Original Article

Study on Risk Factors and Pattern of Coronary Artery Involvement in Young Acute Coronary Syndrome Patients

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Abstract:

Aims: To compare the risk factors and pattern of coronary artery involvement in young acute coronary syndrome patients with that of the elderly.

Methods: This was a cross sectional analytic study done in the Department of Cardiology, Sir Salimullah Medical College and Mitford Hospital during November 2015 to October 2016.

Results: Study population was divided into two subgroups, those 18-40 years were considered as young and those >40 years were considered as elderly. Young patients had greater prevalence of smoking, dyslipidemia and positive family history of Ischemic Heart Disease (IHD), whereas hypertension was more prevalent in the elderly. Younger patients mainly presented with STEMI and predominantly had single vessel disease (SVD), whereas elderly patients frequently presented with NSTEMI and Unstable angina and had higher incidence of double vessel disease (DVD) and triple vessel disease (TVD).

Conclusion: Younger patients had a different pattern of risk factors and coronary artery involvement in comparision to the elderly.

Keywords: Young adult, Acute Coronary Syndrome, Coronary Angiography, Bangladesh.

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Introduction:

Coronary artery disease is a global health problem reaching an epidemic proportion in both developed and developing countries and is the leading cause of mortality and morbidity worldwide.[1, 2] In 1990 coronary artery disease accounted for 28% of world's 50.4 million deaths and 9.7% of the 1.4 billion lost disability adjusted life years. By 2020 the world's population will grow to 7.8 billion and 32% of all deaths will be caused by coronary artery.[3]

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The South Asian countries have among the highest incidence of coronary artery disease globally.[4] Estimates from the global burden of disease study suggests that by the year 2020, this part of the world will have more individuals with atherosclerotic coronary artery disease than in any other region.[4, 5] Data related to different aspects of CAD in Bangladesh are inadequate but it is highly prevalent in Bangladesh.[6]

South Asian populations have an increased risk and 5-10 years earlier onset for acute myocardial infarction compared to the western population. In recent years the frequency of acute myocardial infarction in young individuals is increased.[4, 7, 8] Like other South Asians, Bangladeshis are unduly prone to develop CAD, which is often premature in onset.[6]

Methods:

This was a cross sectional analytical study, done in the Department of Cardiology, Sir Salimullah Medical College and Mitford Hospital, Dhaka during November 2015 to October 2016. All patients 18 yrs and above with acute

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coronary syndrome admitted in CCU during the specified period were included in this study considering the inclusion and exclusion criteria. Inclusion criteria were ACS patients ≥18 yrs and in whom CAG could be done. Exclusion criteria were patients withconcurrent valvular or congenital heart disease, cardiomyopathy, CKD, cerebro-vascular disease and old MI.

They were further divided into 2 groups based on their age. Patients 18-40 yrs were considered as young and those >40 years were considered as elderly.[4]Informed written consent was taken from the selected patients. Initial evaluation of patients was done by history taking and clinical examination and were duly recorded. Demographic data, such as, age, sex and anthropometric data like height (cm) and weight (kg) were recorded. Presence of risk factors of ACS or risk factors reported were also noted. Pulse, BP and other vital parameters were recorded.

Troponin I level was measured at admission but not before 6 hrs from the onset of chest pain. Blood for screening DM was taken with patients fasting at least 8 hrs before giving the blood sample and 2 hrs after 75 gram oral glucose load (in patients not confirmed by FBS and RBS), but for screening dyslipidemia fasting only for 8 hrs would do suffice. To evaluate renal status serum creatinine was assessed. Echocardiography was done after admission of the patient. The mode of ACS presentation in both the groups were noted. Coronary angiogram was done during admission or on follow up (within 14 days) regardless of patient receiving thrombolysis or not and was recorded.

Data were processed and analyzed using SPSS (Statistical Package for Social Science) for Windows Version 16. The test statistics used to analyze the data were descriptive statistics, Chi-square ($Ç^2$) and unpaired t-test. While the categorical data were compared between groups using Chi-square Test, the data presented on continuous scale were compared between groups using unpaired t-test. The level of significance was set at 5% and $p < 0.05$ was considered significant

Results:

The present study intended to compare the risk factors and coronary artery involvement between younger and elder ACS included a total of 110 patients. Of them 58 were £40 years and considered as young (case) and 52 were above 40 years were older (control). Males and females were 83 and 27 respectively. The mean ages of the younger and the elder group were 36.6 ± 4.3 and 56.9 ± 8.7 years respectively, while the mean ages of the males and females 47.0 ± 12.7 and 43.9 ± 10.4 years respectively.

Table-I
Comparison of sex distribution of the study groups (N=110)

Sex distribution	Group		p value*
	Case (≤ 40 years) (n = 58)	Control (>40 years) (n = 52)	
Male	41(70.7)	42(80.8)	0.220
Female	17(29.3)	10(19.2)	

*Data were analyzed using Chi-square test.

Table I shows that over 70% of the case group and 80% of the control group were male with no significant intergroup difference (p = 0.220).

Table-II
Comparison of lifestyle and BMI of the study groups (N=110)

Variables	Group		p value*
	Case (≤ 40 years) (n = 58)	Control (>40 years) (n = 52)	
Lifestyle	0.952		
Active	12(20.7)	11(21.2)	
Sedentary	46(79.3)	41(78.8)	
BMI (kg/m^2)	0.240		
Under weight	3(5.2)	2(3.8)	
Normal BMI	19(32.8)	23(44.2)	
Over weight	20(34.5)	21(40.4)	
Obese	14(24.1)	6(11.5)	
Morbidly obese	2(3.4)	0(0.0)	

*Data were analyzed using Chi-square test.

Table II shows majority of the patients in both case and control groups (79.3 and 78.8% respectively) were accustomed to sedentary life-style, the difference was not statistically significant (p = 0.952). Over half of the patients in both case and control groups were overweight or obese (58.6 and 51.9% respectively). The groups were almost identical in terms of BMI (p = 0.240).sedentary lifestyle was defined as daily engagement of at least 30 minutes or more in moderate to severe exercise[9]

Table-III
Comparison of clinical presentation of the study groups (N=110)

Clinical Presentation	Group		p value*
	Case (≤ 40 years) (n = 58)	Control (>40 years) (n = 52)	
STEMI	28(48.3)	12(23.1)	
NSTEMI	16(27.6)	19(36.5)	0.021
UA	14(24.1)	21(40.4)	

*Data were analyzed using Chi-square (test).

Table III shows while STEMI was considerably higher in the case group compared to the control group, NSTEMI

Table-IV

Comparison of risk factors of the study groups (N=110)

Cardiovascular risk factors	Group		p value*
	Case (≤ 40 years) (n = 58)	Control (>40 years) (n = 52)	
Smoking*	34(58.6)	20(38.4)	0.035
DM*	17(29.3)	19(36.5)	0.420
HTN*	25(43.1)	36(69.2)	0.006
Dyslipidemia*	41(70.7)	24(46.1)	0.009
Family H/o IHD*	30(51.7)	12(23.1)	0.002

*Data were analyzed using Chi-square test.

Table-V

Comparison of biochemical findings of the study groups (N=110)

Biochemical variables#	Group		p value*
	Case (≤ 40 years) (n = 58)	Control (>40 years) (n = 52)	
FBG (m.mol/L)	7.1 ± 3.7	6.0 ± 1.7	0.054
RBG (m.mol/L)	7.4 ± 3.2	7.3 ± 1.8	0.776
Serum creatinine (mg/dl)	0.98 ± 0.7	0.97 ± 0.1	0.945
Total cholesterol (mg/dl)	200.6 ± 49.3	200.2 ± 28.8	0.957
Serum LDL-C (mg/dl)	130.3 ± 42.2	114.6 ± 28.8	0.026
Serum HDL-C (mg/dl)	36.6 ± 4.2	37.0 ± 4.3	0.646
Serum TG (mg/dl)	227.0 ± 134.8	176.3 ± 65.2	0.015

#Data were analyzed using unpaired t-test and were presented as mean ± SD.

Table-VI

Comparison of angiographic profile of the study groups (N=110)

Angiographic profile	Group		p value*
	Case (≤ 40 years) (n = 58)	Control (>40 years) (n = 52)	
Site of lesion*			
LM	3(5.2)	2(3.8)	0.739
RCA	28(48.3)	38(73.1)	0.008
LAD	28(48.3)	45(86.5)	<0.001
LCX	16(27.6)	42(80.8)	<0.001
Severity of lesion#			
Occlusion in LM (%)	67.2 ± 29.5	69.6 ± 29.5	0.919
Occlusion in RCA (%)	86.4 ± 15.5	79.3 ± 23.2	0.165
Occlusion in LAD (%)	80.5 ± 18.9	85.34 ± 14.0	0.209
Occlusion in LCX (%)	83.1 ± 16.1	80.4 ± 23.5	0.657
No. of vessels involved*			
SVD	24(41.4)	12(23.1)	<0.001
DVD	10(17.2)	20(38.5)	
TVD	7(12.1)	20(38.5)	
None	17(29.3)	0(0.0)	

*Data were analyzed using Chi-square; figures in the parentheses denote percentage.
#Data were analyzed using unpaired t-test and were presented as mean ± SD.

and unstable angina were much higher in the latter group, this difference was statistically significant (p = 0.021).NSTEMI was differentiated from UA by having elevated Troponin-I.

Table IV shows risk factors distribution in younger ACS patients had significantly higher prevalence of smoking, dyslipidemia and family history of IHD compared to the elder group (p = 0.035, p = 0.009 and p = 0.002 respectively).In contrast, hypertension demonstrated their significant presence in the latter group compared to that in the former group (p = 0.006).

Table V shows comparison of pertinent biochemical variables reveals that FBS was relatively high in the case group than that in the control group (p = 0.054). The level of serum LDL and serum triglycerides were significantly elevated in the former group than those in the latter group (p = 0.026 and p = 0.015 respectively).

Table VI shows that in younger patients RCA and LAD were commonly involved (48.3% cases) than the LCX (27.6%), where as in elder patients all the major coronary arteries were almost equally involved. Site of lesions were more in elder group than that in younger group. However, in terms of percentage of occlusion, no significant difference was observed between the groups with respect to any of the major coronary arteries. While SVD was common in the case group, DVD and TVD were prevalent in the control group which was statistically significant (p < 0.001).

Discussion:

In the present study majority of the ACS patients in either group were male although earlier studies reported that ACS occurs more in males than in females in younger age.[10,11] CAD is much less frequent in premenopausal women due to the effect of estrogen; as the protection from CAD is much less evident after menopause, the disease affects both sexes equally.[12]In a recent study however, researchers have found that young women who are current smoker and obese are more likely to suffer from ACS.[13]

Among the conventional risk factors smoking, dyslipidemia and positive family history of IHD were the most prevalent cardiovascular risk factors (CVRFs) in the younger patients (58.6, 70.7 and 51.7% respectively) which was statistically significant (p = 0.035, p = 0.009 and p = 0.002 respectively). Whereas hypertension was the most prevalent established CVRF in the elderly group (69.3%) which was statistically significant (p = 0.006).

In terms of clinical presentation, STEMI was the most common form of ACS in younger group (48.3%), whereas NSTEMI and UA were significantly higher in the older group (36.5 and 40.4% respectively) (p = 0.021).Several studies have shown that STEMI is the most common form of ACS in young. Bhattacharjee et al. 2014.[14] in a recent study found that STEMI is significantly more common in younger patients. In a Thai ACS Registry study, 67% young ACS patients had STEMI.[15]On the other hand, NSTEMI and UA have been reported to be more common in the elderly.[16,17] Similar finding has been observed by another group where majority (70%) of the young patients with ACS presented with STEMI.[18]

Mean FBG was relatively high in the case group than that in the control group (p = 0.054). Serum LDL-C and serum triglycerides levels were significantly higher in the former group than in the latter group (p = 0.026 and p = 0.015, respectively).The study demonstrates that younger patients have lesser number of coronary artery involvement and less severe disease (in terms of percentage of occlusion and number of vessels involved) compared to elderly(p = <0.001). They also have fewer complications than the older cohorts in terms of cardiogenic shock and recurrent angina than their older counterparts (p = 0.023 and p < 0.001 respectively).

This study showed that younger patients have lesser number of coronary artery involvements and less severe disease (in terms of percentage of occlusion and number of vessels involved) compared to the elderly. They also have less complications than their older counterparts. Consistent with these findings Bhattacharjee showed prevalence of no. of vessels involvement and SVD to be significantly higher in younger ACS patients while multi-vessel disease is more common in the elderly. Similar findings have been reported by other authors.[19,20] The less extensive CAD observed in younger patients in our study might suggest that premature CAD is associated with rapid disease progression rather than with a gradually evolving process. This is in agreement with the finding that ACS is the common first presentation in younger patients.[21]

The study had few limitations including small sample size and a single center study. Syntax orGensini scores indicating severity of the involvement of the coronary arteries and Medina Classification indicating the type of lesion have not been included in the study as a variable. Because of resource constraint we could not include the emerging cardiovascular risk factors like serum homocystine, high sensitivity C-reactive protein, serum Lp(a), Chlamydia pneumoniae IgG antibody, Vitamin D level.

Conclusion:

Younger ACS patients had significantly higher prevalence of smoking, dyslipidemia and family history of IHD compared to the elder group, whereas elderly ACS patients were more prone to be associated with hypertension. Young ACS patients frequently presented with STEMI and single vessel disease whereas elderly

patients frequently presented with NSTEMI and UA with more severe and extensive CAD.

At the end of this study we recommend early risk stratification, identification of the disease and its management may prevent fatal outcomes in a large number of cases. Particularly smoking cessation in the younger population is strongly advocated to lower the ACS risk, further large-scale multicenter study is needed to elucidate the roles of these risk factors so that appropriate policy making and public health measures can be taken to prevent premature CAD in the young people.

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