

Major Modifiable Risk Factors of Acute Myocardial Infarction in Patients Presented to Tertiary Care Hospital Swat, Pakistan

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Abstract

Background: Cardiovascular disease is a major cause of mortality and morbidity in Pakistan. According to global health forecasts, it is expected to maintain its position as the primary cause of mortality worldwide in 2030. Myocardial infarction (MI) is the leading cause of illness and death on a global scale. Knowledge regarding any disease is an important pre-requisite for implementation of preventive and control measures.

Objectives: This study aimed to evaluate modifiable risk factors of cardiovascular diseases in acute myocardial infarction (MI) patients.

Methods: It was a hospital based cross sectional observational analytical study carried out in Cardiac Care Unit of Saidu Group of Teaching Hospitals, Swat, Pakistan. Data was collected from 236 patients hospitalized with acute myocardial infarction (MI). A standardized questionnaire was employed, evaluating the modifiable risk factors associated with heart disease, including topics such as the consumption of fatty foods, smoking, hypertension, physical activity level, diabetes etc.

Results: Among 236 patients (mean age 54.7 ± 9.3 years; 60% male) 79% had NSTEMI and 55% a positive family history. Hypertension (60%) and diabetes (47%) were common; both remained significantly associated with acute MI after correction ($p < 0.001$), whereas smoking and obesity showed border line significant association.

Conclusion: In our study, hypertension and diabetes emerged as the dominant, statistically significant risk factors of acute myocardial infarction, while NSTEMI predominated across all age and gender. The high prevalence of modifiable risk factor coupled with early disease onset highlight an urgent need for population-level prevention and rapid laboratory-enabled diagnosis.

Keywords: Acute Myocardial infarction, modifiable risk factors, cardiovascular diseases

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Introduction

Cardiovascular diseases includes a large group of heart and blood vessels disorders including blood vessels disorders, coronary artery diseases, structural and functional heart diseases. it is one of the most common cause of morbidity and mortality all over the world. The global burden of cardio-vascular diseases increased significantly over the last decade.¹ Acute myocardial infarction is typically caused by sudden blocked of a coronary-vessels that leads can leads to the myocardial ischemia and ultimately necrosis of heart muscles fibers. Globally it's one of the leading cause of mortality and according to the World Health Organization report, around 1.98 million people died from CVDs in 2022; comprising 32% of all deaths.² The demographic prevalence of CVDs varies and depends upon different factors. Risk factor for CVDs is broadly sub-

divided into the modifiable and non-modifiable risk factors. Existing literature describes the major modifiable risk factors and divides them it into five main domains: smoking, hypertention, dyslipidamia, un-control diabetes and Obesity.³ Over the last two decades, tobacco use has increased in both western pacific and south-east Asian region (940 million male smokers). In Pakistan, 19% of adults regularly consume tobacco, which can double the risk of ST elevated Myocardial infarction.^{4,5} Hypertension is one of the most common public health concerns globally. It's among the most prevalent disease in Eastern Europe and Center Asia accounting for 40% prevalence in that region. In Pakistan, different studies had reported around 25-30% prevalence of hypertension in adult population. Every 20 mm of Hg rise in systolic blood pressure could increase

three times the risk of myocardial infarction.⁶ Diabetic mellitus is one of the most prevalent disease in Pakistan, affecting around 26% of the population including both prediabetic and diabetic individuals.⁷ An HbA1c level greater than 6.5% can increase the risk of acute cardiac event by two-folds.⁸ A Deranged lipid profile is also one of the most common modifiable risk factor for developing of acute myocardial infarction. Dyslipidaemia is highly prevalent in the central and Eastern Europe region and a Pakistani population also shows a higher prevalence of Dyslipidaemias. It can increase the risk of acute myocardial infarction by 25% with every 30mg/dl rise above the normal limit.⁹ Obesity is highly prevalent in Latin America and the Caribbean; more than 50% Pakistani women have truncal obesity. Obesity is one of the modifiable risk factor that could lead to acute myocardial infarction.^{10,11} In literature, studies didn't classify the population attributed modifiable risk factors among the acute myocardial infarction patients admitted to the hospital in our region. The study aims to find out major modifiable risk factors of acute myocardial infarction patients admitted to tertiary care hospital With AMI increase at a significant rate in Khyber-Pakhtunkhwa. This study will help to find out policy-graded data for concerns health authority in the region to prioritise people health and provide awareness about major modifiable risk factors of acute MI. All these will help in better patient outcome and can reduce financial burden on health care system.

Methods

It was a cross-sectional study. The study was our MBBS mandatory research project; it was conducted at department of Cardiology Saidu Group of Teaching Hospital Swat in collaboration with our parent institute i.e. Swat Medical College Swat for a period of One year. Sample size was calculated using open Epi.com software; using population a standard one million, design effect equal to 1, margin of error = 1 and anticipated frequency equal to 18.9%; taken from the study conducted by Sammad Z et.al¹². for 95% confidence level the optimal sample size were 236 and for 80% confidence level, it was 101. For better accuracy of the study we had taken 236 participants. Data was collected using non-probability sampling technique using a pre-formed proforma. For the purpose of the study; Acute Myocardial infarction is

defined as any patient admitted to the hospital or in emergency unit within the last 48 hours having 2 or more any of the following characteristics i.e.

- Ischemic chest pain for more than 20 mins
- ECG abnormalities including ST-segment elevation or new LBBB on first ECG
- Serum troponin- I level greater than 1ng/ml
- New pathological Q wave
- Abnormal Echocardiogram
- Intracoronary thrombus seen on angiography

Risk factors in general is define as any behavioural, biochemical, demographic, genetic or environmental variable that are statistically related to developing of acute MI and recorded before or at the time of admission of patients to the hospital. And modifiable risk factors are any risk factor that are potentially changeable within 12 months through individual-population intervention including smoking, hypertension, dyslipidamia, diabetes and Obesity.

In order to control cofounder and bias in the study, proper inclusion and exclusion criteria were design before data collection. Our study included

- All those patents age 18-70 who are willing to give a written informed consent.
- Patients admitted to emergency or Critical care unit in last 28 hours.
- Patients fulfilling the operational definition of acute myocardial infarction.

While the following patients were excluded from the study

- All those patients having type - 2 MI secondary to arrhythmia, anemia, sepsis or trauma.
- Past history of cardiac surgery, coronary artery interventions within last one year.
- Patients have terminal illness including malignancy, Chronic Kidney disease or patients on dialysis.
- Pregnant patients
- All those patients having psychiatric or cognitive disorders.

All the collected data were transferred to the pass word coded computer and further analysed using IBM SPSS 25. Descriptive statistics were first find out for all variables. Frequency and percentage were find out for categorical variable. Mean and standard deviation were computed for the continuous variable. Inferential statistics including chi-square tests and

Fisher exact test were used for finding any association between the modifiable risk factors and acute myocardial infarction. P value ≤ 0.05 were considered significant. All data were regularly checked for quality assurance and missing variables.

Results

The study included 236 patients, presented to the cardiology unit of Saidu group of Teaching Hospitals Swat. Among them n=142 (60.16%) were male and n=94 (39.83%) were female with mean age of 54.7 ± 9.3 years. All patients were subdivided into three age group i.e. n=54 (22.88%) were in aged between 20 to 40 years, n=96 (40.67%) were in aged between 41-60 years and n=86 (36.44%) were aged above 60 years. Moreover, n=132 (55.93%) belong from urban areas and n=104 (44.6%) belong from rural areas. MI phenotype distribution was 78.81% (n=186) NSTEMI and 21.18% (n=50) STEMI. A positive family history of Acute MI was present in 55.08% (n=130). Moreover, Blood pressure is categorized into Hypertensive (n=142 {60.16%}), pre-hypertensive (n=31 {13.13%}) and normal (n=63 {26.69%}). P=0.089 with MI Phenotype (NSTEMI vs STEMI) and P=0.000041 (with any acute MI). Additionally, n=110 (46.61%) were diabetic, n=23 (9.7%) were pre-diabetic and n=103 (43.64%) were normoglycemic (p=0.144 with MI phenotype and p= 0.00007 with any acute MI). Moreover, n= 109 (46.19%) have current smoking history, n=68 (28.9%) have past history of smoking for at-least one year and n=59 (25.0 %) patients didn't smoke in his/her life; P=0.080 with MI Phenotype (NSTEMI vs STEMI) and P=0.056 (with any acute MI). BMI categories were n= 92 (39.0%) normal, n=81 (34.3%) overweight, n=45 (19.1%) under-weight and n=18 (7.62%) were obese; P=0.72 with MI Phenotype (NSTEMI vs STEMI) and P=0.074 (with any acute MI). All data are described in following tables and graphs.

Discussion

Acute Myocardial Infarction is one of the leading cause of mortality and morbidity all over the world with an estimate of more than seven million causes of AMI reported annually¹³. In South Asia, there is increased incidence of acute myocardial ischemia cases because of multiple factors including rapidly

Table 1: Demographic Data

GENDER DISTRIBUTION		
Gender	Frequency	Percentage
Male	n=142	60.16%
Female	n=94	39.83%
AGE GROUP (mean age of 54.7 ± 9.3 years)		
Age-Group	Frequency	Percentage
20 to 40 years	n=54	22.88%
41-60 years	n=96	40.67%
above 60 years	n=86	36.44%
HYPERTENTION		
Sub-Group	Frequency/Percentage	level of Significance
Hypertensive	n=142 {60.16%}	P=0.089 with MI Phenotype) and P=0.000041 (with any acute MI)
Pre-hypertensive	n=31 {13.13%}	
Normal	n=63 {26.69%}	
HYPERGLYCEMIA		
Sub-Group	Frequency/Percentage	level of Significance
Diabetic	n= 110 (46.61%)	p=0.144 with MI phenotype and p= 0.00007 with any acute MI
Pre-diabetic	n=23 (9.7%)	
Normal	n=103 (43.64%)	
SMOKING HISTROY		
Sub-Group	Frequency/Percentage	level of Significance
Current	n= 109 (46.19%)	P=0.080 with MI Phenotype and P=0.056 with any acute MI
Past history	n=68 (28.9%)	
No Smoking	n=59 (25.0%)	
OBESITY		
Sub-Group	Frequency/Percentage	level of Significance
Normal	n= 92 (39.0%)	P=0.72 with MI Phenotype and P=0.074 (with any acute MI)
Over-weight	n=81 (34.3%)	
Under-weight	n=45 (19.1%)	
Obese	n=18 (7.62%)	

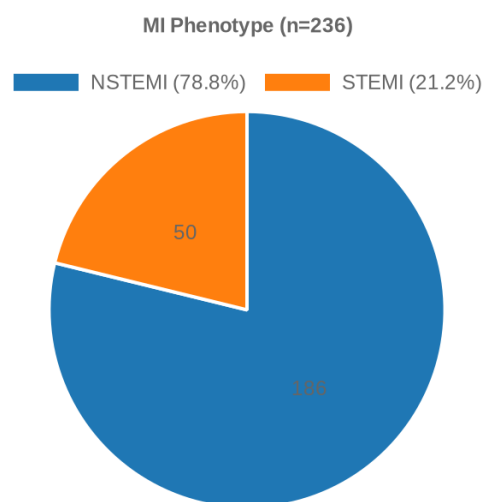


Figure 1: Comparing Different type of MI

urbanization, increase in sedentary life style and clustering of conventional risk factors including diabetics, hypertension and obesity. The present study therefore aims to explore these risks factors and its possible association with developing of acute myocardial infarction; targeting the northern population of Pakistan. In our study the mean age of patents presented with acute MI were mean age of 54.7 ± 9.3 years with 60% of male dominance. A recent study conducted by A Adhikari et.al (mean age = 51 years with 70% male dominance); do support our study findings and the concept of premature cardiovascular disease in young age¹⁵. Moreover, the distribution of AMI -phenotype in our study is consistent with multiple other studies in literature¹⁶. NSTEMI is more prevalent in our study population reflecting wider use of Troponin-I (High Sensitive) and earlier detection. The history of hypertension is commonly associated with acute Myocardial infarction. In our Study findings, the prevalence of Hypertension in patients presented with acute MI were around 60%. The observed prevalence lie in between 76% prevalence recorded in Korean studies and around 46% cases reported in US studies¹⁷. In our study, we didn't find any significant association between the AMI Phenotype (NSTEMI vs STEMI) and Hypertension ($p=0.089$); once Holm-Bonferroni correction was applied ($P=0.000041$). Moreover, prevalence of Diabetic mellitus in patients with AMI was 47%. Our findings are higher than those reported in Gulf (68.7%) and India (54%)^{18,19}. Just like Hypertension, we didn't find any significant association between the AMI Phenotype (NSTEMI vs STEMI) and diabetics ($p=0.14$); once Holm-Bonferroni correction was applied ($P=0.00007$). Globally, smoking in one of the major public health concern, exposing the body to harmful chemical substances. According to existing literature, It can increase significantly increase the risk of acute MI²⁰. We had reported 46% patients had a current history of smoking and 29% did smoking cessation in patients presented with acute myocardial infarction. Our findings showed resemblance with the study conducted in Karachi; reported 44% patients with acute MI have smoking history²¹. The borderline association ($p=0.089$ & 0.056), favour the well documented association of smoking with coronary artery occlusion and thrombotic events²². The lower prevalence (7.62%) of obesity in our study reflecting the community survey from the mount-

ainous regions of Pakistan. The Strength of this study include consecutive patient recruitment from a single demographic background, ensuring representation of both rural and urban populations with in the region. We applied Holm-Bonferroni correction, which provide precise control of type 1 error, a methodology approach not commonly used in similar studies. The limitation of this study included, it's a single centre study and have relative small sample size, which may have limit the precise association between risk factors and acute myocardial infarction. Further study should employ multicentre data collection across diverse region of the country.

Conclusion

In our study, hypertension and diabetes emerged as the dominant, statistically significant risk factors of acute myocardial infarction, while NSTEMI predominated across all age and gender. The high prevalence of modifiable risk factor coupled with early disease onset highlight an urgent need for population-level prevention and rapid laboratory-enabled diagnosis.

Ethical Approval: The Ethical Committee of Saidu Group of Teaching Hospitals, Saidu Sharif Swat granted permission and approved the study.

Conflict of Interest / Disclosure: Nil.

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Authors' Contribution:

FA: Conception and design; acquisition, drafting of article, analysis and interpretation of data, final approval of the version to be published

FA: Acquisition of data, critical revisions for important intellectual content

SMAJ: Drafting of article

HA: Analysis and interpretation of data

References

1. Gaziano TA. Cardiovascular diseases worldwide. Public Health Approach to Cardiovascular Disease Prevention & Management. 2022;1:8-18. Available from <https://www.taylorfrancis.com/chapters/edit/10.1201/b23266-2/cardiovascular-diseases-worldwide-thomas-gaziano>
2. Kumsa K, Bosha T. Knowledge of Modifiable Risk Factors For Cardiovascular Diseases, Primary

- Prevention Practices And Associated Factors Among Type-II Diabetic Patients Attending Public Hospitals At Shashemene, Oromia Region, Ethiopia. Doi: <https://doi.org/10.21203/rs.3.rs-3773566/v1>.
3. Mila L, Barrabes JA, Lidon RM, Sambola A, Baneras J, Oristrell G et.al. Prior adherence to recommended lipid control targets in patients admitted for acute coronary syndrome. *Rev Esp Cardiol (Engl ed)*. 2020; 73(5):376-382. Doi: 10.1016/j.rec.2019.06.014.
 4. Farman S, Shams H, Fahima, Ahmad S, Ullah B, Ullah S. Contributing Risk Factors Before Myocardial Infarction in Men and Women Presenting to Tertiary Care Hospital: A Multicenter Cross-Sectional Study. *J. Health Wellness Community Res*. 2025; 3 (13):793. Doi: <https://doi.org/10.61919/4mnr3g67>.
 5. Memon JA, Nasir M, Nayab D, Siddique O, Kishwar S. Economic burden of tobacco use in Pakistan. *Tobacco control*. 2024;33(Suppl 2):101-7. Doi: <https://doi.org/10.1136/tc-2022-057726>
 6. Mills KT, Stefanescu A, He J. The global epidemiology of hypertension. *Nat Rev Nephrol*. 2020;16(4):223-237. Doi: 10.1038/s41581-019-0244-2
 7. Ijaz M, Ali I, Hussain A. Diabetes mellitus in Pakistan: the past, present, and future. *Int J Diabetes Dev Ctries*. 2020 ;40(1):153-4. Doi: <https://doi.org/10.1007/s13410-019-00754-x>
 8. Xu C, Wen S, Gong M, Dong M, Yuan Y, Li Y, et al. The Implication of Elevated Serum Myoglobin Level in Acute Diabetic Complications of Ketoacidosis and Hyperglycemic Hyperosmolar State: A Real-World Study. *Diabetes Metab Syndr Obes*. 2024;17:2639-2653. Doi: 10.2147/DMSO.S465311
 9. Koh MY, Toh KZ, Loh ED, Teo YN, Joon KC, Tan QX, et al. Association of elevated lipoprotein(a) levels with ischemic stroke in young patients - a systematic review and meta-analysis. *J Stroke Cerebrovasc Dis*. 2024;33(11):107960. Doi: 10.1016/j.jstrokecerebrovasdis.2024.107960.
 10. Jiwani SS, Carrillo-Larco RM, Hernández-Vásquez A, Barrientos-Gutiérrez T, Basto-Abreu A, Gutierrez L, et al. The shift of obesity burden by socioeconomic status between 1998 and 2017 in Latin America and the Caribbean: a cross-sectional series study. *Lancet Glob Health*. 2019;7(12):e1644-e1654. Doi: 10.1016/S2214-109X(19)30421-8.
 11. Malik ZI, Ahmad AM. Non-communicable disease (NCD) burden and their contributing factors among women. *Health Care Women Int*. 2025;46(6):687-701. Doi: <https://doi.org/10.1080/07399332.2025.2472174>
 12. Samad Z, Hanif B. Cardiovascular diseases in Pakistan: imagining a postpandemic, postconflict future. *Circulation*. 2023;147(17):1261-3. Doi: <https://doi.org/10.1161/CIRCULATIONAHA.122.059122>
 13. Reed GW, Rossi JE, Cannon CP. Acute myocardial infarction. *Lancet*. 2017;389(10065):197-210. Doi: 10.1016/S0140-6736(16)30677-8.
 14. Kumar R, Ammar A, Qayyum D, Mujtaba M, Siddiqui MN, Khan MQ, et.al. Increasing incidence of ST-Elevation Acute Coronary Syndrome in Young South Asian Population, a challenge for the World? An Assessment of clinical and angiographic patterns and hospital course of premature Acute Myocardial Infarction. *Am J Cardiol*. 2023;205:190-197. Doi: 10.1016/j.amjcard.2023.07.138
 15. Adhikari A, Nahrwold R, Vaidean G, Hentz R, De Jesus S, Swe N, et.al. Cardiovascular Risk Factors Profile of Young Patients with Coronary Artery Disease: The Young Heart Study. *Am J Prev Cardiol*. 2023;13:100420. Doi: <https://doi.org/10.1016/j.ajpc.2022.100420>
 16. Kumar R, Shaikh AH, Kumar A, Solangi BA, Naseer AB, Awan R, et al. Age and gender-based categorization of very premature, premature, and non-premature acute myocardial infarction: A comparison of clinical and angiographic profile and in-hospital outcomes. *Int J Cardiol*. 2023;391:131292. Doi: 10.1016/j.ijcard.2023.131292.
 17. Konstantinou K, Tsioufis C, Koumelli A, Mantzouranis M, Kasiakogias A, Doumas M, et al. Hypertension and patients with acute coronary syndrome: Putting blood pressure levels into perspective. *J Clin Hypertens*. 2019;21:1135-1143. Doi: <https://doi.org/10.1111/jch.13622>
 18. Daoulah A, Elfarnawany A, Al Garni T, Hersi AS, Alshehri M, Almahmeed W, et al. Outcomes of myocardial revascularization in diabetic patients with left main coronary artery disease: a multicenter observational study from three Gulf Countries. *Cardiovascular Revascularization Medicine*. 2023 Jan 1;46:52-61. Doi: <https://doi.org/10.1016/j.carrev.2022.08.002>
 19. Tipparapu B, Reddy. P VAK. Prevalence and Impact of Diabetes Mellitus in Patients with Acute Myocardial Infarction: A Study. *CME J Ger Med*. 2025;17(1):109-114. Doi : 10.61336/cmejgm/2025-01-16
 20. Iswanto AH, Fadhil AA, Islam MZ, Mohammed AK, Abduladheem Turki Jalil, Khlaif AT, et al. Investigating the Effect of Smoking on the Incidence of Internal Diseases (A Review Paper). *Int J Body Mind Cult*. 9(4):259-270. Doi: <https://doi.org/10.22122/ijbmc.v9i4.393>
 21. Sahrish, Hussain S, Gemnani VK, Habib SD, Memon FA, Uddin S. Coronary Angiographic Profile in Smokeless Tobacco Users in Patients Presenting with Acute Coronary Syndrome at a Tertiary Care Cardiac Center: Coronary Angiographic Profile in Tobacco-

Using Patients Presenting with ACS. Pak. J. Health Sci.2025; 06 (03):259-64.
Doi: <https://doi.org/10.54393/pjhs.v6i3.2883>

22. Alhindal M, Janahi J, D'Angelo EC, Lisignoli V, Palmieri R, Cutri A, et al. Impact of smoking on cardiovascular health: Mechanisms, epidemiology and specific concerns regarding congenital heart disease. Int J Cardiol Congenit Heart Dis. 2025;20:100581.
Doi: 10.1016/j.ijcchd.2025.100581.



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