Original Article

Spectrum of Risk Factors of Myocardial Infarction and Their Associations with Age: A Cross Sectional Study from Gujranwala, Pakistan

Muhammad Shahid, Muhammad Irfan, Mubashar Zeeshan, Yasir Mahmud, Maryum Shafiq and Saqib Shafi Sheikh

Objective: To determine the prevalence of various risk factors of acute ST elevation myocardial infarction (STEMI) and their associations with age among patients admitted at tertiary care hospital, Gujranwala, Pakistan.

Methods: It was a cross sectional study of acute STEMI patients admitted from June 2017 to May 2018. After informed consent, data was collected by purposive sampling. Statistical analysis was done using SPSS version 25. Various risk factors of STEMI including smoking, hypertension, diabetes mellitus, obesity, personal H/O IHD, H/O of IHD in male family member of age <55years, and H/O of IHD in female family member of age <45years, were the qualitative variables while age of the patients was the only quantitative variable. Independent sample T test was used to compare the mean age of patients in two groups of each risk factor. The multiple regression analysis was also performed to predict the age at which STEMI may occur using different risk factors. The prediction by a risk factor was considered statistically significant if p< 0.05.

Results: Amongst 668 patients, 54.2% were smokers, 54% hypertensive, 29.5% diabetics, 22.9% obese, 28.9% had personal H/O IHD, 12.1% had H/O of IHD in male family member of age <55years, and 21.1% had H/O of IHD in female family member of age <45years. The mean age of the patients was 53.81 + 12.37 years. The mean age of the patients was statistically significantly less of smokers than non-smokers (p<0.1), diabetics than non-diabetics (p=0.047), and non-hypertensives than hypertensives (p<0.1). The mean age of the patients had no statistically significant association with H/O obesity (p=0.264), personal H/O IHD (p=0.134), H/O of IHD in male family member of age <55years (p=0.700), and H/O of IHD in female family member of age <45years (p=0.265). A multiple regression analysis suggested that age at which STEMI may occur can be statistically significantly predicted by 4 variables (Smoking, Hypertension, Diabetes mellitus, Obesity).

Conclusions: Smoking was the most prevalent risk factor for myocardial infarction in our studied population. Smokers and diabetic patients who suffered STEMI were younger than non-smokers and non-diabetic patients respectively. Among STEMI patients, hypertension was seen in relatively older group of patients. Smoking, Hypertension, Diabetes mellitus, Obesity are those four risk factors which significantly predict the age at which STEMI may occur.

Keywords: STEMI, risk factors, age, cross-sectional study, SPSS

Introduction

Acute myocardial infarction (MI) is the leading cause of death worldwide.[1] It occurs when blood flow to heart through one or more of the coronary arteries is blocked suddenly.[2] As a result, myocardial necrosis usually begins in the endocardium and spreads towards the epicardium.[3] In USA, the incidence of first MI in both genders is approximately stable during last 10 years, that is 1.1% and 1.7% per year in men and women, respectively.[4] The people of our subcontinent are more prone to MI, where annual incidenc is approx 6.44%.[5] The major known risk factors of MI include smoking, hypertension, diabetes mellitus,

and dyslipidemia.[6] The recent studies have also associated these risk factors with premature coronary artery disease.[7,8] The known risk factors of first acute MI among youngs differ from that of eldely,[9] where smoking, dyslipidemidemia, family history of MI, and male gender are known common factors among youngs, while diabetes and systolic hypertension are common factors among elderly people.[10] The literature focusing such elaboration from Pakistan is lacking. Therefore, the author is keen to determine the prevalence of various risk factors of myocardial infarction among patients admitted at tertiary care hospital, Gujranwala, Pakistan. We will also find the associations of these risk factors with age of the

patients in our population.

Methods

This cross-sectional study was conducted in the Department of Cardiology, GMC Teaching hospital, Gujranwala from June 2017 to May 2018. Sample size calculation was performed using online Rao soft calculator. With a population size of 20000, response distribution of 50% and confidence interval of 95%, the minimum recommended sample size was 377. The written informed consent was taken from all patients and the data was collected by purposive sampling using a structured proforma. All the patients diagnosed with ST segment elevation myocardial infarction (STEMI) who were hospitalized were included in this study. The diagnosis of STEMI was made by ST segment elevation and raised cardiac enzymes in a patient with acute chest pain. Left bundle branch block or left ventricular hypertrophy cause secondary ST-T changes. Here cardiac troponins were especially used to help diagnosis. Statistical analysis was performed using the Statistical Package for Social Science (SPSS), version 25. Age of the patients was the only quantitative variable, while history of (H/O) smoking, hypertension, diabetes mellitus, obesity, personal H/O ischemic heart disease (IHD), H/O of IHD in male family member of age <55years, and H/O of IHD in female family member of age <45years were the qualitative variables. During descriptive interpretation of data, continuous variables were expressed as mean and standard deviation. Frequencies and percentages were computed for different categorical variables. Independent sample T test was used to compare the mean age of patients in two groups of each risk factor of MI i.e. with or without that risk factor. The multiple regression analysis was also performed to predict the age at which STEMI may occur using different risk factors. The prediction by a risk factor was considered statistically significant if $p < 0.05$.

.

Results

Amongst 668 patients who presented with STEMI, the percentage distribution of the risk factors was as follow: 54.2% (n=362) had H/O Smoking, 54% (n=361) had Hypertension, 29.5% (n=197) had Diabetes mellitus, 22.9% (n=153) had Obesity, 28.9% (n=193) had personal H/O IHD, 12.1% (n=81) had H/O of IHD in male family member <55years of age, and 21.1% (n=81) had H/O of IHD in female family member <45years of age. (F-

Fig-1). The mean age of the patients was 53.81 ± 12.37 years with a range of 24-90 years. The mean age of smokers who presented with STEMI was 2.74 years less than that of non-smokers, and the association between H/O smoking and the mean age of the patients was statistically significant ($p<0.01$). Similarly, the mean age of diabetics who presented with STEMI was 2.09 years less than non-diabetics, and the association between H/O diabetes mellitus and the mean age of the patients was statistically significant ($p=0.047$). The mean age of hypertensive patients who presented with STEMI was 5.85 years more than that of non-hypertensive patients, and the association between H/O hypertension and the mean age of the patients was statistically significant ($p<0.01$). The mean age of the patients had no statistically significant association with personal H/O IHD ($p=0.134$), H/O of IHD in male family member of age <55years ($p=0.700$), and H/O of IHD in female family member of age <45years ($p=0.265$) **(Table 1).**

A multiple regression was run to predict the age at which STEMI happened from presence / absence of different risk factors (H/O Smoking, H/O Hypertension, H/O Diabetes mellitus, H/O Obesity, Personal H/O IHD, H/O of IHD in male family member <55years, H/O of IHD in female family member <45years). These variables statistically predicted age at STEMI, $F_{(7,660)} = 8.463$, $p<0.000$, $R^2 = 0.082$. Among these 7 independent variables, 4 variables (Smoking, Hypertension, Diabetes mellitus, Obesity) added statistically significantly to the prediction, $p < 0.05$. Unstandardized coefficients indicate how much the dependent variable (i.e. age at STEMI) varies with an independent variable when all other independent variables are held constant. Hence, H/O Smoking, H/O Hypertension, H/O Diabetes mellitus, and H/O Obesity independently alter the age of the patient at which STEMI may occur **(Table 2).**
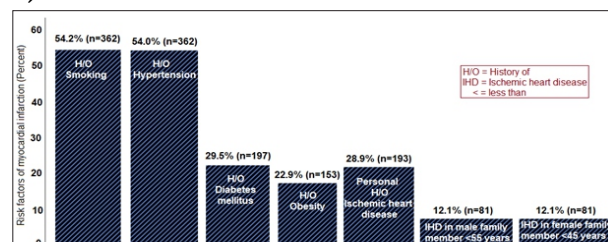

Fig-1: Percentage distribution of various risk factors among patients admitted with myocardia infraction.

Discussion

There are various modifiable and non-modifiable risk factors associates with myocardial infarction. It is also

Table-1: Comparison of Factors with mean age of the patients admitted with myocardial infarctionat GMC, Gujranwala (n=668)*

Risk Factors of MI		Mean age (years)	Standard deviation	Mean differnce	P-value
H/O Smoking	Yes	52.56	11.87	-2.74	<0.01
	No	55.30	12.78		
H/O Hypertension	Yes	56.50	11.57	5.85	<0.01
	No	50.65	12.55		
H/O Diabetes Mellitus	Yes	52.34	11.51	-2.09	0.047
	No	54.43	12.67		
H/O Obesity	Yes	52.83	11.90	-1.27	0.264
	No	54.10	12.50		
Personal H/O IHD	Yes	54.94	12.11	1.59	0.134
	No	53.35	12.45		
H/O of IHD in male family member <55 years	Yes	54.31	9.90	0.57	0.700
	No	53.74	12.67		
H/O of IHD in female family member <45 years	Yes	55.25	8.08	1.64	0.265
	No	53.61	12.84		

Table-2: Prediction of Age at which myocardial infaction can occur by different risk factors: A multiple regression analysis (n=668)

Risk Factors	B coefficient	Standard error	t	p-value	95% C.I for B Lower	Upper
H/O Smoking (Yes/No)	2.466	0.967	2.550	0.011	0.567	4.364
H/O Hypertension (Yes/No)	-5.878	0.959	-6.131	0.000	-7.760	-3.995
H/O Diabetes Mellitus (Yes/No)	2.963	1.043	2.842	0.005	0.916	5.010
H/O Obesity (Yas/ No)	2.392	1.131	2.114	0.035	0.170	4.614
Personal H/O IHDy (Yas/ No)	-0.888	1.074	-0.828	0.408	-2.996	1.220
H/O of IHD in male family member <55 years (Yes/No)	1.048	2.560	0.409	0.682	-3.978	6.074
H/O of IHS in female family member <45 years (Yes/ No)	1.746	2.610	0.669	0.504	-6.871	3.379
Constant	52.339	4.710	11.113	0.000	43.091	61.586

known that addition of a risk factor results acute MI in younger age,[2,3] hence modifiable factors must be addressed to avoid earlier disease. In majority studies, the mean age of the acute MI was in 5th decades. In a study of 213 patients suffering acute MI by F kiani et al, the mean age was 58.3±12.6 years.[11] In a 331 patient's study from Multan, Pakistan, the mean age of acute MI patients was 54.99±11.25 years.[12] Similarly, the mean age of the patients in our study was in same decade i.e. it was 53.81±12.37 years. In a study from Karachi, Arsalan Majeed Adam and colleagues found dyslipidaemia (91.2%) as the most frequent risk factor, followed by hypertension, diabetes, family history of disease, where smoking (29.2%) was the least common factor.[13] In our study from Gujranwala, Smoking (54.2%) was the most common risk factor of acute MI. Another mith that Obesity is prevalent at peak in Gujranwala people may not be true. In our data from this city about risk factors, prevalence of Obesity (22.9%) in acute MI

patients comes at 4th number, after smoking, HTN, and DM. The findings of Abdul Ghaffar Memon form Hyderabad were in concordrant to our study, who noted Smoking (65.9%) being most frequent risk factor followed by hypertension (42.0%) and diabetes mellitus (34.1%).[14] Bahaaedin A. Elkhader found that Smokers have 3.71 times higher risk of myocardial infarction than non-smokers.[15] Emily M. Bucholz from USA observed that compared with non-smokers, current smokers affected by acute MI were younger (mean age 77.20±7.40 vs 72.41±5.82 years) and the findings were significant (p<0.001).[16] Similarly, in our study, smokers were younger than non-smokers suffering acute MI (p<0.001). Diabetes mellitus is a well-established risk factor that increases the risk of coronary heart disease by two to four times.[17] This is because DM facilitates formation of atherosclerotic plaque and increases the rate of athersclerotic progression.[18] In a 216 patients study, for diabetic vs nondiabetic patients with AMI, there was no significant difference in age (64.0±13 vs

60.0±14 years, p = 0.13).[19]In contrast, in our study, diabetics suffering acute MI were 2.09 years younger than non-diabetics and relation of diabetes mellitus with younger age was significant (p=0.047). In old age, hypertension is even worse to heart and responsible for at least 70% of cardiac disease.[20] **In our study, hypertension** was seen in relatively older group of patients suffering acute MI (p<0.001). Obese patients suffer coronary artery disease at a younger age.[21] On average, obese patients were 1.27 years younger than non-obese patients in our study. In a study from North Punjab, Pakistan, Riffat Iqbal et al noted that patients with a positive parental history of CHD experienced MI at a younger age (P = 0.0001).[22] In our study, presence or absence of personal history

of IHD or history of IHD in male or female family member had no difference in the mean age of patients at time of acute MI. Similarly, in multiple reression analysis of our data, no such statistically significant correlation of age with these risk factors was seen.

Conclusion

Smoking was the most prevalent risk factor for myocardial infarction in our studied population. Smokers and diabetic patients who suffered STEMI were younger than non-smokers and non-diabetic patients respectively. Among STEMI patients, hypertension was seen in relatively older group of patients. Smoking, Hypertension, Diabetes mellitus, Obesity are those four risk factors which significantly

References

1. Benjamin EJ, Virani SS, Callaway CW, Chamberlain AM, Chang AR, Cheng S, et al. Heart disease and stroke statistics - 2018 update: A report from the American Heart Association. Circulation. 2018;137(12):E67492.

2. Myocardial ischemiale [Internet]. Available from: https://www.mayoclinic.org/diseases-conditions/myocardial-ischemia/symptoms-causes/syc-20375417

3. Burke AP. Pathology of Acute Myocardial Infarction [Internet]. Available from: https://emedicine.medscape.com/article/1960472-overview

4. Sanchis-Gomar F, Perez-Quilis C, Leischik R, Lucia A. Epidemiology of coronary heart disease and acute coronary syndrome. Ann Transl Med. 2016;4(13):256.

5. Lim SS, Vos T, Flaxman AD, Danaei G, Shibuya K, Adair-Rohani H et al. A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010. Lancet. 2012;380:222460.

6. Rathore V, Singh N and MR. Risk Factors of Acute Myocardial Infarction: A Review. Eurasian J Med Investig. 2018;2(1):17.

7. Panwar RB, Gupta R, Gupta BK, Raja S, Vaishnav J, Khatri M, et al. Atherothrombotic risk factors & premature coronary heart disease in India: a case-control study. Indian J Med Res. 2011 Jul;134(1):2632.

8. Aggarwal A, Aggarwal S, Goel A, Sharma V, Dwivedi S. A retrospective case-control study of modifiable risk factors and cutaneous markers in Indian patients with young coronary artery disease. JRSM Cardiovasc Dis. 2012;1(3):18.

9. Shah N, Wang C, Lee V, Cox N, Wong C, Kelly AM et al. Myocardial Infarction in Young versus Older Adults : An Analysis of graphic Findings and in-Hospital Outcomes. Int J Clin Cardiol. 2016;3(3):16.

10. Dabiran S, Manesh BK, Khajehnasiri F. Risk Factors of First Acute Myocardial Infarction: Comparison of Elderly and Non-Elderly: A 24-Year Study. Adv Aging Res. 2015;4(1):137.

11. Kiani F, Hesabi N, Arbabisarjou A. Assessment of Risk Factors in Patients With Myocardial Infarction. Glob J Health Sci. 2015;8(1):25562.

12. Malik MA, Khan SA, Safdar S, Taseer IUH. Chest Pain as a presenting complaint in patients with acute myocardial infarction (AMI). Pakistan J Med Sci. 2013;29(2):5658.

13. Adam AM, Rehan A, Waseem N, Iqbal U, Saleem H, Ali MA, et al. Prevalence of conventional risk factors and evaluation of baseline indices among young and elderly patients with coronary artery disease. J Clin Diagnostic Res. 2017;11(7):349.

14. Memon AG, Shaikh FH, Shaikh MK. Myocardial infarction in young patients. J Liaquat Univ Med Heal Sci. 2016;15(4):1647.

15. Elkhader BA, Abdulla AA, Ali Omer MA. Correlation of Smoking and Myocardial Infarction Among Sudanese Male Patients Above 40 Years of Age. Polish J Radiol. 2016;81:13840.

16. Bucholz EM, Beckman AL, Kiefe CI KH. Smoking status and life expectancy after acute myocardial infarction in the elderly. Heart. 2016;102(2):1339.

17. Gu K, Cowie CC HM. Mortality in adults with and without diabetes in a national cohort of the U.S. population, 1971-1993. Diabetes Care. 1998;21:113845.

18. Khan MZ, Pervaiz MK, Javed I. Biostatistical study of clinical risk factors of myocardial infarction: a case-control study from Pakistan. Pak Armed Forces Med J. 2016;66(3):35460.

19. Richman PB, Brogan GX Jr, Nashed AN THJ. Clinical characteristics of diabetic vs nondiabetic patients who "rule-in" for acute myocardial infarction. Acad Emerg Med. 1999;6(7):71923.

20. Kannel WB. Incidence and epidemiology of heart failure. Hear Fail Rev. 2000;5:16773.

21. Foussas S. Obesity and Acute Coronary Syndromes. Hell J Cardiol. 2016;57:635.

22. Iqbal R, Jahan N, Hanif A. Epidemiology and Management Cost of Myocardial Infarction in North Punjab, Pakistan. Iran Red Crescent Med J. 2015;17(7):13776.