International Journal of Science and Research (IJSR)
ISSN: 2319-7064
Impact Factor 2024: 7.101

Prevalence and Clinical Characteristics of Diabetes Mellitus in Young Patients with ST-Segment Elevation Myocardial Infarction: A Cross-Sectional Study from Central India

Royal Singh[1], Sunil Washimkar[2]

[1]Senior Resident, Department of Cardiology, Government Medical College Nagpur
Correspondence Author Email: *royaljipmer[at]gmail.com*

[2]Professor and Head, Department of Cardiology, Government Medical College Nagpur

Abstract: ***Aim & objective: To study the role of diabetes mellitus in ST segment elevation myocardial infarction in young adults aged < 45 years. Methods: 51 Adult cases of ST elevated myocardial infarction aged < 45 years, presenting to the Dept. of cardiology of Govt. College Nagpur were sequentially enrolled in the study. Patients were categorised into two groups: diabetics and non-diabetics based on their HbA1c levels. The clinical features, risk factors, and outcomes post intervention were compared in both groups. The student's t-test was used to compare means of two groups. The chi square test was used for categorical data. A p value less than 0.05 was considered to be statistically significant. Results and Discussion: In our study, 27 (52.94 %) subjects were diabetic and 24 (47.05 %) were non-diabetic. The average age of diabetic cases (41±2.5 years) was significantly lower as compared to non-diabetics (43±1.8 years). Female subjects were significantly more in the diabetic group as compared to the non-diabetic group. Majority of the participants in the diabetic group (92.59 %) were found to be obese and had a higher mean BMI (27.28±1.5). Hypertension, history of smoking, past history of cardiovascular disease was significantly more in the diabetic group as compared to the non-diabetic group. Sub-acute stent thrombosis post intervention was significantly more frequent among diabetic cases (8/27) as compared to non-diabetics (1/24). In our study, double and triple vessel was more common among diabetic subjects (88%) as compared to non-diabetic subjects (62 %). TIMI flow after intervention was comparable in both the groups. Conclusion: Diabetic cases of STEMI were significantly younger, more commonly female, with comparatively higher BMI and obesity. Hypertension, smoking, past history of CVD was more frequent in the diabetic group. Although the TIMI flow post intervention was comparable in both groups, sub-acute stent thrombosis was more common among diabetics.***

Keywords: diabetes mellitus, STEMI in young adults, cardiovascular risk factors, stent thrombosis, obesity and heart disease

1. Introduction

Myocardial infarction (MI), colloquially known as "heart attack," is caused by decreased or complete cessation of blood flow to a portion of the myocardium. Myocardial infarction may be "silent" and go undetected, or it could be a catastrophic event leading to hemodynamic deterioration and sudden death. (1) India accounts for one-fifth of cardiovascular deaths worldwide especially in younger population. The results of Global Burden of Disease study state age-standardized CVD death rate of 272 per 100000 population in India which is much higher than that of global average of 235. CVDs strike Indians a decade earlier than the western population. (2) Diabetes is widely recognized as a significant factor greatly increasing the risk of developing atherosclerotic cardiovascular diseases, such as myocardial infarction (3,4). Diabetes is a growing epidemic in India and a major threat to most of the households. Diabetes is a key risk factor for cardiovascular diseases, with a 2- to 4-fold increased risk of cardiovascular events and a 3-fold increased risk of cardiovascular mortality. (5,6) Acute myocardial infarction (AMI) is a leading cause of morbidity and mortality in patients with diabetes. (7). Additionally young adults (aged <55 years) with diabetes mellitus have a 6- to 14-fold increased risk of acute myocardial infarction (AMI) and higher mortality after AMI compared with age-matched individuals without diabetes mellitus. (8) There is insufficient literature exploring the role of diabetes mellitus in acute ST segment elevation myocardial infarction specifically in young adults from India. Hence this study was conducted to study in a tertiary care super-speciality teaching hospital in central India to study the same.

2. Methodology

This cross-sectional study was conducted in the Dept. of cardiology of Govt. College Nagpur, a tertiary care super-speciality hospital in central India between April 2024 and April 2025. Adult cases of ST elevated myocardial infarction aged < 45 years, presenting to the centre during the study period were sequentially enrolled in the study after obtaining their written informed consent. Patients with unstable angina, NSTEMI, stable angina and those not consenting for the study were excluded. A total of 51 patients with STEMI, aged 18-45 years, were included in the present study. The study was approved by the Institutional ethics committee. All patients underwent comprehensive evaluation, including detailed medical history. Patient details such a socio-demographic details, past medical history, history of smoking were collected by the principal investigator using a pre-tested semi-structured proforma. All study subjects underwent electrocardiography, two-dimensional echocardiography and coronary angiography to assess cardiac function and coronary artery status with diabetes. The STEMI was defined according to international guidelines as persistent angina pectoris for ≥20 minutes,

accompanied by ST-segment elevation in two contiguous leads: ≥0.25 mV in men below 40 years, ≥0.15 mV in women in leads V2–V3, and/or ≥0.1 mV in all other leads. (9-11)Diabetes mellitus was classified based on the World Health Organisation definitions using HbA1c levels: patients who's HbA1c was ≥6.5% were consider as diabetic. (12). Patients were categorised into two groups: diabetics and non-diabetics based on their HbA1c levels. Data was collected, compiled and entered in MS Excel. Frequencies and proportions were calculated and data was presented in tabular and graphical formats. Mean and standard deviations were calculated for continuous data and the student's t-test was used to compare means of two groups. The chi square test was used for categorical data. A p value less than 0.05 was considered to be statistically significant.

3. Results

We studied 51 cases of ST elevated myocardial infarction in adults aged 18-45 years from April 2024 to April 2025. The average age of presentation was 42±3.64 years (mean± SD). The cases were predominantly male (35/52, 68.63 %). Most of the study subjects were obese (76.47%), and the average BMI was 27.52 ±5.67 (mean± SD). Out of 51 cases, 74.51% were hypertensive, 60.78 % were smokers and 33.33 % had past history of cardiovascular disease. The baseline characteristics of study subjects have been detailed in **Table 1**. In our study, 27 (52.94 %) subjects were diabetic and 24 (47.05 %) were non-diabetic (**Fig 1**).

Table 1: Baseline Characteristics of Study Subjects (n=51)

Age ± SD (years)		42±3.64
Sex	Male	35 (68.63)
	Female	16 (31.37)
BMI		27.52 ±5.67
Obesity	Present	39 (76.47)
	Absent	12 (25.53)
Family History of CVD		14 (27.45)
Hypertension	Present	38 (74.51)
	Absent	13 (25.49)
Smoking	Present	31 (60.78)
	Absent	20 (39.22)
History of CVD	Past history of coronary artery disease	17 (33.33)
	Prior myocardial infarction	8 (16.69)
	Prior CABG	6 (11.76)
	Prior PCI	2 (3.92)
	Known PAD	4 (7.84)
	Prior stroke	2 (3.92)

SD standard deviation, *BMI* body mass index, *CABG* coronary artery bypass grafting, *PCI* percutaneous coronary intervention, PAD peripheral artery disease

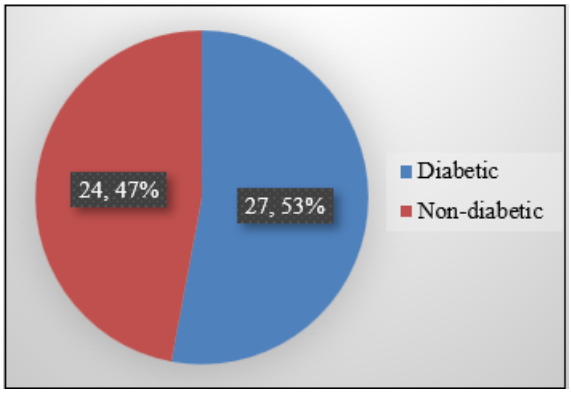

Figure 1: Diabetes status of study subjects

In our study we found that the average age of diabetic cases (41±2.5 years) was significantly lower as compared to non-diabetics (43±1.8 years). Gender was found to be significantly associated with diabetic status of the patients. Female subjects were significantly more in the diabetic group as compared to the non-diabetic group. There was also a significant association between body weight and diabetic status of young MI patients. Majority of the participants in the diabetic group (92.59 %) were found to be obese and had a higher mean BMI (27.28±1.5) as compared to the non-diabetic group (25.46±2.3). Hypertension and history of smoking also significantly more common in the diabetic group. The number of study subjects with a past history of cardiovascular disease was significantly more in the diabetic group (15/27) as compared to the non-diabetic group (2/24). Sub-acute stent thrombosis post intervention was significantly more frequent among diabetic cases (8/27) as compared to non-diabetics (1/24). In our study, double and triple vessel was more common among diabetic subjects (88%) as compared to non-diabetic subjects (62 %). TIMI flow after intervention was comparable in both the groups and the difference was not statistically significant. **(Table 2)**

Table 2: Association of Patient Characteristics with Diabetic Status

Characteristics		Diabetics (n=27)	Non- diabetics (n=24)	p value
Age ± SD (years)		41±2.5	43±1.8	**0.002**
Sex	Male	15 (55.56)	20 (83.33)	**0.032**
	Female	10 (44.44)	6 (16.67)	
BMI		27.28±1.5	25.46±2.3	**0.001**
Obesity	Present	25(92.59)	14(58.33)	**0.003**
Family History of CVD	Present	8(29.63)	6 (25)	0.711
Hypertension	Present	24 (88.89)	14 (58.33)	**0.012**
Smoking	Present	16(59.26)	15(62.50)	0.812
History of CVD	Past history of coronary artery disease	15 (55.56)	2 (8.33)	**0.0003**
	Prior myocardial infarction	5 (18.52)	3 (12.50)	0.55
Sub-acute stent thrombosis post intervention		8 (29.63)	1 (4.17)	**0.01**
Killip classification	I	15 (55.56)	12 (50.00)	0.84
	II/III	7 (25.93)	8 (33.33)	
	IV	5 (18.52)	4 (16.67)	
Gp2b3a blocker	Given	18(66.67)	13 (54.17)	0.36

Number of coronary vessels diseased	1	3(11.11)	9 (37.50)	**0.02**
	Multivessel (2 or 3)	24 (88.89)	15 (62.50)	
TIMI flow after intervention	TIMI flow 0/1 post PCI	3 (11.11)	2 (8.33)	0.93
	TIMI flow 2 post PCI	6 (22.22)	5 (20.83)	
	TIMI flow 3 post PCI	18 (66.67)	17 (70.83)	

SD standard deviation, *BMI* body mass index, *CVD* cardiovascular disease, *Gp2b3a* glycoprotein IIb/IIIa (GPIIb/IIIa) receptor, *PCI* percutaneous coronary intervention, TIMI flow *Thrombolysis in Myocardial Infarction.*

4. Discussion

We studied 51 cases of ST elevated myocardial infarction in adults aged 18-45 years from April 2024 to April 2025 presenting to the Dept. of Cardiology, GMC Nagpur. In our study, 27 (52.94 %) subjects were diabetic and 24 (47.05 %) were non-diabetic. On comparison, we found that the average age of diabetic cases (41±2.5 years) was significantly lower as compared to non-diabetics (43±1.8 years). A similar study from Bangladesh conducted in 100 acute anterior MI patients (50 diabetic and 50 non-diabetic) also reported that diabetic cases of MI were significantly younger as compared to non-diabetics. (13) Female subjects were significantly more in the diabetic group as compared to the non-diabetic group. Previous literature supports that in young adults with Myocardial Infarction (MI) and diabetes, the condition appears to be more common in women than men. Diabetes was also reported to be more common among female cases of young MI by previous studies. (14) There was also a significant association between body weight and diabetic status of young MI patients. Almost all of the participants in the diabetic group (92.59 %) were found to be obese and had a higher mean BMI (27.28±1.5) as compared to the non-diabetic group (25.46±2.3). In our study we found that 88.89 % of diabetic subjects were hypertensive, while only 58.33 % non-diabetic participants were hypertensive, and this difference was statistically significant. A study analysing 5,900 patients with a first-time MI in Germany also reported that hypertension was more common in diabetic cases of myocardial infarction as compared to non-diabetic patients. (15) A positive history of cardiovascular diseases in the family was also found to be more commonly present in diabetic cases. A study investigating the role of family history of premature cardiovascular disease (CVD) in patients aged < 50 years with myocardial infarction (MI) found that younger age of patients with myocardial infarction is associated with family history of premature MI/ischaemic stroke in not only first- but also second-degree relatives. (16). Available literature suggests that sub-acute stent thrombosis, occurring 24 hours to one month after stent placement, poses a significant risk in young myocardial infarction (MI) patients, particularly those with diabetes. A similar study reported that sub-acute stent thrombosis was significantly more common in diabetic cases of MI (17). We also found that double and triple vessel disease was significantly more common in diabetic patients. Compared to non-diabetics, Cole et al. observed higher rates of double-vessel and triple-vessel disease in subjects with DM (18). We found that both diabetic and non-diabetic groups were comparable in terms of Killip classification, use of Gp2b3a blockers, and TIMI flow after intervention.

5. Conclusion

Diabetic cases of STEMI were significantly younger, more commonly female, with comparatively higher BMI and obesity. Hypertension, smoking, past history of CVD were more frequent in the diabetic group. Although the TIMI flow post intervention was comparable in both groups, sub-acute stent thrombosis was more common among diabetics.

6. Future Scope

Similar studies with larger sample size. Follow up studies would better delineate effect of diabetes control on future risks of MI, TVR, SAT, ISR. Impact of duration of diabetes preceding first presentation on cardiovascular disease severity

Ethical consideration: institutional ethics committee approval was obtained prior to the study. A written informed consent was obtained from all study participants.

Funding sources: None

Conflict of interest: None declared

References

[1] Thygesen K, Alpert JS, White HD. Universal Definition of Myocardial Infarction. Circulation. 2007 Nov 27;116(22):2634–53.).
[2] Sreeniwas Kumar A, Sinha N. Cardiovascular disease in India: A 360 degree overview. Med J Armed Forces India. 2020 Jan;76(1):1-3. doi: 10.1016/j.mjafi.2019.12.005. Epub 2020 Jan 13. PMID: 32020960; PMCID: PMC6994761.
[3] Narayan KM, Boyle JP, Thompson TJ, Sorensen SW, Williamson DF. Lifetime risk for diabetes mellitus in the United States. JAMA. (2003) 290:1884–90. 10.1001/jama.290.14.1884.
[4] Franco OH, Steyerberg EW, Hu FB, Mackenbach J, Nusselder W. Associations of diabetes mellitus with total life expectancy and life expectancy with and without cardiovascular disease. Arch Intern Med. (2007) 167:1145–51. 10.1001/archinte.167.11.1145
[5] Fox CS, Coady S, Sorlie PD, Levy D, Meigs JB, D'Agostino RB, Wilson PWF, Savage PJ. Trends in cardiovascular complications of diabetes. *JAMA.* 2004;292:2495–2499.
[6] Gregg EW, Gu Q, Cheng YJ, Narayan KMV, Cowie CC. Mortality trends in men and women with diabetes, 1971 to 2000. *Ann Intern Med.* 2007;147:149–155.
[7] Rao Kondapally Seshasai S, Kaptoge S, Thompson A, DiAngelantonio E, Gao P, Sarwar N, Whincup PH, Mukamal KJ, Gillum RF; Emerging Risk Factors Collaboration, et al. Diabetes mellitus, fasting glucose,

and risk of cause-specific death. *N Engl J Med.* 2011;364:829–841.

[8] Hillier TA, Pedula KL. Complications in young adults with early-onset type 2 diabetes: losing the relative protection of youth. *Diabetes Care*. 2003;26:2999–3005.

[9] Ibanez B, James S, Agewall S, Antunes MJ, Bucciarelli-Ducci C, Bueno H, Caforio AL, Crea F, Goudevenos JA, Halvorsen S, Hindricks G. 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation: The Task Force for the management of acute myocardial infarction in patients presenting with ST-segment elevation of the European Society of Cardiology (ESC). European heart journal. 2018 Jan 7;39(2):119-77.

[10] Steg PG, James SK, Atar D, Badano LP, Blömstrom-Lundqvist C, Borger MA, et al. ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation. Eur Heart J. 2012;33(20):2569-619.

[11] O'Gara PT, Kushner FG, Ascheim DD, Casey DE Jr, Chung MK, de Lemos JA, et al. 2013 ACCF/AHA Guideline for the Management of ST-Elevation Myocardial Infarction: A report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. J Am Coll Cardiol. 2013;61(4):e78-e140. Doi: 10.1016/j.jacc.2012.11.019.

[12] World Health Organization. Glycated haemoglobin (HbA1c) for the diagnosis of diabetes [Internet]. Nih.gov. World Health Organization; 2011. Available from: https://www.ncbi.nlm.nih.gov/books/NBK304271/

[13] Alam S, Shahabuddin M, Mukid A, Tazin F, Tarin T, Roy S, Chowdhury P. International Journal of Medical Research and Review.

[14] Alexander T, Kumbhani DJ, Subban V, Sundar H, Nallamothu BK, Mullasari AS. Acute ST-elevation myocardial infarction in the young compared with older patients in the Tamil Nadu STEMI program. Heart, Lung and Circulation. 2021 Dec 1;30(12):1876-82.

[15] Schmitz T, Wein B, Raake P, Heier M, Peters A, Linseisen J, Meisinger C. Do patients with diabetes with new onset acute myocardial infarction present with different symptoms than non-diabetic patients? Front Cardiovasc Med. 2024 Jan 15;11:1324451. doi: 10.3389/fcvm.2024.1324451. PMID: 38287984; PMCID: PMC10822885.

[16] Ambroziak, M., Niewczas-Wieprzowska, K., Maicka, A. *et al.* Younger age of patients with myocardial infarction is associated with a higher number of relatives with a history of premature atherosclerosis. *BMC Cardiovasc Disord* **20**, 410 (2020). https://doi.org/10.1186/s12872-020-01677-w

[17] Tariq S, Kumar R, Fatima M, Saghir T, Masood S, Karim M. Acute and sub-acute stent thrombosis: Frequency, predictors and features in patients undergoing primary percutaneous intervention at a tertiary care cardiac centre. Int J Cardiol Heart Vasc. 2019 Nov 14;26:100427. doi: 10.1016/j.ijcha.2019.100427. PMID: 31763441; PMCID: PMC6864178.

[18] Cole JH, Miller JI, Sperling LS, Weintraub WS. Long-term follow-up of coronary artery disease presenting in young adults. *J Am Coll Cardiol*. 2003;41(4):521–528.