Original Article

Incidence and Risk Factors of Myocardial Infarction Among Young Adults in a Tertiary Care Hospital in Punjab: A Cross-sectional Study

Riya Singh[1], Jagriti Bhatia[2], Rakendra Singh[3], Arman Kumar[4], Riya Kataria[5]

[1]Final Year MBBS final year, Adesh Institute of Medical Sciences and Research, Bathinda, Punjab, [2]Assistant Professor, Community Medicine, Adesh Institute of Medical Sciences and Research, Bathinda, Punjab, [3]Professor, Department Of Medicine, Adesh Institute of Medical Sciences and Research, Bathinda, Punjab, [4]Final year MBBS, Adesh Institute of Medical Sciences and Research, Bathinda, Punjab, [5]Final year MBBS, Adesh Institute of Medical Sciences and Research, Bathinda, Punjab.

How to cite this article: Riya Singh, Jagriti Bhatia, Rakendra Singh et. al. Incidence and Risk Factors of Myocardial Infarction Among Young Adults in a Tertiary Care Hospital in Punjab: A Cross-sectional Study. Indian Journal of Public Health Research and Development / Vol. 15 No. 4, October-December 2024.

Abstract

Background: Cardiovascular diseases, particularly myocardial infarction (MI), are a major global health concern, with a rising incidence among younger populations. MI is a result of inadequate oxygen supply to the heart, often exacerbated by thrombus formation in coronary arteries due to atherosclerotic plaque deposition. Risk factors include obesity, hypertension, dyslipidaemia, diabetes mellitus, smoking, sedentary lifestyle, and familial predisposition. Early detection and intervention are crucial for improving prognosis and reducing mortality rates. Treatment strategies include pharmacotherapy and lifestyle modifications, with lifestyle interventions promoting physical activity and dietary changes.

Aim: To determine the incidence and risk factors of Myocardial infarction among young adults.

Methodology: This study investigated the prevalence and causes of myocardial infarction (MI) among patients admitted to the Department of Medicine at Adesh Hospital, Bathinda, Punjab. The sample size was 130, with participants being patients aged 18 and above, exhibiting cardiac manifestations, and providing consent for study participation. Data collection involved interactions with MI patients and their relatives, recording demographic information, smoking, and presenting symptoms. Data were analyzed using Microsoft Excel and SPSS version 28, with Chi square used for statistical significance. All data were collected after approval from the Institutional Ethics Committee.

Result: The study involved 131 patients diagnosed with Myocardial Infarction (MI) at AIMSR, with 78.6% being males and a mean age of 56 ± 10.8 years. 15.2% of patients were young adults (<45 years). Risk factors included smoking, a positive family history of cardiovascular diseases, hypertension, and diabetes. Symptoms included chest pain, shortness of breath, and palpitations.

Corresponding Author: Jagriti Bhatia, Assistant Professor, Community Medicine, Adesh Institute of Medical Sciences and Research, Bathinda, Punjab.

E-mail: jaagriti09@gmail.com

Submission date: Jan 2, 2024 **Revision date:** March 22, 2024 **Published date: September 20 , 2024**

Conclusion- study emphasizes the rising incidence of myocardial infarction (MI) among young adults, attributing it to factors such as smoking, socioeconomic status, rural residency, and comorbid conditions. It advocates for lifestyle changes, smoking cessation initiatives, and better healthcare access to mitigate this burden. Additionally, it calls for larger-scale studies to confirm these findings and develop tailored interventions for preventing and managing MI in young individuals.

Keywords: Myocardial Infarction, Young Adults, Hypertension, Cardiovascular diseases.

Introduction

Cardiovascular diseases (CVDs) remain a significant global health challenge, with myocardial infarction (MI) being a leading cause of mortality worldwide.[1] Traditionally considered a disease of the elderly, MI has increasingly manifested in younger populations, particularly those aged between less than 45 years.[2] This shift in the epidemiology of MI underscores the urgency to understand its prevalence and underlying determinants in younger adults.[3]

The pathophysiology of MI involves myocardial cell death due to inadequate oxygen supply to the heart, often exacerbated by thrombus formation in coronary arteries, primarily attributable to atherosclerotic plaque deposition. While aging has long been associated with increased risk, recent trends suggest a rising incidence of MI among younger individuals, necessitating a deeper exploration of contributory factors.[4]

Contributing to this shift are various modifiable and non-modifiable risk factors. Established risk factors include obesity, hypertension, dyslipidaemia, and diabetes mellitus, alongside behavioural factors such as smoking and sedentary lifestyle. Furthermore, familial predisposition, illicit substance use, and haemostatic dysfunction have emerged as additional determinants of MI in the young.[5]

Early detection and intervention are pivotal for improving prognosis and reducing mortality rates associated with MI.[6] Screening strategies encompassing electrocardiography (ECG), biochemical markers, blood pressure monitoring, and lipid profiling are essential, particularly for individuals with a family history of CVDs or those exhibiting risk factors.[7] Recognizing the clinical manifestations of MI, including chest pain, dyspnea, and associated symptoms, facilitates prompt diagnosis and management.[8]

Treatment strategies for MI encompass a multifaceted approach, integrating pharmacotherapy and lifestyle modifications. Lifestyle interventions promoting physical activity and dietary modifications are paramount, especially among younger cohorts. Pharmacological agents such as statins, beta-blockers, calcium channel blockers, antiplatelet drugs, and angiotensin-converting enzyme (ACE) inhibitors play a pivotal role in mitigating cardiovascular risk and improving outcomes.[9] With this background, the present study aimed to determine the incidence and risk factors of Myocardial infarction among young adults in a tertiary care hospital.

Methodology

Study Design: This study employed a cross-sectional design to investigate the incidence and underlying causes of myocardial infarction (MI) among patients admitted to the Department of Medicine at Adesh Hospital, Bathinda, Punjab. The research was conducted over a period spanning from January 2023 to August 2023.

Sample Size Calculation: The sample size was determined using Daniel's formula, considering an expected proportion (p) of 4.4%, a level of precision (d) of 4%, and a constant (z) of 1.96, derived from previous literature.[10]The calculated sample size came out to be 130, considering a non-response rate of 20%.

Participant Recruitment and Selection Criteria: Participants comprised patients of all age groups presenting with MI-related symptoms to the Medicine Department. Inclusion criteria encompassed patients aged 18 years and above, exhibiting cardiac manifestations, and providing consent for study participation. The young population for analysis was defined as individuals aged less 45 years

Data Collection: Data collection involved interactions with MI patients and their relatives. Demographic information, including name, age, sex, residence, and socioeconomic status, was recorded. Additionally, data on smoking, substance abuse, and

presenting symptoms such as chest pain, palpitations, sweating, nausea, vomiting, and shortness of breath were documented. Clinical evaluations encompassed vital signs (blood pressure), lipid profile, body mass index (BMI), family history of cardiovascular disease, and comorbid conditions such as diabetes mellitus and thyroid disorders.

Operational Definitions:

1. Hypertension: Defined as individuals previously diagnosed with hypertension and taking antihypertensive medications, or with blood pressure measurements consistently exceeding 140/90 mm Hg.[11]
2. Diabetes Mellitus: Defined as individuals previously diagnosed with diabetes mellitus and receiving antidiabetic drugs.[12]
3. Dyslipidemia: Defined as individuals already taking statins or cholesterol-lowering medications, or with total cholesterol >200 mg/dl, LDL-C >150 mg/dl, or HDL-C <40 mg/dl in males and <45 mg/dl in females [13]
4. Thyroid Profile: Defined as individuals already receiving medication for hypothyroidism or hyperthyroidism, or with thyroid-stimulating hormone (TSH) levels indicating hyperthyroidism (<0.4 mU/L) or hypothyroidism (>10 mU/L).[14]
5. BMI: Calculated as weight in kilograms divided by the square of height in meters. BMI categories included underweight (<18.5), normal (18.5-22.9), overweight (23-29.9), and obese (>30).[15]

Data Analysis: Collected data were entered in Microsoft Excel, and analysed by using SPSS version 28.Descriptive data was presented in terms of mean and SD and percentages. Chi square was employed to find statistical significance of categorical data. A p value of < 0.05 was considered statistically significant.

All the data were collection after approval from Institutional Ethics Committee.

Results

The study enrolled a total of 131 patients diagnosed with Myocardial Infarction (MI) at the Medicine Department of AIMSR between January 2023 and August 2023. Among the enrolled patients, 78.6% were males. The mean age of the patients was 56 ± 10.8 years.(Table-1). Out of 131 total MI patients, 15.2% were less than 45 years of age. The analyses of risk factors revealed that 32% of the patients were smokers, and a significant 41.2% had a positive family history of cardiovascular diseases. At the time of presentation, 43.5% were hypertensive, and 29% had diabetes. Regarding symptomatic presentations, chest pain was the predominant complaint, observed in 70.8% of cases, followed by shortness of breath (22.9%) and palpitations (22.1%). Patients below 45 years old had a significantly higher percentages of dyslipidaemia (45% vs. 22.5%, p=0.035), and smoking (55% vs. 27.9%, p=0.017). There were no significant differences in the percentages of diabetes mellitus type 2, hypothyroidism, and history of coronary artery disease (CAD) between the two age groups (p-values > 0.05).A family history of cardiovascular diseases was more common in the <45 years group, but the difference was marginally significant (p=0.043). (Table-2)

Table 1: Sociodemographic profile of patients with Myocardial Infarction.(N=131)

Characteristic	Frequency n(%)	p- value
Age(in years)		
30-35	3(2.2)	<0.01
35-45	17(12.9)	
>45	111(84.7)	
Gender		
Male	103(78.6)	<0.01
Female	28(21.4)	
BMI(kg/m		
Underweight (<18.5)	0	
Normal (18.5-22.9)	32(24.4)	<0.01
Overweight 23-24.9	65(49.6)	
Pre-Obese 25-29.9	29(22.1)	
Obese >30	5(3.8)	
SocioEconomicStatus		
Upper	4(3)	
Upper middle	20(15.2)	<0.01
Lowermiddle	36(27.4)	
Upperlower	61(46.5)	
Lower	10(7.6)	
Residence		
Rural	90(68.7)	<0.01
Urban	41(31.2)	

* P- value using Chi-Square Test.

Table 2 :Comparison of Clinical Characteristics Between Patients Aged <45 Years and ≥45 Years with Myocardial Infarction (N=131)

Characteristic	Age of patient		p- value
	<45 Years (n=20) n(%)	≥45 Years (n=111) n(%)	
Symptoms			
Chest Pain (n=92)	16(80)	76(69)	0.32
Shortness of breath(30)	5(25)	25(22)	0.808
Palpitations(29)	5(25)	24(21.6)	0.73
Sweating(n=22)	2(10)	20(18)	0.37
Nausea & Vomiting (n=13)	4(20)	9(8.1)	0.102
Co-morbidities			
Hypertension (n=57)	3(15)	54(51)	**0.005**
Diabetes Mellitus type 2(n=38)	3(15)	35(31.5)	0.134
Dylipidemia (n=34)	9(45)	25(22.5)	**0.035**
Hypothyroidism (n=7)	1(5)	5(4.5)	0.922
History of CAD (n=8)	1(5)	7(6.3)	0.822
Smoking (n=42)	11(55)	31(27.9)	**0.017**
Family History of Cardiovascular Diseases (n=46)	11(45)	35(31.5)	0.043

* P- value using Chi-Square Test.

Discussion

The findings of our study shed light on several important aspects regarding the incidence and determinants of myocardial infarction (MI) in the studied population. Notably, the prevalence of MI among young adults (<45 years) was found to be 15.2%, which is higher compared to previous studies, including one conducted by E. Incalcaterra, which reported a prevalence of 10% in the same age group. This suggests a concerning trend of increasing MI incidence among younger individuals, potentially attributed to lifestyle factors and changing environmental influences.[16]

Consistent with previous research, our study highlights a gender disparity in MI prevalence, with males being affected more than females.[17] This observation aligns with existing literature, where males have shown a higher susceptibility to MI compared to females. Interestingly, among the female MI patients in our study, a majority were above 45 years of age, potentially indicating the protective effect of estrogen on the cardiovascular system, particularly pre-menopause.[18]

The high prevalence of smoking among MI patients in our study echoes findings from previous research, emphasizing the significant role of smoking as a major risk factor for MI. Comparable studies have reported similarly elevated rates of smoking among MI patients, reinforcing the urgent need for targeted smoking cessation interventions to mitigate MI risk.[19-21]

Socioeconomic status emerged as another important determinant of MI prevalence, with a higher proportion of patients belonging to lower socioeconomic strata. This finding corroborates previous research demonstrating a link between lower socioeconomic status and increased risk of MI. Addressing socioeconomic disparities and

implementing measures to improve access to healthcare and promote healthier lifestyles among disadvantaged populations are crucial steps in reducing MI incidence.

Furthermore, our study highlights the predominance of rural residency among MI patients, suggesting a potential association between rural living, dietary habits, limited healthcare access, and increased MI risk. Similar findings from other studies underscore the need for tailored interventions to address the unique challenges faced by rural populations in managing and preventing cardiovascular diseases.[22,23]

Clinical presentation of MI in our study primarily involved chest pain, followed by shortness of breath, palpitations, sweating, nausea, and vomiting, consistent with established symptoms of MI reported in previous research. Additionally, overweight and obesity were prevalent among MI patients, further emphasizing the role of obesity as a significant risk factor for MI.The coexistence of hypertension, type 2 diabetes mellitus, and dyslipidemia among MI patients underscores the importance of managing these comorbid conditions to reduce MI risk. Similar findings from other studies highlight the need for comprehensive management of cardiovascular risk factors to mitigate the burden of MI.[8,9]

Despite providing valuable insights, our study has certain limitations. The sample size was relatively small, and the study was conducted at a single center, limiting generalizability. Additionally, some MI cases may have been missed due to misdiagnosis or early mortality before hospital presentation.

In conclusion, our study underscores the increase of MI among young adults and highlights the role of various risk factors, including smoking, socioeconomic status, rural residency, and comorbid conditions. Addressing these factors through lifestyle modifications, smoking cessation programs, and improved access to healthcare services is essential for reducing the burden of MI in the young population. Further research with larger, multicenter studies is warranted to validate these findings and inform targeted interventions aimed at preventing and managing MI effectively.

Ethical Clearance: Taken from Ethics Committee for Biomedical & Health Research, dated- 10/03/2023, Reference no.- AU/EC_BHR/2K23/347.

Conflict of interest: Nil

Source of Funding: Self

References

1. Labarthe DR. Cardiovascular Health and Disease. Springer eBooks. 2023 Jan 1;1–43.
2. Antza C, Gallo A, Boutari C, Ershova A, Gurses KM, Lewek J, Mirmaksudov M, Silbernagel G, Sandstedt J, Lebedeva A. Prevention of cardiovascular disease in young adults: Focus on gender differences. A collaborative review from the EAS Young Fellows. Atherosclerosis. 2023 Sep 19:117272.
3. Manemann SM, Gerber Y, Bielinski SJ, Chamberlain AM, Margolis KL, Weston SA, Killian JM, Roger VL. Recent trends in cardiovascular disease deaths: a state specific perspective. BMC Public Health. 2021 Dec;21:1-7.
4. Severino P, D'Amato A, Pucci M, Infusino F, Adamo F, Birtolo LI, Netti L, Montefusco G, Chimenti C, Lavalle C, Maestrini V. Ischemic heart disease pathophysiology paradigms overview: from plaque activation to microvascular dysfunction. International journal of molecular sciences. 2020 Oct 30;21(21):8118.
5. Teo KK, Rafiq T. Cardiovascular risk factors and prevention: a perspective from developing countries. Canadian Journal of Cardiology. 2021 May 1;37(5):733-43.
6. Xu W, Wang L, Zhang R, Sun X, Huang L, Su H, Wei X, Chen CC, Lou J, Dai H, Qian K. Diagnosis and prognosis of myocardial infarction on a plasmonic chip. Nature communications. 2020 Apr 3;11(1):1654.
7. Patel R, Peesay T, Krishnan V, Wilcox J, Wilsbacher L, Khan SS. Prioritizing the primary prevention of heart failure: Measuring, modifying and monitoring risk. Progress in Cardiovascular Diseases. 2024 Jan 24;82:2-14.
8. Shao C, Wang J, Tian J, Tang YD. Coronary artery disease: from mechanism to clinical practice. Coronary Artery Disease: Therapeutics and Drug Discovery. 2020:1-36.
9. Sachdeva P, Kaur K, Fatima S, Mahak FN, Noman M, Siddenthi SM, Surksha MA, Munir M, Fatima FN, Sultana SS, Varrassi G. Advancements in myocardial infarction management: exploring novel approaches and strategies. Cureus. 2023 Sep 19;15(9).

10. Ambroziak M, Niewczas-Wieprzowska K, Maicka A, Budaj A. Younger age of patients with myocardial infarction is associated with a higher number of relatives with a history of premature atherosclerosis. BMC Cardiovascular Disorders. 2020 Dec;20(1):1-9.
11. Flack JM, Adekola B. Blood pressure and the new ACC/AHA hypertension guidelines. Trends in cardiovascular medicine. 2020 Apr 1;30(3):160-4.
12. Hamada S, Gulliford MC. Antidiabetic and cardiovascular drug utilisation in patients diagnosed with type 2 diabetes mellitus over the age of 80 years: a population-based cohort study. Age and Ageing. 2015 Jul 1;44(4):566-73.
13. Yamamoto-Honda R, Takahashi Y, Mori Y, Yamashita S, Yoshida Y, Kawazu S, Iwamoto Y, Kajio H, Yanai H, Mishima S, Handa N. Changes in antidiabetic drug prescription and glycemic control trends in elderly patients with type 2 diabetes mellitus from 2005-2013: an analysis of the National Center Diabetes Database (NCDD-03). Internal Medicine. 2018 May 1;57(9):1229-40.
14. Razvi S, Ryan V, Ingoe L, Pearce SH, Wilkes S. Age-related serum thyroid-stimulating hormone reference range in older patients treated with levothyroxine: a randomized controlled feasibility trial (SORTED 1). European Thyroid Journal. 2020 Jan 1;9(1):40-8.
15. Tahir A, Noor A, Ghafoor A, Noor A, Nazir AB, Chattha AA, Warriach AA, Aziz AR, Chaudhry AJ, Zahid A, Aziz F. Correlation of Body Mass Index with Visual Acuity among Adults. Journal of Society of Prevention, Advocacy and Research KEMU. 2022 Jun 15;1(1 (Special Issue)).
16. Incalcaterra E, Caruso M, Lo Presti R, Caimi G. Myocardial infarction in young adults: risk factors, clinical characteristics and prognosis according to our experience. Clin Ter. 2013 Jan 1;164(2):e77-82.
17. Jortveit J, Pripp AH, Langørgen J, Halvorsen S. Incidence, risk factors and outcome of young patients with myocardial infarction. Heart. 2020 Sep 1;106(18):1420-6.
18. Elder P, Sharma G, Gulati M, Michos ED. Identification of female-specific risk enhancers throughout the lifespan of women to improve cardiovascular disease prevention. American Journal of Preventive Cardiology. 2020 Jun 1;2:100028.
19. Hu G, Zhou M, Liu J, Smith Jr SC, Ma C, Ge J, Huo Y, Fonarow GC, Hao Y, Liu J, Taubert KA. Smoking and provision of smoking cessation interventions among inpatients with acute coronary syndrome in China: Findings from the Improving Care for Cardiovascular Disease in China-Acute Coronary Syndrome Project. Global heart. 2020;15(1).
20. Biery DW, Berman AN, Singh A, Divakaran S, DeFilippis EM, Collins BL, Gupta A, Fatima A, Qamar A, Klein J, Hainer J. Association of smoking cessation and survival among young adults with myocardial infarction in the partners YOUNG-MI registry. JAMA Network Open. 2020 Jul 1;3(7):e209649-.
21. Gallucci G, Tartarone A, Lerose R, Lalinga AV, Capobianco AM. Cardiovascular risk of smoking and benefits of smoking cessation. Journal of thoracic disease. 2020 Jul;12(7):3866.
22. Nuotio J, Vähämurto L, Pahkala K, Magnussen CG, Hutri-Kähönen N, Kähönen M, Laitinen T, Taittonen L, Tossavainen P, Lehtimäki T, Jokinen E. CVD risk factors and surrogate markers-Urban-rural differences. Scandinavian Journal of Public Health. 2020 Nov;48(7):752-61.
23. Gupta R, Singhal S. Coronary heart disease in India. Clinical Handbook of Coronary Artery Disease. 2020 Aug 31:338.