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Original Research Article

A retrospective study to assess prevalence of self-reported physical activity levels among patients with myocardial infarction and its association with socio-economic and demographic variables

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Abstract

Introduction: Myocardial infarction is a leading cause of mortality and morbidity in the United States. Physical activity plays a crucial role in prevention and reduction of debilitating effects of Myocardial infarction (MI). It also decreases the incidence of coronary artery disease (CAD) and reduces symptoms in patients with established cardiovascular disease. It also reduces the chances of further attacks and complications associated with myocardial infarction.
Aim: The aim is to analyse the factors affecting prevalence of physical activity among patients with a history of myocardial infarction.
Materials and Methods: A retrospective study is conducted using data from the Behavioural Risk Factor Surveillance System database (BRFSS WEAT) database for the year 2021. Participants were categorized based on self-reported MI history. Their physical activity levels were measured using standard survey questions. We used statistical analysis for differences in age, gender, race, income and other health problems.
Results: Based on the statistical analysis, the prevalence of physical activity was highest with the following demographic parameters: - Age group-65+ years (60.4%), male gender (65.1%), white non-Hispanic race (62%), advanced education state(66.8%) , not employed status(57.7%) and low income levels(54.5%). Among participants who had a health check-up within past one year, the prevalence was higher in those who did not have a history of myocardial infarction (75.8%).
Conclusions: Despite physical activity being an important parameter for maintaining good health in MI patients, the prevalence of it in MI patients is sub-optimal. Therefore, it is essential to evaluate the factors affecting the prevalence of physical activity and identify areas that require intervention to improve quality of life in MI patients.

Keywords: Myocardial infarction, Physical activity, United States, BRFSS database.

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1. Introduction

Heart attacks, also referred to as myocardial infarctions (MI), are one of the world's major causes of morbidity and mortality. In the United States alone, approximately 805,000 people experience an MI each year, with significant implications for their daily lives and long-term health. Survivors of MI often face numerous challenges, including reduced physical capacity, increased risk of recurrent cardiac events, and a significant impact on their quality of life.[1-3] These challenges emphasise the need for effective secondary prevention strategies to improve outcomes and provide a better quality of life for these patients.

Physical activity plays a crucial role in the secondary prevention of myocardial infarction by improving cardiovascular health and reducing the risk of further cardiac events. Increased physical activity results in improved

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endothelial function, reduced inflammatory markers and enhancements in overall cardiovascular fitness.[4] Studies have consistently shown that regular physical activity can significantly reduce morbidity and mortality among MI survivors. For example, Anderson et al. (2016) found that exercise-based cardiac rehabilitation programs lead to a 20-30% reduction in cardiovascular mortality and a significant decrease in hospital readmissions.[5] In a similar vein, Taylor et al. (2004) showed that these initiatives enhance patients' physical and emotional well-being who have coronary heart disease.[6]

The Behavioural Risk Factor Surveillance System (BRFSS) is a valuable tool for assessing health-related behaviours, including physical activity, through telephonic surveys.[7] This study will contribute to the broader understanding of how to optimise secondary prevention strategies for individuals affected by myocardial infarction.

2. Aims and Objectives

The aim of this study is to investigate and evaluate the factors affecting self-reported prevalence of physical activity among patients with a history of myocardial infarction. The primary objective of this study is to highlight the demographics and clinical factors influencing the level of physical activity in patients with myocardial infarction to establish targeted interventions to promote cardiac rehabilitation and overall health maintenance.

3. Materials and Methods

A Retrospective original research study is conducted using Behavioural Risk Factor Surveillance System database.[8] the data was extracted on 13 April 2024. Since Behavioural Risk Factor Surveillance System contains deidentified data and it is publicly available and no human participation is involved directly the ethics committee approval is not needed.

Data extracted from Behavioural Risk Factor Surveillance System Web Enabled Analysis Tool (BRFSS WEAT) for the year 2021 since it is the last available year. Here the Disease variable: 'Ever told you had a heart attack, also called a myocardial infarction?' (CVDINFR4) and physical activity variable: 'During the past month, any physical activity or exercises such as running, calisthenics, golf, gardening, or walking for exercise?' (EXERANY2) are used. The control variables used here are Demographic characteristics, socioeconomic characteristics and health care access, demographic characteristics include Age: Calculated variable for 4-level imputed age category(_AGE_G,18-24,25-44,45-64,65+) , Gender (SEX1) , Race: Calculated variable for 4-levelrace (_RACEGR3).Here parameters, Age (_AGE_G,18-24,25-44,45-64,65+) , Gender (SEX1) , Race (_RACEGR3) are combined together under the group Demographic characteristics. Socio economic characteristics include Education: Education level (EDUCA), Employment: Employment status (EMPLOY1), Income: Annual household income (INCOME3). Here parameters, Education (EDUCA), Employment (EMPLOY1), Income (INCOME3), are combined together under the group Socio-economic characteristics. And other control variable is Healthcare access: How long has it been since last routine check-up (CHECKUP1). Physical activity in members with previous attack of myocardial infarction under age, gender, race, education, employment, income, healthcare access variables is the inclusion criteria used in this study.

The education level was divided into two groups: "Basic Education: Never attended school or only kindergarten, Grades 1 - 8 (Elementary), Grades 9 - 11 (Some high school), Grade 12 or GED (High school graduate)" or "Advanced Education: College 1 year to 3 years (Some college or technical), College 4 years or more (College graduate)".

The employment status was divided into two groups: "Employed: Employed for wages" and "Self-employed". The "Not employed" option included being out of work for 1 year or more, out of work for less than 1 year or being a homemaker.

The annual income has been divided into 3 groups. The time since last routine check-up was divided into: 'Within past one year: Within the past year (1-12 months ago)', 'More than a year ago or never: Within the past 2 years (1-2 years ago)', 'Within the past 5 years (2-5 years ago), 5 or more years ago, never'.

Descriptive data in the form of number and percentages was generated for each variable using cross- tabulations in the web enabled analysis tool in the BRFSS. Data was collected in Microsoft Excel and statistical analysis was performed using R version 4.3.1. Chi-square test and Fishers exact test was used for statistical tests.

4. Results

In the year 2021 in the United States of America, 22,756 people participated in the BRFSS study. Out of this, 22,756 self-identified or answered "Yes" to the question "Ever told you had a heart attack, also called a myocardial infarction?" These were thus considered to have the myocardial infarction (CVDINFR4), as shown in **Table 1**.

In the past month, 60.9% participants of myocardial infarction were involved in physical activity whereas 39.1% were not. Among participants who did not have myocardial infarction, 76.5% were involved and 23.5% were not involved in physical activity in the past month. The Chi-squared test suggests that there is a statistically significant association between physical activity level and self-reported myocardial infarction.

Table 1: Prevalence of self-reported Myocardial Infarction by physical activity level

Paramaeters	Yes / No	During the past month, any physical activities, or exercises such as running, calisthenics, golf, gardening, or walking for exercise (Exerany2)		P value (Chi-squared test)
		Yes	No	
Ever told you had a heart attack, also called a myocardial infarction (CVDINFR4)	Yes	13849 (60.9%)	8907 (39.1%)	<0.001*
	No	315415 (76.5%)	97053 (23.5%)	
Values are mentioned in n (%). p value <0.05 is significant				

Table 2: Prevalence of self-reported Myocardial Infarction by physical activity level based on demographic characteristics of study participants.

Variables	Myocardial Infarction	N	Physically Active	Physically Not Active	P value (Fisher's exact test)
Age Groups					
18-24 years	Yes	86	61 (70.9%)	25 (29.1%)	0.003*
	No	25805	21597 (83.7%)	4208 (16.3%)	
25-44 years	Yes	994	685 (68.9%)	309 (31.1%)	<0.001*
	No	104622	85405 (81.6%)	19217 (18.4%)	
45-64 years	Yes	6585	3989 (60.6%)	2596 (39.4%)	<0.001*
	No	143174	109351 (76.4%)	33823 (23.6%)	
65+ years	Yes	15091	9114 (60.4%)	5977 (39.6%)	<0.001*
	No	138867	99062 (71.3%)	39805 (28.7%)	
Gender					
Male	Yes	13919	9068 (65.1%)	4851 (34.9%)	<0.001*
	No	187978	149163 (79.4%)	38815 (20.6%)	
Female	Yes	8837	4781 (54.1%)	4056 (45.9%)	<0.001*
	No	224490	166252 (74.1%)	58238 (25.9%)	
Race					
White, non-Hispanic	Yes	17733	10953 (61.8%)	6780 (38.2%)	<0.001*
	No	302955	235888 (77.9%)	67067 (22.1%)	
Black, non-Hispanic	Yes	1506	812 (53.9%)	694 (46.1%)	<0.001*
	No	30940	21850 (70.6%)	9090 (29.4%)	
Hispanic	Yes	1296	718 (55.4%)	578 (44.6%)	<0.001*
	No	36767	25450 (69.2%)	11317 (30.8%)	
Other	Yes	1605	994 (61.9%)	611 (38.1%)	<0.001*
	No	31830	24580 (77.2%)	7250 (22.8%)	
Values are mentioned in n (%). p value <0.05 is significant					

Table 1 shows the prevalence of physical activity based on socioeconomic characteristics of study participants.

The level of physical activity among patients of myocardial infarction was highest in participants with advanced education level (66.8%), not-employed (57.7%) and low- income (54.5%) categories.

Based on demographic variables, there is a statistically significant association between physical activity and myocardial infarction for advanced education level, not-employed status and low- income categories.

Table 2 shows prevalence of physical activity based on time since last routine check-up of study participants. Among participants with routine check-up within the past one year, 60.9% participants with myocardial infarction were physically active compared to 75.8 participants without myocardial infarction. This difference is statistically significant.

Among participants with routine check-up more than one year, 61.9% participants with myocardial infarction were physically active compared to 79.2% participants without myocardial infarction. This difference is statistically significant.

5. Discussion

This retrospective study was conducted to assess physical activity (PA) levels among patients with a history of Myocardial Infarction (MI) in the United States using the 2021 BRFSS database. It was found that PA is lower among patients with a history of MI than those who had no such history. The benefits of regular physical activity in reducing cardiovascular morbidity and mortality are well

established.[9,10] Regular PA provides significant protection from CVD by lowering high blood pressure, insulin resistance, high triglyceride levels , and obesity.[11] Furthermore, it has been suggested that PA independently improves endothelial function and reduces inflammation.[12,13] At the endothelial threshold, it increases the vascular circulation of nitric oxide and reduces the production of reactive oxygen species (ROS).[14] These adaptations help in improving myocardial perfusion and remodeling, partly through stimulation of endothelial progenitor cells and vasculogenesis.

In this research, subgroup analyses were performed to assess the PA–MI relationship taking into account their confounding (gender, age, and race etc.) variables. Across different demographic parameters, PA and MI showed negative correlation according to various parameters. Studies have shown that people who exercise reduce the risk of coronary heart disease (CHD) in men and women over many years. Even after taking into account other important risk factors for CHD, like income,[15] this effect remains. CVD risk in women observed to decrease as level of PA increased, showing a dose response relationship.[16]

The prevalence of MI is known to increase with age. Most of the subjects who have MI in this study were above 65 years (66%) of age. An inverse relationship between PA and MI was noted in all subgroups including the youngest age group (18 – 24 yrs). The effect was less pronounced but still statistically significant in this group, possibly due to smaller sample size or other unmeasured confounders such as genetics and substance use.[17] Other studies are also consistent with this finding as well.[18]

In terms of racial and ethnic groups, little to no information are available regarding non-white populations. In the current analysis, we characterize the proportion of those with a history of MI who are non-white to be ~21%. The results indicated statistically significant inverse relation between PA and MI and the results were uniform among racial/ethnic subgroups. This has been supported in non-white as well as white populations by other studies.[19]

The socio-economic status (SES) continues to be an independent, significant risk factor of CHD apart from those of traditional Framingham factors[20,21] Indeed, the association between low income and education and increased CVD risk has been strongly documented.[22] Some authors suggest that SES is included in the prediction of cardiovascular risk to better predict the risk and fairness.[23] For instance, inclusion of income and education information attenuated SES bias in Framingham-derived estimates.[24]

Furthermore, physical activity is a fantastic tool to address socioeconomic disparities in cardiovascular health. Research has also demonstrated that those with lower socioeconomic status are much less likely to meet PA recommendations, leading to variability in MI prevalence between income groups.[25] Public health interventions that foster equitable access to safe spaces for physical activity, and education and infrastructure for them are crucial. Preventing cardiovascular health disparity, as posited by Mensah et al.

The large overall sample size and inclusion of both genders, different age groups and from different racial, socioeconomic backgrounds as well as the consistent demonstration of an inverse relationship between PA and MI in multiple subgroup analyses makes the association robust.

6. Limitations

Being a telephone survey rather than in-person, those without access to landlines due to not using landlines being away from home were not contacted. Since the survey was conducted in English and selected other languages, those who did not speak these languages may belong to underrepresented groups and were excluded. A diagnosis of MI as well as details of PA may be affected for the following reasons. There is a possibility of misclassification being that a diagnosis of MI is self-reported for the study rather than based on specific diagnostic criteria. Additionally, the BRFSS dataset does not specify the type or severity of the disease, how many months before the participants developed the disease as well as the presence or absence of complications or additional interventions like surgery. These can affect the PA status of participants. Since the question asked about PA is within the past one month, it does not distinguish individuals who have started or stopped PA during the mentioned period. Thus, the onset of a continuous physical activity or inactivity cannot be established. It is unsure if one month of PA level can cause significant improvement in prognosis or if individuals who are temporarily inactive would lose the benefit. Being an observational study, it is possible that the summary estimates were influenced by unmeasured plausible confounders (such as smoking habit and diet). Causation cannot be established because both the exposure (physical activity) and the outcome (myocardial infarction) were collected concurrently. Prospective research study designs are needed to determine causality as well as the level of PA that can help prevent or reduce the risk of MI. More research is also needed to identify common barriers to participation in PA so that they can be addressed to reduce the risk of coronary heart disease.

7. Conclusion

Mortality due to myocardial infarction has been progressively contributing to mortality rates globally and is projected to rise. As physical activity is a critical component in primary and secondary prevention of MI in patients, it is essential to scrutinise the contributing factors to levels of physical activity in these patients. Understanding these contributing factors will help highlight potential areas for healthcare professionals to target when establishing interventions to promote physical activity adherence and long-term health maintenance in MI patients.

8. Source of Funding

None.

9. Conflict of Interest

None.

References

1. Benjamin EJ, Muntner P, Alonso A, Bittencourt MS, Callaway CW, Carson AP.. Heart Disease and Stroke Statistics—2019 Update: A Report From the American Heart Association. *Circulation*. 2019;139(10):e56-e528. https//doi:10.1161/CIR.0000000000000659
2. SS, Alonso A, Aparicio HJ, Benjamin EJ, Bittencourt MS, Callaway CW. Heart Disease and Stroke Statistics—2021 Update: A Report From the American Heart Association. *Circulation*. 2021;143(8):e254-e743. https://doi.org/10.1161/CIR.0000000000000950
3. Lloyd-Jones D, Adams RJ, Brown TM, Carnethon M, Dai S, De Simone G. Heart disease and stroke statistics—2010 update: a report from the American Heart Association. *Circulation*. 2010;121(7):e46 e215.https://doi:10.1161/CIRCULATIONAHA.109.192667
4. Lavie CJ. Exercise and the cardiovascular system: clinical science and cardiovascular outcomes. *Circul Res.* 2019;124(5):799-815.
5. Anderson L, Oldridge N, Thompson DR, Zwisler D, Rees K, Martin N, Taylor RS.. Exercise-based cardiac rehabilitation for coronary heart disease: Cochrane systematic review and meta-analysis. *J Am Coll Cardiol*, 2016;67(1):1 12. https;//doi:10.1016/j.jacc.2015.10.044
6. Taylor RS. Exercise-based rehabilitation for patients with coronary heart disease: systematic review and meta-analysis of randomised controlled trials. *Am J Med*. 2004;116(10):682-92. https://doi:10.1016/ j.amjmed.2004.01.009
7. Centres for Disease Control and Prevention. Behavioral Risk Factor Surveillance System (BRFSS). Retrieved from, 2020; Available: https://nccd.cdc.gov/weat/#/crossTabulation.
8. Powell KE, Thompson PD, Caspersen CJ, Kendrick JS. Physical activity and the incidence of coronary heart disease. *Annu Rev Public Health*. 1987; 8: 253–87. https://doi:10.1146/annurev.pu.08.050187.001345.
9. Thompson PD, Buchner D, Pina IL, Balady GJ, Williams MA, Marcus BH. American Heart Association Council on Clinical Cardiology Subcommittee on Exercise, Rehabilitation, and Prevention; American Heart Association Council on Nutrition, Physical Activity, and Metabolism Subcommittee on Physical Activity. Exercise and physical activity in the prevention and treatment of atherosclerotic cardiovascular disease: a statement from the Council on Clinical Cardiology (Subcommittee on Exercise, Rehabilitation, and Prevention) and the Council on Nutrition, Physical Activity, and Metabolism (Subcommittee on Physical Activity). *Circulation*. 2003;107:3109–16.
10. Sofi F, Capalbo A, Cesari F, Abbate R, Gensini GF. Physical activity during leisure time and primary prevention of coronary heart disease: an updated meta-analysis of cohort studies, *Eur J Cardiov Prevention Rehabil*. 2008;15(3):247–57. https://doi:10.1097/HJR.0b013e3282f232ac
11. Ribeiro F, Alves AJ, Duarte JA, José Oliveira, Is exercise training an effective therapy targeting endothelial dysfunction and vascular wall inflammation. *Int J Cardiol*, 2010:141(3):214-21.
12. Alves AJ, Viana JL, Cavalcante SL, Oliveira NL, Duarte JA, Mota J. Physical activity in primary and secondary prevention of cardiovascular disease: Overview updated. *World J Cardiol*. 2016;8(10):575-83.https://doi:10.4330/wjc.v8.i10.575.
13. Sundquist K, Qvist J, Sven-Erik Johansson, Jan Sundquist, The long-term effect of physical activity on incidence of coronary heart disease: A 12-year follow-up study, *Prev Med*. 2005;41(1): 2005:219-25. https://doi:10.1016/j.ypmed.2004.09.043.
14. Oguma Y, Shinoda-Tagawa T. Physical activity decreases cardiovascular disease risk in women: Review and meta-analysis, *Am J Preven Med*. 2004;26(5) 2004:407-18. https://doi:10.1016/j.amepre.2004.02.007.
15. Wu WY, Berman AN, Biery DW, Blankstein R. Recent trends in acute myocardial infarction among the young. *Curr Opin Cardiol*. 2020;35(5):524-30. https://doi:10.1097/HCO.0000000000000781
16. Shiroma EJ, Lee IM. Physical Activity and Cardiovascular Health Lessons Learned From Epidemiological Studies Across Age, Gender, and Race/Ethnicity. *Circulation.* 2010;122:743–52. https://doi:10.1161/CIRCULATIONAHA.109.914721
17. Franks P, Tancredi DJ, Winters P, Fiscella K. Including socioeconomic status in coronary heart disease risk estimation. *Ann Fam Med*. 2010;8(5):447-53. https://doi:10.1370/afm.1167.
18. Franks. Do changes in traditional coronary heart disease risk factors over time explain the association between socio-economic status and coronary heart disease?. *BMC Cardiovascular Dis.* 2011 11:28
19. Tremblay JO, Nahodyl L, Mesa RA, Vilchez L, Elfassy T. Low income and education are associated with greater ASCVD risk scores among adults in the US. *Prev Med Rep*. 2024;41:102720. https://doi:10.1016/j.pmedr.2024.102720
20. Hippisley-Cox J, Coupland C, Vinogradova Y, Robson J, Minhas R, Sheikh A, et al. Predicting cardiovascular risk in England and Wales: prospective derivation and validation of QRISK2. *BMJ*. 2008;336(7659):1475-82. https://doi:10.1136/bmj.39609.449676.25
21. Kershaw KN, Droomers M, Robinson WR. Quantifying the contributions of behavioral and biological risk factors to socioeconomic disparities in coronary heart disease incidence: the MORGEN study. *Eur J Epidemiol*. 2013;28, 807–14. https://doi:10.1007/s10654-013-9847-2
22. Yusuf S, Hawken S, Ôunpuu S. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. *Lancet*, 2004;364(9438):937–52. https://doi:10.1016/S0140-6736(04)17018-9.
23. Stringhini S, Sabia S, Shipley M, Brunner E, Nabi H, Kivimaki M. Association of socioeconomic position with health behaviors and mortality. *JAMA*. 2010;303(12):1159–66. https://doi:10.1001/jama.2010.297.
24. Cheng S, Li W, Zhao Y, Wang Y. Physical activity levels and socioeconomic inequality: NHANES analysis. *Am J Prev Med*. 2020;58(4):558-66.
25. Mensah GA. Eliminating disparities in cardiovascular health: opportunity and responsibility. *Circ Res.* 2017;120(1):6–8. https://doi:10.1161/01.CIR.0000158134.24860.91.

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