RESEARCH ARTICLE

Angiographic characteristics and in hospital outcome of young patients, age up to 40 versus more than 40 years undergoing primary percutaneous coronary intervention

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Abstract

Objective: To compare angiographic characteristics and outcomes of primary percutaneous coronary intervention between young and old patients presenting with acute ST-Elevation Myocardial Infarction.

Methods: The prospective observational study was conducted at the National Institute of Cardiovascular Diseases, Karachi, from December 17, 2016, to June 16, 2017, and comprised acute ST-Elevation Myocardial Infarction patients undergoing primary percutaneous coronary intervention (PCI). Data was collected on demographic, angiographic, and in-hospital outcomes. Those <40 years were considered young. Data was analysed using SPSS 21.

Results: Of the 415 patients, 50(12%) were young. Proportion of male was higher among the young (p=0.02) and so was the case with positive family history (p=0.002). The young had lesser cases of diabetes (p=0.028) and hypertension (p=0.034). Single vessel disease was more common among young (p<0.001). No significant difference was observed in post-procedure outcome related to age (p>0.05).

Conclusion: Acute Myocardial Infarction in young was more likely associated with male gender, positive family history and less likely with hypertensive and diabetic status.

Keywords: Young, Premature myocardial infarction, Angiographic profile, Primary percutaneous coronary intervention, ST-elevation myocardial infarction. (JPMA 69: 1307; 2019)

Introduction

Acute Myocardial Infarction (AMI) is the most lethal manifestation of cardiovascular diseases (CVDs) and can result in sudden cardiac death. It is considered to be the disease of the old, but the protecting net of young against the AMI has been slowly waved off.[1,2] Studies have reported varying rates of prevalence based on the definition of young population, about 1-16% prevalence of MI is reported.[1-9] Potential causes of premature MI are reported to be stressful work environment, excessive workload, sedentary lifestyle, unhealthy dietary habits, smoking and addiction.[2,6] Generally, premature MI is associated with relatively good prognosis[10-12] but economic and social burden of the disease in productive years of life is critical for both family and society.[13] Younger population is considered to be the breadwinner of family, and the aftermath of premature MI not only impacts the patient himself but also multiple family dependents get affected both psychologically and economically.[14] Disease anatomy, risk profile and clinical presentation are different in the young compared to the old.[1] Studies have reported premature MI to be more likely associated with male gender, smoking history, positive CVD family history, and dyslipidaemia, and is less associated with diabetes mellitus (DM) and hypertension (HTN).[1,6]

Late presentation and ignorance of early symptoms of coronary artery disease (CAD) is more common among young patients, which can be attributed to the false sense of security associated with younger age.[15] Unlike the older patients, instead of deteriorating or stable angina, first onset in younger patients rapidly evolves into fully developed MI.[15,16] Studies conducted in many parts of the world have reported the aetiological differences of MI between the young and the old.[1,3-7,17,18] Considering the fact, understanding of differences in risk profile, angiographic characteristics, and the outcomes of primary percutaneous coronary intervention (PCI) for Pakistani population is important. Further, this will help to formulate customised preventive and therapeutic strategies. Therefore, the current study was planned to compare the

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angiographic characteristics and the outcomes of young patients with those of older patients.

Methods

The prospective observational study was conducted at the Catheterisation Laboratory of the National Institute of Cardiovascular Disease (NICVD), Karachi, from December 17, 2016, to June 16, 2017, and comprised consecutive patients aged 18-80 years diagnosed with acute ST-Elevation Myocardial Infarction (STEMI) undergoing primary PCI.

After approval taken from the institutional ethics committee, the sample size was calculated using World health Organisation (WHO) calculator version 2.0,[19] setting confidence level of 95%, power of test 80%, and anticipated population in-hospital mortality of 0.9% in young patients and 6.1% in the older ones.[17] Those <40 years of age were considered young and >40 years as old. An additional 10% patients were recruited to account for any potential information loss and dropouts. Informed consent was obtained from all the subjects.

AMI was diagnosed based on presenting symptoms, cardiac enzymes, and electrocardiography (ECG) changes. Patients with history of any prior cardiac-related surgery were excluded. Coronary angiography (CAG) and primary PCI in all patients were performed by interventional cardiologists with over five years of experience. Post-procedure outcomes were recorded for all patients during hospital stay. A structured questionnaire was used after it was cleared by the senior faculty of the institution. Data on demographic, angiographic and procedural characteristics, risk profile, and in-hospital outcomes were recorded for all patients.

SPSS 21 was used for data analysis. Mean ± standard deviation (SD) and frequencies and percentages were calculated for quantitative (continuous) and categorical variables respectively. Shapiro-Wilk test of normality was applied for continuous variables and appropriate independent sample t-test or Mann-Whitney U test were applied to compare the differences in younger and older patients on quantitative (continuous) variables. The association of age groups with categorical variables was assessed by using Chi-square test. Two sided $p \leq 0.05$ was taken as statistically significant.

Results

Of the 415 patients, 50(12%) were young and the rest were old. Proportion of male was higher among the young (p=0.02) and so was the case with positive family history (p=0.002). The young had lesser cases of diabetes (p=0.028) and hypertension (p=0.034) (Table 1).

Table-1: Baseline characteristics of the young vs. old patients.

Baseline characteristics	Total (n = 415) n [%]	Young (n=50) n [%]	Old (n=365) n [%]	**p-value
Gender				
Male	290 [69.9]	42 [84]	248 [67.9]	0.02*
Female	125 [30.1]	8 [16]	117 [32.1]	
BMI (mean ± SD kg/m^2)¥	24.4 ± 3.23	24.62 ± 2.64	24.37 ± 3.3	0.275
Risk profile				
Diabetes Mellitus	140 [33.7]	10 [20]	130 [35.6]	0.028*
Hypertension	240 [57.8]	22 [44]	218 [59.7]	0.034*
Smoking	124 [29.9]	13 [26]	111 [30.4]	0.522
Dyslipidaemia	107 [25.8]	13 [26]	94 [25.8]	0.97
Family History of CHD	26 [6.3]	8 [16]	18 [4.9]	0.002*
Chronic Kidney Disease	14 [3.4]	1 [2]	13 [3.6]	0.566
Presenting symptoms				
Chest Pain	340 [81.9]	46 [92]	294 [80.5]	0.048*
Chest Pain with SOB	31 [7.5]	0 [0]	31 [8.5]	0.032*
Sudden cardiac arrest	13 [3.1]	2 [4]	11 [3.0]	0.707
State of shock	31 [7.5]	2 [4]	29 [7.9]	0.319
KILLIP class at presentation				
Killip I	323 [77.8]	43 [86]	280 [76.71]	0.138
Killip II	29 [7.0]	2 [4]	27 [7.4]	0.376
Killip III	32 [7.7]	3 [6]	29 [7.9]	0.628
Killip IV	31 [7.5]	2 [4]	29 [7.9]	0.319

BMI: Body Mass Index, CHD: Coronary Heart Disease, SOB: Shortness of Breath, SD: Standard Deviation, ¥Shapiro-Wilk test of normality rejected with p-value <0.001
**p-values are based on Mann-Whitney U test for BMI and chi-square test for all the categorical variables. *Statistically significant at 5% level of significance.

Table-2: Angiographic and procedural characteristics of the young vs. old patients.

Characteristics	Total (n = 415) n [%]	Young (n=50) n [%]	Old (n=365) n [%]	**p-value
ST Elevation pattern at presentation				
Lead V1-V6, LBBB	230 [55.4]	32 [64]	198 [54.2]	0.193
Lead V5,V6,I,aVL	20 [4.8]	1 [2]	19 [5.2]	0.320
Lead II,III,aVF	136 [32.8]	12 [24]	124 [34.0]	0.158
Lead II,III,aVF,V7,V8	29 [7.0]	5 [10]	24 [6.6]	0.373
Number of Vessels				
Single vessel disease (SVD)	147 [35.4]	31 [62]	116 [31.8]	<0.001*
Two vessel disease (2VD)	135 [32.5]	13 [26]	122 [33.4]	0.293
Three vessel disease (3VD)	133 [32.0]	6 [12]	127 [34.8]	0.001*
Type of vessels				
Left anterior descending (LAD)	247 [59.5]	34 [68]	213 [58.4]	0.192
Right coronary artery (RCA)	128 [30.8]	11 [22]	117 [32.1]	0.148
Circumflex artery (CX)	40 [9.6]	5 [10]	35 [9.6]	0.926
Lesion type				
A	18 [4.3]	3 [6]	15 [4.1]	0.538
B	125 [30.1]	14 [28]	111 [30.4]	0.727
C	272 [65.5]	33 [66]	239 [65.5]	0.942
ST Segment resolution				
No	24 [5.8]	1 [2]	23 [6.3]	0.221
<90min	362 [87.2]	48 [96]	314 [86.0]	0.047*
>90min	29 [7.0]	1 [2]	28 [7.7]	0.140
TIMI flow post PCI				
No flow	6 [1.45]	0 [0]	6 [1.6]	0.361
I	4 [0.96]	0 [0]	4 [1.1]	0.456
II	29 [7.0]	1 [2]	28 [7.7]	0.140
III	376 [90.6]	49 [98]	327 [89.6]	0.055
MBG grade				
0	6 [1.4]	0 [0]	6 [1.6]	0.361
1	7 [1.7]	0 [0]	7 [1.9]	0.323
2	30 [7.2]	1 [2]	29 [7.9]	0.127
3	372 [89.6]	49 [98]	323 [88.5]	0.038*
LVEF on presentation¥	40.52 ± 11.95	43.9 ± 10.22	40.06 ± 12.11	0.003*
EDD on presentation¥	49.46 ± 6.35	45.26 ± 6.79	50.04 ± 6.07	<0.001*
LVEDP Pre PCI¥	31.59 ± 7.56	29.6 ± 7.41	31.86 ± 7.55	0.045*

LBBB: Left Bundle Branch Block, TIMI: Thrombolysis In Myocardial Infarction, MBG: Myocardial Blush Grade, PCI: Percutaneous Coronary Intervention, LVEF: Left Ventricular Ejection Fraction, EDD: End-Diastolic Diameter, LVEDP: Left Ventricular End-Diastolic Pressure, ¥Shapiro-Wilk test of normality rejected with p-value <0.001
**p-values are based on Mann-Whitney U test for continuous variables and chi-square test for all the categorical variables.*Statistically significant at 5% level of significance.

Table-3: Post procedure in-hospital and short term outcomes by young vs. old patients.

Post Procedure Outcome	Total (n = 415) n [%]	Young (n=50) n [%]	Old (n=365) n [%]	**p-value
Length of Stay (mean ± SD days) ¥	3.07 ± 1.46	3.02 ± 0.82	3.08 ± 1.53	0.694
Complications				
Any Complication	129 [31.1]	13 [26]	116 [31.8]	0.407
Contrast Induced Nephropathy	33 [8]	5 [10]	28 [7.7]	0.568
Slow/No flow	22 [5.3]	2 [4]	20 [5.5]	0.661
Need ventilator	18 [4.3]	0 [0]	18 [4.9]	0.108
Heart block	17 [4.1]	4 [8]	13 [3.6]	0.137
Pulmonary Oedema	16 [3.9]	0 [0]	16 [4.4]	0.131
Shock	10 [2.4]	0 [0]	10 [2.7]	0.236
Dissection	8 [1.9]	2 [4]	6 [1.6]	0.255
IABP placement	5 [1.2]	0 [0]	5 [1.4]	0.405
Post procedure outcome				
In-hospital mortality	31 [7.5]	1 [2]	30 [8.2]	0.116
Emergency CABG	20 [4.8]	0 [0]	20 [5.5]	0.089
Discharge to home	364 [87.7]	49 [98]	315 [86.3]	0.018*

SD: Standard Deviation, IABP: Intra-Aortic Balloon Pump, CABG: Coronary Artery Bypass Graft. ¥Shapiro-Wilk test of normality rejected with p-value <0.001
**p-values are based on Mann-Whitney U test for length of stay and chi-square for all the categorical variables. *Statistically significant at 5% level of significance.

Single vessel disease (SVD) was more common among young (p<0.001). Comparison of angiographic and procedural characteristics between the two age groups was separately noted (Table 2).

No statistically significant differences were observed between the groups in terms of post-procedure length of hospital stay, complication rate, and in-hospital outcome (p>0.05 each) (Table 3).

Discussion

The current study was an effort to understand the differences in risk profile, angiographic characteristics and the outcomes of primary PCI in young and old patients presenting with STEMI. Proportion of patients ≤40 years of age was 12% which is in line with the reported range of 1-16% based on various PCI registries and studies.(1-9) MI in young patients is found to be associated with, male gender, smoking history, positive family history of CVDs, and dyslipidaemia.[1,6] The current study found significantly higher proportion of male patients and positive family coronary heart disease (CHD) history among the young which is aligned with the literature[1,3,5,6,7,17,18] Besides, history of smoking and dyslipidaemia were found to be insignificant in young patients compared to the old. HTN and DM were less frequent in young patients in our study, which agrees with published data.[3,5,6,7,17,18] Past studies on young patients reported that young patients were more likely to have SVD[3,5-8] and in the current study SVD was found in significantly higher proportion of young patients while three vessels disease (3VD) was higher among the old. The current study further revealed that the young patients had early resolution of ST segment, rapidly achieving Myocardial Blush Grade (MBG) 3, higher left ventricular ejection fraction (LVEF), and lower left ventricular end-diastolic pressure (LVEDP) pre-PCI. However, no statistically significant difference was observed between the two groups in terms of ST elevation patterns and infarct-related artery.

Despite the evident differences in risk profile and disease anatomy, no statistically significant differences were observed between the groups in terms of post-procedure length of hospital stay, complication rate, and in-hospital outcome. A few studies have reported relatively favourable outcomes for younger patients.[5,7,18]

Primary PCI is generally considered to be a less risky procedure, but the aggressive nature of the disease and longer life expectancy of younger patients may increase the risk of reoccurrence of coronary events.[3]

The current study is limited by its single-centre nature and small sample size. Larger multicentre studies are needed to further investigate the disease behaviour among the young in our population.

Conclusion

Primary PCI in premature MI resulted in favourable procedural and post-procedural outcome with relatively lesser complications. Conceiving the psychological and economic burden of premature MI for patients, family, and community at large, it is important to further explore the contributing factors towards premature MI and formulate preventive and management strategies to marginalise the burden of the disease.

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