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Research Article

COMPARISON OF CLINICAL PROFILES OF PATIENTS WITH ACUTE CORONARY SYNDROME OF THE AGE ABOVE AND BELOW 40 YEARS

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Abstract:

Background: Acute coronary syndrome is major cause of mortality and morbidity in the elderly population. Now it is increasing in younger age group also. There is different clinical presentation in the young and old age group.

Objectives: to determine the difference in clinical presentation, outcome, and association of the risk factors for different age groups and to study the difference in angiographic findings and complications in young and old age group.

Methodology: The study includes a total of 80 cases of acute coronary syndrome, of which40 Patients were of age below 40 years and 40 patients were above 40 years, admitted in ward or ICU at a tertiary health care centre, fulfilling all the inclusion and exclusion criteria of the study. All risk factors, clinical presentation and angiographic findings were assessed.

Results: Out of the total 80 cases, 65 were males while 15 were females. No difference was observed between study groups with regards to gender distribution. No difference was observed between study groups with regards to presenting symptoms. Common risk factors among young ACS were hypertension, smoking, dyslipidemia and diabetes. Common risk factors among elderly ACS were hypertension, diabetes and dyslipidemia. Mean BMI was 25.06 Kg/m2 and 24.44 Kg/m2 in cases of young and elderly ACS respectively. Prevalence of obesity (BMI> 25 Kg/m2) was 47.5% and 27.5% respectively in young and elderly ACS. Decreased ejection fraction (<40%) was observed in 25% and 35% cases of young and elderly ACS respectively. In most of the young ACS cases, single (62.5%) or double vessel (12.5%) disease were more common while in elderly ACS cases double and triple vessel disease was seen in 40% and 27.5% cases respectively. In the present study overall mortality was 5% in elderly and 2.5% in young ACS cases while the re-admission rate was 2.5% and 0% respectively.

Conclusion: Most common presenting symptoms in our study were chest pain followed by dyspnea. Common risk factors among young ACS were hypertension,

smoking, dyslipidemia and diabetes. Common risk factors among elderly ACS were hypertension, diabetes and dyslipidemia respectively. Tobacco smoking was identified as one of the major risk factors that contributed to young ACS. Most common artery involved in young ACS cases was LAD followed by RCA while in that of elderly ACS was LAD followed by LCx. The LCx and RCA involvement was found to be significantly more in elderly ACS cases.

Keywords: Coronary artery disease, Acute Coronary Syndrome, the prevalence of risk factors

INTRODUCTION

Coronary artery disease (CAD) is the leading cause of mortality and morbidity in the world and the acute coronary syndrome is the most common cause of mortality in patients with CAD [1].

Acute coronary syndrome (ACS) refers to a spectrum of clinical conditions ranging from Unstable Angina through Non-Q-wave acute myocardial infarction (AMI) and Q-wave acute myocardial infarction, all having ischemic chest discomfort as the common presenting feature. The specific diagnosis of each of these conditions is made based on clinical history, electrocardiography (ECG) and presence of conventional biochemical markers (Troponin, creatinine kinase – total and MB fraction, lactate dehydrogenase) in the serum [2].

The prevalence of CAD and the incidence of ACS are very high among Indians. India has the highest burden of ACS in the world. The rising incidence of ACS in Indians may be related to the changes in lifestyle, westernization of food practices, increasing prevalence of diabetes mellitus and probably genetic factors [3].

Although atherosclerosis, the main cause of CAD, develops in the early stage of life [4], symptomatic CAD and acute coronary syndrome (ACS) rarely occur in young adults less than 40 years of age. The incidence of ACS in such young adults has been reported to account for 0.4-19% of all ACS cases [5,6].

Studies have suggested that early incidence of CAD is increasing in young people because they prefer high-fat diet and unhealthy lifestyle, in addition to their increased incidence of metabolic syndrome and hypertension [7,8]. Moreover, studies have suggested that conventional vascular risk factors encountered in the middle-aged population in the Framingham study are present in the young population [9]. Smoking, hypercholesterolemia and low high-density lipoprotein (HDL) levels are associated with CAD in young patients. In addition, obesity, insulin resistance and hyperglycaemia are risk factors for CAD in the young population [10]. In addition, non-atherosclerotic factors such as cocaine use, high homocysteine levels, connective tissue diseases and hyper-coagulopathy, including antiphospholipid syndrome and nephrotic syndrome, may precipitate CAD [11].

There is a paucity of data regarding the prevalence of risk factors and angiographic profiles in young Indian ACS patients. The objective of this study is to represent the clinical profile, prevalence of risk factors and pattern of coronary artery stenosis in acute coronary syndrome (ACS) patients of age above and below 40 years.

MATERIAL AND METHODS

This Hospital-based prospective observational study was conducted among patients presenting to Department of

cardiology, Fortis Hospital, Mumbai with the acute coronary syndrome. Further sub-classified as unstable angina, Non-ST-elevation myocardial infarction, and ST-elevation myocardial infarction. Study Duration was 18 months from the approval of the Institutional Ethics Committee

Sample Size Calculation:

Sample size was calculated using following formulae:

$(Z_{\alpha/2}+ Z_{\beta})$ x PQ * 2 /D^2

n – (1.96+0.84) * 0.0425 * 0.9575* 2

$(0.075)^2$

n=40 (approx.) in each group

So, the study includes a total of 80 cases of the acute coronary syndrome of which 40 patients of age below 40 years and 40 patients above 40 years.

Inclusion Criteria

Women and men above 18 years with:

1. Angina or angina equivalents (Dyspnoea, Fatigue, Faintness)
2. Characteristic ECG Changes
3. Elevated Troponin and Cardiac Enzymes (CPK-MB)

If any patient with two out of the above three features are present, those Cases were included in the study.

Exclusion Criteria

1. History of any other cardiac illness like Hypertrophic obstructive cardiomyopathy.
2. Chronic inflammatory conditions like Systemic lupus erythematosus, Rheumatoid arthritis, or Multiple sclerosis.
3. Pregnancy

Methodology

Written informed consent was obtained to participate in the study. The diagnosis of ACS was determined by the treating physician based on symptoms and signs atpresentation and at least two of the following:

1. Angina or angina equivalents (Dyspnoea, Fatigue, Faintness)
2. Electrocardiographic changes in 2 or more contiguous leads (transient ST-segment elevations of ≥1 mm, ST-segment depressions of ≥1 mm, new T-wave inversions of ≥1 mm, pseudo-normalization of previously inverted T waves, new Q waves [one-third the height of the R wave or ≥0.04 seconds], new R wave &qSwave in lead V 1 [posterior myocardial infarction {MI}], or new left bundle branchblock).
3. Increase in cardiac enzyme levels (positive troponin I or T [which all hospitals used] or creatine kinase–MB [CK-MB] value;2 × upper limits of the hospital's normal range or, if no CK-MB value available, total creatinine phosphokinase [CPK] value;2 × upper limits of the hospital's normal range). Data was collected regarding demographic variables (Age, Gender, Maritalstatus, etc.), clinical symptoms, and coronary risk factors (diabetes, hypertension, smoking, hyperlipidemia, and family history of ischemic heart disease). All casesunderwent investigations including routine laboratory tests like CBC, random blood sugar, blood urea, serum creatinine, serum electrolytes, lipid profile,cardiacenzymes, and ECG. In addition, all of the patients underwent echocardiography and coronary evaluation.

Statistical Analysis

All the data was noted down in a pre-designed study proforma. Qualitative data was represented in the form of frequency and percentage. Association between qualitative variables was assessed by Chi-Square test and Fisher exact test. Quantitative data was represented using

Mean ± SD. Analysis of Quantitative data between the two groups done using unpaired t-test if data passed 'Normality test' and by Mann-Whitney Test if data failed 'Normality test'. A p-value 0.05 is taken as a level of significance. Results were graphically represented where deemed necessary. SPSS Version 21.0 is used for most of the analysis and Microsoft Excel 2010 for graphical representation.

RESULTS

Out of the total 80 cases, 65 (81.3%) were males while 15 (18.8%) were females. No difference was observed between study groups with regards to gender distribution (p-0.39).

Most common presenting symptoms were chest pain (77.5%) followed by dyspnoea (28.8%), perspiration (23.8%) and radiation of pain to arm (21.3%). No difference was observed between study groups with regards to presenting symptoms (p>0.05).

Table 1.Association of age with risk factors in cases of Acute Coronary Syndrome

Risk Factors	Group		Total	p-value
	<=40 yrs	> 40 yrs		
Hypertension	13	31	44	**<0.01**
	32.5%	77.5%	55.0%	
Diabetes	9	19	28	**0.034**
	22.5%	47.5%	35.0%	
Hypothyroidism	7	4	11	**0.518**
	17.5%	10.0%	13.8%	
Smoking	13	6	19	**0.057**
	32.5%	15.0%	23.8%	
Dyslipidemia	11	16	27	**0.344**
	27.5%	40.0%	33.8%	

Common risk factors among young ACS were: hypertension (32.5%), smoking (32.5%), dyslipidemia (27.5%) and diabetes (22.5%). Common risk factors among elderly ACS were: hypertension (77.5%), diabetes (47.5%) and dyslipidemia (40%).

Positive family history was given by 20% and 7.5% cases of young and elderly ACS cases respectively (p-0.193).

Mean BMI was 25.06 Kg/m2 and 24.44 Kg/m2 in cases of young and elderly ACS respectively (p-0.379). Prevalence of obesity (BMI> 25 Kg/m2) was 47.5% and 27.5% respectively in young and elderly ACS (p-0.06).

Table 2.Association of age with cardiac enzymes in cases of Acute Coronary Syndrome

Troponin I	**Group**		**Total**
	<=40 yrs	**> 40 yrs**	
Negative	14	13	27
	35.0%	32.5%	33.8%
Positive	26	27	53
	65.0%	67.5%	66.3%
Total	40	40	80
	100.0%	100.0%	100.0%
p- value - 1.0			

Positive Troponin I was observed in 65% and 67.5% cases of young and elderly ACS respectively(p-1.0).

Table 3.Association of age with ejection fraction in cases of Acute Coronary Syndrome

Ejection Fraction (%)	**Group**		**Total**
	<=40 yrs	**> 40 yrs**	
</= 40%	10	14	24
	25.0%	35.0%	30.0%
>40%	30	26	56
	75.0%	65.0%	70.0%
Total	40	40	80
	100.0%	100.0%	100.0%
p- value - 0.56			

Decreased ejection fraction (<40%) was observed in 25% and 35% cases of young and elderly ACS respectively (p- 0.56).

Table 4.Association of age with type of Acute Coronary Syndrome

Type of ACS	Group		Total
	<=40 yrs	> 40 yrs	
STEMI	18	18	36
	45.0%	45.0%	45.0%
Non STEMI	8	9	17
	20.0%	22.5%	21.3%
Unstable Angina	14	13	27
	35.0%	32.5%	33.8%
Total	40	40	80
	100.0%	100.0%	100.0%
p- value - 0.78			

Out of the total 80 cases of ACS, 45% were of STEMI, 21.3% were of Non STEMI and 33.8% were of unstable angina. No difference was observed between elderly and young cases in terms of type of ACS.

Table 5.Association of age with site of myocardial infraction

Site of MI	Group		Total	p-value
	<=40 yrs	> 40 yrs		
AWMI	3	3	6	1.00
	7.5%	7.5%	7.5%	
ASMI	6	3	9	0.48
	15.0%	7.5%	11.3%	
ALMI	3	2	5	1.00
	7.5%	5.0%	6.3%	
LWMI	0	1	1	1.00
	0.0%	2.5%	1.3%	
IWMI	6	11	17	0.27
	15.0%	27.5%	21.3%	
PWMI	1	1	2	1.00
	2.5%	2.5%	2.5%	

No difference was observed between elderly and young cases in terms of site of myocardial infraction (p>0.05).

Table 6.Association of age with vessel involved in cases of Acute Coronary Syndrome

Vessel Involved	Group		Total	p-value
	<=40 yrs	> 40 yrs		
LM	2	3	5	1.00
	5.0%	7.5%	6.3%	
LAD	22	29	51	0.16
	55.0%	72.5%	63.8%	
LCX	7	22	29	<0.01
	17.5%	55.0%	36.3%	
RCA	10	21	31	0.02
	25.0%	52.5%	38.8%	
PDA & PLV	3	10	13	0.07
	7.5%	25.0%	16.3%	

Most common artery involved in young ACS cases was LAD (55%) followed by RCA (25%) while in that of elderly ACS was LAD (72.5%) and LCx (55%). The LCx and RCA involvement was seen to be significantly more in elderly ACS cases (p<0.05).

Medical management was done in 27.5% young ACS cases as compared to none in elderly cases.

Thrombolysis was done in 15% and 7.5% cases of young and elderly ACS cases respectively (p-0.48).

Table 7.Association of age with number of vessels involved

Angiographic Findings	Group		Total
	<=40 yrs	> 40 yrs	
Normal	10	0	10
	25.0%	0.0%	12.5%
SVD	25	13	38

	62.5%	32.5%	47.5%
DVD	5	16	21
	12.5%	40.0%	26.3%
TVD	0	11	11
	0.0%	27.5%	13.8%
Total	3	10	13
	7.5%	25.0%	16.3%
p- value <0.01			

In most of the young ACS cases, single (62.5%) or double vessel (12.5%) disease was more common while in elderly ACS cases double and triple vessel disease was seen in 40% and 27.5% cases respectively (p<0.01).

Table 8.Association of age with pattern of involvement in cases of Acute Coronary Syndrome

Pattern of Involvement	Group		Total
	<=40 yrs	> 40 yrs	
Normal	10	0	10
	25.0%	0.0%	12.5%
Diffuse	4	24	28
	10.0%	60.0%	35.0%
Discrete	26	16	42
	65.0%	40.0%	52.5%
Total	40	40	80
	100.0%	100.0%	100.0%
p- value <0.01			

Discrete involvement was more common in young ACS cases (65%) while diffuse involvement was more common in elderly ACS cases (60%).

Table 9.Association of age with outcome

Outcome	Group		Total	p-value
	<=40 yrs	> 40 yrs		
Dead	1	2	3	**1.00**
	2.5%	5.0%	3.8%	
IABP	2	4	6	**0.24**
	5.0%	10.0%	7.5%	
Re-admission for HF	0	1	1	**1.00**
	0.0%	2.5%	1.3%	

In present study overall mortality was 5% in elderly and 2.5% in young ACS cases while re-admission rate was 2.5% and 0% respectively. Incidence of arrhythmia was 10% in elderly and 5% in young ACS cases (p-0.24).

DISCUSSION

At present, there is limited data on the prevalence and risk factors involving young ACS in India. The present study was thus planned to observe and compare the clinical spectrum of acute coronary syndrome in young and elderly cases. Study included a total of 80 cases of acute coronary syndrome. A total of 40 patients were of age below 40 years and 40 patients were above 40 years.

Out of the total 80 cases, 65 (81.3%) were males while 15 (18.8%) were females. No difference was observed between study groups with regards to gender distribution (p-0.39).

In a similar study in young adults by Shoo et al., 628 patients were enrolled. The mean age was 39.0 ± 6.1 years. Male (68.4%) were relatively more common in this young cohort compared to female (31.6%) [12].

No difference was observed between study groups with regards to presenting symptoms (p>0.05). Chest pain was the most frequent symptom at hospital admission in most studies among young ACS cases [13,14,15]. Schoenenberger et al. in his study observed that 91.6% patients were presented with chest pain. Other common symptoms observed were dyspnoea, perspiration and radiation of pain [16].

Common risk factors among young ACS were: hypertension (32.5%), smoking (32.5%), dyslipidemia (27.5%) and diabetes (22.5%). Common risk factors among elderly ACS were: hypertension (77.5%), diabetes (47.5%) and dyslipidemia (40%). Positive family history was given by 20% and 7.5% cases

of young and elderly ACS cases respectively (p-0.193). Prevalence of obesity (BMI> 25 Kg/m2) was 47.5% and 27.5% respectively in young and elderly ACS (p-0.06).

Tobacco smoking had been identified as one of the major risk factors that contributed to young ACS in several studies [13,14,15]. Exposure to tobacco is found to cause endothelial cells damage, leading to endothelial dysfunction, and injury to the vascular intima via a complex pathway [17]. Smoking behavior among the young adults had found to accelerate atherosclerosis compared to older population [18].

Diabetes mellitus and hypertension are two well-established major risk factors for CAD. Diabetes is a metabolic disease with explicit complication on the coronary blood vessels by precipitating atherosclerosis [19]. Hypertension will lead to plaque ruptured within the coronary arteries and causing thrombosis and occlusion of the circulation. Our study had shown that older patients had a higher frequency of diabetes mellitus, hypertension, and dyslipidemia, as compared to younger patients. Lamki et al. had proposed poor diabetic control was responsible for the onset of young ACS despite low prevalence amongst the young populations [20].

The family history of CAD is associated with increased risk of young ACS. It had been reported that the risk of developing first acute myocardial infarction in patients with positive family history was more than a decade earlier compared to those without a family history of CAD [121]. Several studies had reported the frequency of young ACS with family history ranged from 14 to 60% [13,14,15].

In our study, positive family history of coronary syndrome was seen in 25%in young ACS cases as compared to 7.5% in elderly ACS. In a study by shoo et al. only 29.7% of the young ACS presented with a positive family history of CAD which could be due to the retrospective nature of their study, which may have caused missing data [12]. Schoenenberger et al. observed the positive family history of ACS in 55% patients [16] while Bhardwaj et al. observed it in 43.3% [21].

Out of the total 80 cases of ACS, 45% were of STEMI, 21.3% were of Non STEMI and 33.8% were of unstable angina. No difference was observed between elderly and young cases in terms of type of ACS. No difference was observed between elderly and young cases in terms of site of myocardial infarction (p>0.05).

Panduraga et al. observed prevalence of ST and Non ST elevated MI as 32% and 25% in their study among young ACS, with no difference between elderly and young ACS [109]. Chen TS et al. observed that younger patients tended to be more commonly present with ST segment elevation myocardial infarction, but difference was not significant [22].

Decreased ejection fraction (<40%) was observed in 25% and 35% cases of young and elderly ACS respectively (p- 0.56). Most common artery involved in young ACS cases was LAD (55%) followed by RCA (25%) while in elderly ACS was LAD (72.5%) and LCx (55%). LCx and RCA involvement was seen to be significantly more in elderly ACS cases (p<0.05). In most of the young ACS cases, single (62.5%) or double vessel (12.5%) disease was more common while in elderly ACS cases double and triple vessel disease

was seen in 40% and 27.5% cases respectively (p<0.01). Discrete involvement was more common in young ACS cases (65%) while diffuse involvement was more common in elderly ACS cases (60%).

Chugh A et al. [23] in their study observed that 73% of cases either had non-obstructive disease or single/ double vessel involvement in young ACS cases. In elderly ACS cases, 32.4% cases had triple vessel disease. In another similar study by Galon et al. [24], single-vessel disease was present in almost half of the younger age group patients when compared to one-third of the elderly and multi-vessel disease was more common in elderly age group.

Medical management was done in 27.5% young ACS cases as compared to none in elderly cases (p<0.01). Thrombolysis was done in 15% and 7.5% cases of young and elderly ACS cases respectively (p-0.48).

In a study by Wiwun T et al. [14] 54.1% young ACS cases were manged conservatively by medical management [14] while in the study by Schoenenberger et al., about 43% young ACS patients were managed conservatively [16].

Younger patients with MI have a better prognosis. In present study overall mortality was 5% in elderly and 2.5% in young ACS cases while re-admission rate was 2.5% and 0% respectively. No difference was observed between elderly and young ACS cases in terms of incidence of arrhythmias (Brady and tachyarrythmias)(p-0.24).

The favourable outcome among young patients might be the consequence of the lower prevalence of extensive CAD in younger patients [112]. In a similar study by Chug et al. [23], mortality rate among young and elderly ACS cases was 1.63% and 6.9% respectively.

In a study by Bhardwaj et al. in-hospital mortality was just 1.6% in young ACS cases while Xie et al. [25] and Schoenenberger et al. [16] found no in-hospital mortality in young cases.

Among elderly ACS cases, Khesroh AA et al. [26] observed an overall mortality rate of 9% at the end of 6 months follow up. Mortality rates in the studies by Howard et al. [27], Stone et al. [128] and Culic et al. [28] was 14%, 6% and 16% respectively.

CONCLUSION

Young patients with ACS differed from older patients in terms of risk factor profile, however, the outcome was comparable between the groups. There are also more double vessel and triple vessel disease in elderly cases. In the present study, we observed that two leading risk factors i.e. tobacco smoking and obesity were significantly associated with the onset of young ACS. Thus, it is important to identify this cohort and implement aggressive measures in tackling these risk factors to prevent or halt the development of coronary artery disease. Primary prevention of smoking and advocacy of healthy lifestyle with regular exercise should be aggressively promoted since adolescent age.

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