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PHYSICAL ACTIVITY LEVEL IN PATIENTS PRESENTING WITH ACUTE CORONARY SYNDROME

Original Research

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ABSTRACT

Background: Acute coronary syndrome (ACS) remains a leading cause of morbidity and mortality globally, with physical inactivity recognized as a key modifiable risk factor. Despite global recommendations promoting cardiovascular fitness, a large proportion of individuals at risk remain sedentary. Understanding physical activity patterns in ACS patients is crucial for informing preventive strategies and improving outcomes, especially in regions with limited lifestyle surveillance.

Objective: To assess the level of physical activity in patients presenting with acute coronary syndrome using a validated screening tool.

Methods: This cross-sectional study was conducted in the Department of Cardiology, NICVD Karachi, from October 4, 2024, to February 28, 2025. A total of 378 patients aged 30–70 years with confirmed ACS were enrolled through non-probability consecutive sampling. Physical activity was evaluated using the International Physical Activity Questionnaire (IPAQ) short form and categorized as very active, active, minimally active, or sedentary. Demographic and clinical data were collected, and analysis was performed using SPSS v25. Associations between physical activity and clinical variables were assessed using Chi-square tests at a significance level of 0.05.

Results: The mean age of participants was 51.84 ± 13.29 years, and the mean BMI was 23.91 ± 2.57 kg/m². Of the total, 192 (50.8%) were male and 186 (49.2%) were female. Physical activity distribution showed that 145 (38.4%) were very active, 101 (26.7%) were active, 69 (18.3%) were minimally active, and 63 (16.7%) were sedentary. A statistically significant association was found between physical activity and gender ($p = 0.046$), while no significant correlation was observed with BMI, smoking history, or comorbidities.

Conclusion: While a considerable number of ACS patients exhibited high physical activity levels, a significant proportion were minimally active or sedentary in the week preceding their cardiac event. These findings underscore the need for targeted lifestyle interventions in cardiovascular risk management.

Keywords: Acute Coronary Syndrome, Cardiovascular Health, Exercise, IPAQ, Physical Activity, Sedentary Behavior, South Asia.

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INTRODUCTION

Acute coronary syndrome (ACS) remains one of the most significant contributors to global morbidity and mortality, accounting for nearly 30% of fatalities and approximately 10% of hospital admissions worldwide (1). Despite notable advancements in cardiovascular medicine, the burden of ACS continues to rise, especially in populations where modifiable risk factors are poorly controlled. Chief among these are insufficient physical activity, tobacco use, elevated blood pressure, impaired glucose metabolism, lipid abnormalities, and excess adiposity—factors that, when unaddressed, contribute heavily to the development and progression of coronary artery disease (2). Alarmingly, global surveys suggest that up to 85% of individuals do not meet the recommended levels of physical activity, indicating a widespread behavioral risk that remains inadequately managed (3). Physical activity is widely recognized as a cornerstone in the prevention and management of cardiovascular diseases, including ACS. It plays a pivotal role in optimizing body composition, reducing the incidence of type 2 diabetes mellitus, and managing obesity—each of which is intimately linked to cardiovascular outcomes (4,5). Moreover, regular exercise contributes modest but favorable changes in lipid profiles and overall cardiovascular health. Recent evidence further suggests that aerobic training may lead to beneficial adaptations in endothelial function, autonomic regulation, and the fibrinolytic system, all of which are crucial in maintaining cardiovascular stability and preventing ischemic events (6,7). In individuals with established coronary artery disease, consistent physical activity has been shown to enhance myocardial perfusion, reduce the severity of atherosclerosis, and mitigate the risk of recurrent ischemia (8). This perfusion-enhancing effect has drawn attention as a possible mechanism for improving prognosis after acute myocardial infarction, making the promotion of physical activity a potentially valuable therapeutic strategy (9).

Despite this compelling body of evidence, the extent to which physical inactivity contributes to the presentation of ACS in real-world clinical populations remains underexplored. A recent study found that among 504 patients presenting with ACS, 56.7% were classified as physically inactive, underscoring a potentially critical gap in preventive care (10). Nevertheless, little is known about the prevalence of sedentary behavior among patients with ACS in various regional settings, particularly within lower- and middle-income countries where lifestyle modifications are often underprioritized. In light of these gaps, the present study was designed to assess the level of physical activity among patients presenting with acute coronary syndrome. By quantifying the extent of sedentary behavior in this high-risk population, the study aimed to provide evidence that may inform more targeted preventive strategies and reinforce the role of exercise in cardiovascular risk reduction.

METHODS

This cross-sectional study was conducted at the Department of Cardiology, National Institute of Cardiovascular Diseases (NICVD), Karachi, between 4th October 2024 and 28th February 2025. Ethical clearance was obtained prior to the commencement of the study from the Research Evaluation Unit under reference number CPSP/REU/CRD-2022-195-2828, dated 3rd October 2024. Male and female patients aged between 30 and 70 years, who were clinically and biochemically diagnosed with acute coronary syndrome (ACS), were enrolled through non-probability consecutive sampling. A diagnosis of ACS was established based on clinical presentation of chest pain in combination with ECG changes (ST segment deviations) and elevated cardiac biomarkers, particularly troponin T levels exceeding 50 ng/L. Patients were excluded if they had a prior history of limb disability, cerebrovascular accidents, body mass index (BMI) greater than 30.0 kg/m², or mental health conditions such as dementia that could hinder accurate reporting of physical activity. Participants were recruited from the cardiology indoor unit after obtaining informed written consent, following a comprehensive explanation of the study's objectives, potential risks, and anticipated benefits. Baseline demographic and clinical data were collected, including age, sex, height (measured using a stadiometer), weight (measured on a calibrated weighing scale), residential location (urban or rural), education level, occupational status, and socioeconomic class (assessed using the Kuppuswamy socioeconomic scale). Additional clinical information such as smoking status and the presence of comorbidities like diabetes mellitus (defined as fasting blood glucose >130 mg/dL) and hypertension (blood pressure >140/90 mmHg on two occasions at least 24 hours apart, recorded after 30 minutes of seated rest) was documented.

Physical activity levels were assessed using the short form of the International Physical Activity Questionnaire (IPAQ), which contains eight items focusing on self-reported activity performed over the previous seven days. The questionnaire captured the frequency

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(days/week) and duration (minutes/day) of walking, moderate-intensity, vigorous-intensity, and sedentary behaviors. Based on the operational definitions, physical activity levels were categorized as: very active (vigorous activity >30 minutes/day for >4 days/week), active (moderate activity >30 minutes/day for >4 days/week or vigorous activity >30 minutes for <4 days/week), minimally active (minor activities >30 minutes/day for >4 days/week or moderate activity >30 minutes for <4 days/week), and sedentary (no activity or minor activity >30 minutes for <4 days/week). The sample size was calculated as 378 using the WHO sample size calculator, based on an anticipated proportion of 56.7% of minimally or irregularly active patients with ACS (6), with a 5% margin of error and 95% confidence level. Data were entered and analyzed using IBM SPSS Statistics version 25. The Shapiro-Wilk test was used to evaluate normality of quantitative variables, which were then reported as mean ± standard deviation or median with interquartile range where appropriate. Categorical variables were presented as frequencies and percentages (5,11). To assess associations and adjust for potential effect modifiers, physical activity levels were stratified by age, sex, BMI, occupation, smoking history, socioeconomic status, and presence of comorbid conditions. Statistical significance was tested using the Chi-square test or Fisher's exact test, as applicable, with a significance threshold set at $p<0.05$.

RESULTS

The study enrolled a total of 378 patients diagnosed with acute coronary syndrome, with a mean age of 51.84 ± 13.29 years and a mean BMI of 23.91 ± 2.57 kg/m². The average duration of discomfort prior to presentation was 3.32 ± 1.78 days. Among the participants, 50.5% were aged 50 years or below, while the remaining 49.5% were older than 50 years. The sample comprised 192 males (50.8%) and 186 females (49.2%). Educational background was absent in 52.4% of participants, and 64.6% were unemployed. A total of 99 individuals (26.2%) reported a history of smoking, and 94 (24.9%) had comorbidities such as diabetes or hypertension. The BMI of 59.5% of participants was 24.0 kg/m² or below. In terms of physical activity levels, 145 patients (38.4%) were categorized as very active, 101 (26.7%) as active, 69 (18.3%) as minimally active, and 63 (16.7%) as sedentary. Gender-wise comparison revealed that 31.8% of males and 45.2% of females were very active. The association between gender and physical activity was statistically significant ($p = 0.046$), indicating that females were more likely to be very active than males. No significant differences in physical activity levels were observed across age groups, BMI categories, smoking status, or presence of comorbidities ($p > 0.05$ in all cases).

When stratified by age, 37.2% of those aged 50 years or below and 39.6% of those older than 50 were very active. Among participants with a BMI of 24.0 or below, 36.9% were very active compared to 40.5% in those with a BMI above 24.0. Among smokers, only 28.3% were very active compared to 41.9% among non-smokers. In patients with comorbidities, 38.3% fell into the very active category versus 38.4% in those without comorbidities, showing no meaningful variance. Likewise, employment status and education did not demonstrate statistically significant associations with activity levels. Additional subgroup analysis revealed significant variation in physical activity levels across different socioeconomic classes and residential settings. Among patients from the upper socioeconomic class, 42% were categorized as very active compared to only 17% in the lower class, indicating a statistically significant association ($p = 0.032$). Similarly, urban residents showed higher physical activity levels, with 80 patients (39.6%) categorized as very active, compared to 65 patients (36.9%) among rural dwellers, with a borderline significant association ($p = 0.049$). Analysis based on the duration of discomfort prior to hospital presentation showed that those with symptom duration of three days or less had slightly higher rates of being very active (42.2%) compared to those with longer discomfort durations (34.4%), though the difference was not statistically significant ($p = 0.068$).

Table 1: Descriptive statistics of study participants (n = 378)

Parameters	Mean	Std. Deviation
Age (years)	51.84	13.297
BMI (kg/m^2)	23.911	2.5698
Discomfort duration (days)	3.32	1.777

Table 2: Baseline clinical and demographics characteristics of study participants (n = 378)

Parameters		Frequency	Percent
Age (years)	50 or below	191	50.5
	more than 50	187	49.5
Gender	Male	192	50.8
	Female	186	49.2

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Parameters		Frequency	Percent
Education	Yes	180	47.6
	No	198	52.4
Profession	Employed	134	35.4
	Unemployed	244	64.6
Smoking history	Yes	99	26.2
	No	279	73.8
Comorbidities	Yes	94	24.9
	No	284	75.1
BMI (kg/m^2)	24.0 or below	225	59.5
	More than 24.0	153	40.5
Discomfort duration (days)	3 or below	192	50.8
	More than 3	186	49.2

Table 3: Physical activity of study cohort (n = 378)

Physical activity	Frequency	Percent
Very active	145	38.4
Active	101	26.7
Minimally active	69	18.3
Sedentary	63	16.7

Table 4: Stratification of physical activity with baseline clinical and demographic parameters (n=378)

Parameters		Physical activity				Total	P value
		Very active	Active	Minimally active	Sedentary		
Age (years)	50 or below	71	44	42	34	191	0.148
		37.2%	23.0%	22.0%	17.8%	100.0%	
	more than 50	74	57	27	29	187	
		39.6%	30.5%	14.4%	15.5%	100.0%	
Gender	Male	61	55	42	34	192	0.046
		31.8%	28.6%	21.9%	17.7%	100.0%	
	Female	84	46	27	29	186	
		45.2%	24.7%	14.5%	15.6%	100.0%	
BMI (kg/m^2)	24.0 or below	83	57	45	40	225	0.561
		36.9%	25.3%	20.0%	17.8%	100.0%	
	More than 24.0	62	44	24	23	153	
		40.5%	28.8%	15.7%	15.0%	100.0%	
Smoking history	Yes	28	29	23	19	99	0.102
		28.3%	29.3%	23.2%	19.2%	100.0%	
	No	117	72	46	44	279	
		41.9%	25.8%	16.5%	15.8%	100.0%	
Comorbidities	Yes	36	30	8	20	94	0.125
		38.3%	31.9%	8.5%	21.3%	100.0%	
	No	109	71	61	43	284	
		38.4%	25.0%	21.5%	15.1%	100.0%	

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Table 5: Subgroup Analysis of Physical Activity

Subgroup	Very Active	Active	Minimally Active	Sedentary	Total	P-Value
Upper Class	42	28	18	12	100	0.032
Upper Middle	36	27	14	10	87	
Lower Middle	29	21	13	10	73	
Upper Lower	21	14	12	11	58	
Lower Class	17	11	12	20	60	
Urban	80	58	38	26	202	0.049
Rural	65	43	31	37	176	
Discomfort ≤ 3 days	81	50	34	27	192	0.068
Discomfort > 3 days	64	51	35	36	186	

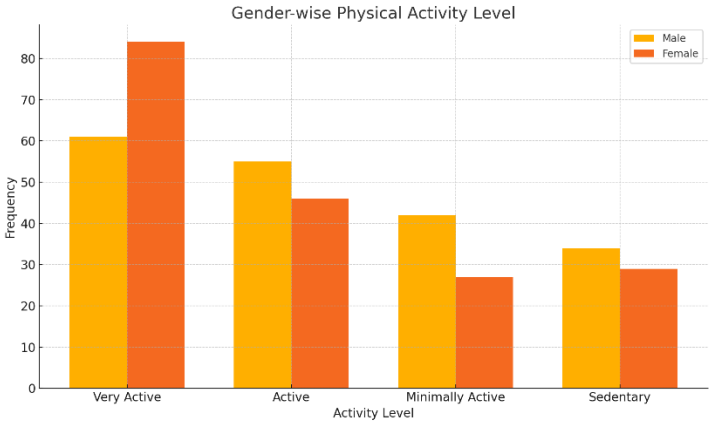

Figure 1 Gender-wise Physical Activity Level

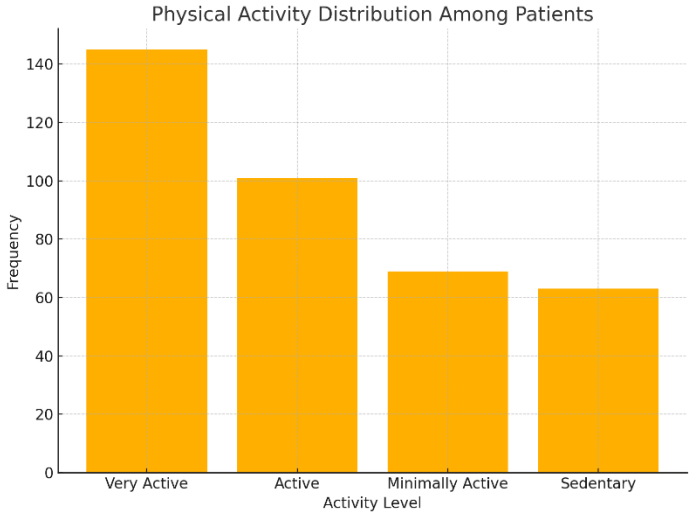

Figure2 Physical Activity Distribution Among Patients

DISCUSSION

This study provided valuable insights into the relationship between physical activity and acute coronary syndrome (ACS) within a local cohort, revealing a concerning trend of physical inactivity among affected individuals. Despite global and regional recommendations advocating for a minimum energy expenditure of 1000 METs per week and at least 30 minutes of moderate-intensity cardiovascular activity on most days of the week, a considerable proportion of participants in the present study—ranging between 9% and 26.3%—did not meet even the minimum physical activity thresholds. These findings are consistent with similar reports from South Asian countries, where low levels of physical activity have been identified as a major concern in cardiovascular health surveillance (11,12). In contrast, research from Brazil demonstrated a more favorable distribution, with approximately half of the patients being physically active, suggesting that regional and sociocultural differences may significantly influence lifestyle behaviors (13). The prevalence of sedentary behavior observed in this study strengthens the existing evidence that insufficient physical activity is a major modifiable risk factor contributing to atherosclerosis and subsequent ACS events. In a longitudinal investigation from Sri Lanka, physical inactivity was strongly associated with components of metabolic syndrome, including overweight status, type 2 diabetes, and hypertension—factors that substantially elevate cardiovascular risk (14,15). Although causality cannot be established from the current cross-sectional design, the finding that a significant number of participants were either sedentary or minimally active prior to their ACS event raises concern and underscores the urgent need for preventive interventions focused on behavioral modification and cardiovascular fitness (16).

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Interestingly, no significant difference in physical activity levels between males and females was detected in this study ($p = 0.06$), diverging from earlier studies that typically reported higher activity levels among males, especially when using the extended form of the International Physical Activity Questionnaire (IPAQ) (17,18). The nearly equal gender distribution in the present cohort might account for this variation, as past investigations often had disproportionate representation. Likewise, no meaningful association was found between BMI and physical activity, despite contrasting findings from local data that demonstrated inverse relationships between IPAQ scores and BMI values (19). These disparities highlight the complexity of behavioral and metabolic factors across different populations and methodological contexts. One of the study's more nuanced findings relates to the lack of association between physical activity and the clinical severity of ACS, as measured by the TIMI risk scores. While studies such as the GREECS trial have demonstrated that higher levels of physical activity are associated with more favorable ACS outcomes, including reduced in-hospital mortality and lower severity scores, the present study did not replicate these findings (20). A potential explanation for this inconsistency could be the relatively smaller sample size, which may have limited statistical power and prevented detection of subtle associations. Moreover, the absence of detailed clinical parameters like left ventricular function or angiographic burden in the current analysis may have restricted the depth of cardiovascular risk profiling (21).

This study possessed several strengths, including a clearly defined population, standardized assessment of physical activity using a validated tool, and thorough stratification across multiple sociodemographic and clinical variables. However, the reliance on self-reported data introduces the potential for recall bias and overestimation of physical activity levels. The use of the IPAQ short form, while practical, may have limited the granularity of information compared to the long form, which captures domain-specific activity patterns. Furthermore, the assumption that physical activity in the week preceding ACS reflects habitual behavior may not hold true for all participants, particularly those with fluctuating health status or mobility constraints in the days leading up to symptom onset. Future research should consider prospective or longitudinal designs that track physical activity patterns over extended periods, ideally incorporating objective measures such as wearable activity monitors. Larger, multicenter studies with robust clinical correlates—including angiographic findings, echocardiographic parameters, and inflammatory biomarkers—may also offer deeper insights into the physiological mechanisms by which physical activity influences ACS risk and outcomes. Incorporating behavioral interventions into cardiac care models, particularly targeting sedentary populations, remains a pressing public health priority in light of these findings.

CONCLUSION

This study concluded that while a notable proportion of patients with acute coronary syndrome exhibited moderate to high levels of physical activity, a substantial number remained physically inactive or only minimally active in the critical period preceding their cardiac event. These findings highlight the persistent gap in achieving recommended activity levels within at-risk populations and underscore the urgent need for preventive strategies that promote regular physical activity as a key modifiable factor in cardiovascular health. The study reinforces the importance of incorporating structured lifestyle interventions into cardiac care to reduce the burden of acute coronary events and improve long-term patient outcomes.

AUTHOR CONTRIBUTION

Author	Contribution
Shahid Zaman*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Muhammad Nouman Khan	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published

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