Acute coronary syndrome (ACS) is now one of the leading causes of mortality in the Asia-Pacific region. ACS in the Asia-Pacific region accounts for around half of the global burden.<sup>2</sup> With the current demographic transition and increase in life expectancy, incidence of non-communicable diseases, including ACS is on the rise in Sri Lanka. In 2001, non-communicable diseases (NCDs) accounted for 71% of all deaths and from the year 2005 to 2010; there was a 29% increase in hospitalization due to ischemic heart disease (IHD).<sup>3</sup>

Prevention is a key public health strategy in controlling any NCD. The modification of risk factors significantly reduces morbidity and mortality from heart disease. The well established risk factors for CVD are smoking, abnormal lipids, hypertension,

diabetes, abdominal obesity, psychosocial factors, reduced consumption of fruits, vegetables, alcohol abuse and physical inactivity.<sup>4</sup> Several studies have shown that mortality and morbidity of coronary heart disease is inversely related to the level of physical activity.<sup>5,6</sup> Though the exact mechanism as to how physical activity helps to reduce ACS is still not fully understood there are many mechanisms put forward to explain how physical activity reduces cardiovascular events. Some of them are improved endothelial function, attenuated plaque progression/regression and outward remodeling, stabilization of vulnerable plaques preventing plaque rupture, infarct sparing due to myocardial preconditioning, correction of autonomic imbalance, reduction in myocardial oxygen demand, decreased thrombosis, enhanced collateralization and decreased inflammatory mediator release from skeletal muscle and adipose tissue.<sup>7</sup>

The objectives of this study were to describe the level of physical activity and its effects on patients presenting with ACS.

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## 2. Methodology

All patients, admitted with ACS, to the University Unit of the Colombo South Teaching Hospital completed the International Physical Activity Questionnaire (IPAQ). The study period was from June 2013 to June 2014. The IPAQ is an internationally accepted and validated questionnaire that is used to measure physical activity. Validity of IPAQ has been tested in over 12 countries for reliability and it had been found to be reliable and valid.<sup>7,8</sup> The IPAQ short form asks about three specific types of activity undertaken: walking, moderate-intensity activities and vigorous-intensity activities. Categorical and continuous indicators of physical activity are measured. Both the total volume and the number of sessions of activity are included in the IPAQ. Populations are divided into three levels based on physical activity: i.e., low, moderate and high. To enable this categorization, a further index – namely metabolic equivalents of task (MET) is used. The MET is a physiological measure expressing the energy cost of physical activities. One MET is equivalent to the rate of energy produced per unit surface area of an average person seated at rest and is equal to 3.5 ml of O<sub>2</sub>/kg/min.<sup>10</sup>

In the IPAQ,<sup>11</sup> high activity is defined based on two criteria: vigorous-intensity activity on at least 3 days achieving a minimum of at least 1500 MET-min/week or seven or more days of any combination of walking, moderate-intensity or vigorous-intensity activities achieving a minimum of at least 3000 MET-min/week. Moderate category was defined as three or more days of vigorous-intensity activity of at least 20 min/day or 5 or more days of moderate-intensity activity and/or walking of at least 30 min/day or 5 or more days of any combination of walking, moderate-intensity or vigorous intensity activities achieving a minimum of at least 600 MET-min/week. Those not falling under categories high and moderate were classified as “Low”.

The IPAQ was given to the participants by a fully qualified MBBS doctor and was present for any clarification during the filling of the questionnaire by the participants. According to the American physical activity guideline of 2008,<sup>9</sup> health benefits of physical activity are seen if total weekly energy expenditure is 500–1000 MET-min/week.

Baseline demographic data and details of the ACS were collected from all patients. All patients were assessed by a specialty registrar and a senior registrar. Myocardial infarction (MI) was defined according to the universal classification of MI.<sup>12</sup> Thrombolysis in myocardial infarction (TIMI) scores was calculated to measure the severity of ACS. Smoking status was defined as follows: current smoker–currently smoking and those who have stopped within the last 1 year and former smoker – those who have stopped smoking over 1 year ago.

The ethical approval for the study was obtained from the Ethics Review Committee of the Colombo South Teaching Hospital.

## 3. Statistics

Data were analyzed using Statistical Package for Social Sciences version 19. Descriptive statistics frequencies were used for qualitative measurements. Summary statistics of mean, median, standard deviation and percentiles were used for quantitative measurements. The association between qualitative measures was assessed using the chi square test. ANOVA was used to compare means and Kruskal Wallis was used to compare an independent variable on a continuous or ordinal dependent variables. Multiple regression was carried out to predict the TIMI score according to gender, body mass index (BMI) and physical activity. The statistical significance was established at  $p < 0.05$ .

## 4. Results

The study included 348 males and 156 females. The majority 393 (77%) of the patients were between 45 and 74. Pre-existing ischemic heart disease was found in 236 (46.8%) patients, diabetes in 198 (39.3%), hypertension in 254 (50.4%) and dyslipidemia in 109 (21.6%). 123 (24.4%) were current smokers, 107 (21.23%) were former smokers and 274 (54.36%) were non-smokers.

The chief complaint on admission was chest pain in 347 (68.8%) and shortness of breath in 78 (15.4%). Of the total of 504 patients, 128 (25.1%) were highly active, 87 (17.1%) were moderately active and 289 (56.7%) belonged to the low activity group. When considering METS per week 134 (26.3%) patients spent less than 1000 METS/week. The baseline characteristics of the study population according to activity levels are given in Table 1.

Physical activity levels of men and women showed no difference ( $p = 0.06$ ). There were 20 patients (3.9%) with BMI  $< 18.5 \text{ kg/m}^2$ , 52 (10.2%) with BMI of  $18.5\text{--}23 \text{ kg/m}^2$ , 82 (16.1%) with BMI of  $23\text{--}27.5 \text{ kg/m}^2$  and 32 (6.3%) with BMI  $> 27.5 \text{ kg/m}^2$ . There was no significant association between BMI and total IPAQ score ( $p = 0.11$ ). The initial presentation (chest pain vs. other complaints) did not vary according to the activity level ( $p = 0.36$ ). There was no difference in the physical activity levels of patients presenting with different types of ACS: ST-elevation myocardial infarction (STEMI), non-ST-elevation myocardial infarction (NSTEMI) or unstable angina (UA) ( $p = 0.46$ ). The activity levels did not affect the severity of ACS assessed by TIMI scores. (NSTEMI/UA  $p = 0.24$ , STEMI  $p = 0.10$ ) The mean TIMI scores are given in Table 2.

A multiple regression was carried out to establish the relationship between the TIMI score and gender, BMI and physical activity. These variables did not significantly predict TIMI score,  $F(3, 94) = 1.896$   $p = 0.136$ , and  $R^2 = 0.057$ . The  $p$  values for each of these non-significant variables were: sex (0.684), total METs per week (0.724), and BMI (0.6).

**Table 1**  
Baseline characteristics according to activity levels.

	Number of patients			p value
	Highly active (%)	Moderately active (%)	Low active (%)	
Gender				
Male	95 (74.2)	67 (77)	186 (64.4)	0.06
Female	33 (25.8)	20 (23)	103 (35.6)	
ACS Type				
STEMI	40 (7.3)	24 (27.6)	73 (25.3)	0.46
Non STEMI	36 (28.1)	34 (39.1)	93 (32.2)	
Unstable Angina	39 (30.5)	22 (25.3)	60 (20.8)	
Initial presentation				
Chest pain	92 (71.9)	64 (73.6)	186 (64.4)	0.36
Other complaint	35 (27.3)	23 (26.4)	95 (32.9)	

**Table 2**  
TIMI scores according to patient's activity levels.

	TIMI UA/NSTEMI (Mean scores)	TIMI STEMI (Mean scores)
Highly active	2.3	3.31
Moderately active	2.57	3
Low active	2.56	3.99
p Value	0.97	0.23

## 5. Discussion

This study provides many important insights in to the relationship between physical activity and ACS in the patients we studied. Our study found a majority of patients with ACS to be physically inactive. Many international organizations and guidelines suggest a minimum of 1000 METs/week energy expenditure for cardiovascular benefits<sup>9</sup> and 26.3% of our population did not meet this minimum standard. The ACC/AHA 2006 update recommends moderate-intensity aerobic activity for 30–60 min a day for at least 5 days and preferably 7 days a week. Studies done on physical activity in other south Asian countries have found similar rates of inactivity.<sup>13</sup> In other countries such as India, Japan, Hong Kong and Taiwan lower physical activity levels have been reported.<sup>14</sup> A study from Brazil found 50% patients to be physically active.<sup>15</sup> It is accepted that physical inactivity is one of the major risk factors for atherosclerosis. A large cross sectional study done on Sri Lankans found physical inactivity was associated with obesity, diabetes, hypertension and metabolic syndrome.<sup>16</sup> As majority of our patients were physically inactive it could imply that physical inactivity could be a causative factor in the development of ACS in these patients, though this hypothesis needs further larger experimental studies. Physical inactivity is a major remediable risk factor in the development of CVD and therefore, this study gives an important preventive public health message.

Our study did not find a significant difference in the physical activity levels between males and females ( $p=0.06$ ). This was different from some previous studies which used the long form of IPAQ where men were found to be physically active than women.<sup>9</sup> Some of these studies had very few women. There was no significant association between BMI with total IPAQ score in the present study. A study done in Pakistan<sup>17</sup> showed there was a significant difference between BMI with total IPAQ score.

Though one would assume physical inactivity to be associated with worse outcomes in ACS, our study did not show a difference. The activity levels did not affect the severity of ACS assessed by TIMI scores. In GRECS study,<sup>18</sup> physical activity was associated with a reduced severity of ACS, reduced in-hospital mortality rates, and better short-term prognosis. It is unclear why our study failed to show this relationship between physical activity level and severity of ACS. One reason for the above could be the smaller sample size compared to the GRECS study, which had 2172 patients.

The main limitation of the study is the self-reported nature of the level of physical activity. Self-reported physical activity could be an overestimate and also affected by recall inaccuracies. The other limitation is that the physical activity in the last week prior to ACS was taken as the normal level of physical activity of the individual. The usage of the short form of IPAQ instead of the long form could have also contributed to a limited assessment of physical activity.

Large observational studies (EUROpean Action on Secondary Prevention through Intervention to Reduce Events – EUROASPIRE I, II, III)<sup>19</sup> have shown that the recommendations for the control of cardiovascular risk factors have not been implemented optimally in clinical practice. In general, we should advice patients to achieve

at least the minimal activity level needed to maintain a healthy life in order to prevent CAD and preventive programmes should actively address this issue of low physical activity in Sri Lankan people.

## Authors

ATM and DKND were involved in data collection, management of patients, statistics and drafting the manuscript. SG and JI were involved in patient management and drafting of the manuscripts.

## Ethical Approval

Received form the Ethical review Committee of the CSTH.

## Previous Publication

Presented as an oral presentation at the Annual Academic Sessions of the Ceylon College of Physicians 2014.

## Conflict of interest

The authors have none to declare.

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