Original Research Article

The prevalence of cardiometabolic risk factors among Indians with coronary artery disease

Debjani Goswami[1], Sabyasachi Mondal[2], Nirmalya Biswas[3*], Somnath Das [4], T.P. Manohar[5], Sukanta Sen[6]

[1]Assistant Professor, Department of General Medicine, IQ City Medical College, IQ City Road, Durgapur 713206, West Bengal, India
[2]Assistant Professor, Department of Pharmacology, Shri Ramkrishna Institute of Medical Sciences & Sanaka Hospitals, Malandighi, Kanksha, Durgapur 713212, West Bengal, India
[3]Assistant Professor, Department of Community Medicine, Shri Ramkrishna Institute of Medical Sciences & Sanaka Hospitals, Malandighi, Kanksha, Durgapur 713212, West Bengal, India
[4]Associate Professor, Department of Pulmonary Medicine, IQ City Medical College, IQ City Road, Durgapur 713206, West Bengal, India
[5]Professor, Department of General Medicine, N. K. P. Salve Institute Of Medical Sciences & Research Centre & Lata Mangeshkar Hospital, Nagpur 440019, Maharashtra, India
[6]Professor & Head, Department of Pharmacology, ICARE Institute of Medical Sciences and Research, Banbishnupur, Purba Medinipur, Haldia, West Bengal 721645, India

Received: 16-09-2020 / Revised: 15-10-2020 / Accepted: 31-10-2020

Abstract

Background: Coronary artery disease (CAD), one of the major causes of morbidity and mortality worldwide, had become a public health problem in India during the past few decades. Cardiometabolic risk factors significantly accelerate the progression of coronary artery disease (CAD); however, whether CAD patients in India are aware of the prevalence of these risk factors is not clear yet. The aim of the study was to assess the pattern of risk factors of acute coronary syndrome (ACS) in patients with coronary artery disease (CAD) in different age groups and sex categories. **Materials & Methods:** The study group comprised of 100 patients of acute coronary syndrome admitted at the tertiary care centre over a period of 2 years from November 2009 to November 2011 and an equal number of age and sex matched controls. **Results:** Maximum number of patients of acute coronary syndrome was between 60-69 years. Youngest case of acute coronary syndrome occurred at the age of 35. The mean age of males was 54.51± 10.82 and mean age of females was 59.13± 8.67. The difference was statistically significant (p=0.0413). Thus the female cases were older as compared to male cases. It was seen that there is a male preponderance of cases with acute coronary syndrome (M:F =70:30). Chest pain was the predominant presenting symptom (98%). Out of the 100 patients with acute coronary syndrome, 31 had unstable angina, 17 had NSTEMI and 52 had STEMI. Patients of acute coronary syndrome had a significantly higher WHR (0.88±0.17 vs. 0.82±0.08) and BMI (24.59±2.99 vs. 22.63±2.22kg/m^2) (p=0.0114 and 0.000 respectively). Biochemical analysis showed that Total cholesterol (179.60 ± 41.11 vs. 143.45±21.11mg/dl), Serum triglycerides (123.19±37.29 vs. 109.35±22.86mg/dl), LDL (109.05±37.62 vs. 69.02±19.30mg/dl) and Non-HDL (133.71±40.52 vs. 90.99±20.20mg/dl) were also significantly raised in cases as compared to controls (p=0.001, 0.0018, p=0.000 and p=0.000 respectively). **Conclusion:** Raised WHR, BMI, Hypertension, diabetes, alcohol consumption, smoking, raised total cholesterol, serum triglycerides, LDL, Non-HDL cholesterol, serum uric acid and decreased HDL were the risk factors associated with acute coronary syndrome. Hypertension, diabetes, BMI, Total cholesterol, HDL and Serum uric acid were found to be the independent predictors of acute coronary syndrome.

Keywords: Coronary artery disease (CAD), acute coronary syndrome (ACS), cardiometabolic risk factors, Indians

Introduction

**Correspondence*
Dr. Nirmalya Biswas
Assistant Professor, Department of Community Medicine, Shri Ramkrishna Institute of Medical Sciences & Sanaka Hospitals, Malandighi, Kanksha, Durgapur 713212, West Bengal, India
E-mail: nb9051@gmail.com

'Cardiovascular health' a novel concept is rapidly evolving in the developed world. American Heart association defines ideal cardiovascular health, a concept well supported in literature, as presence of both ideal health behavior i.e. non-smoking, BMI <25 kg/m^2, physical activity at goal levels, pursuance of diet consistent with recommended guidelines and ideal health factors i.e. untreated total cholesterol <200 mg/dl, untreated B.P. < 120/80 mmHg and FBS < 100 mg %. Over there Government policies are decided with the goal of cardiovascular health promotion, however state of affairs is entirely different in our country [1]. In India with the second largest population in the world, cardiovascular disease (CVD) is becoming a major health problem. It is well established that this population experiences coronary artery disease at a younger age than other populations. With infectious diseases still endemic, non- communicable diseases including cardiovascular disease (CVD) are a lower priority for Governments of developing countries. There is clear progression of lifestyle related diseases, like cardiovascular disease as a result of current social and economic changes. The lack of public response to increasing risk of CVD is mostly due to perception among policy makers and the public that CVD is largely a problem of only urban, rich or an affluent population [2]. Coronary heart disease is the leading cause of death in India and its prevalence appears to be worsening. In developed countries, ischemic heart disease is predicted to rise 30-60% between 1990 and 2020 [3].Patients with ischemic heart disease fall into two groups: Patients with chronic coronary heart disease who most commonly present with stable angina and patients with acute coronary syndromes. The latter group, in turn is composed of patients ST segment elevation myocardial infarction (STEMI), unstable angina (UA) and Non-ST segment elevation myocardial infarction (NSTEMI) [4].

According to consensus conference report published by ADA (American diabetes association) and American college of cardiology foundation, cardiometabolic risk refers to a high lifetime risk for cardiovascular disease. The specific factors that can cause this increased risk include: obesity, insulin resistance, hyperglycemia, dyslipoproteinemia and hypertension. When patients have one or more risk factors and are physically inactive or smoke, the cardiometabolic risk is increased even more. In addition, when these risk factors occur in clusters, they can greatly increase the risk of cardiovascular disease [5]. Cardiometabolic risk is similar to the metabolic syndrome but is more inclusive, as it also includes smoking and glucose in the diabetic range. Therefore the cardiometabolic risk population is a larger population than metabolic syndrome [6].Advances in the prevention and treatment of CV risk factors have lead to significant reductions in CVD related mortality in the US during the last several decades. Considering these facts, in this study we attempted to determine the association between wide arrays of risk factors and ACS and also compared them with age and sex matched controls.

Materials & methods

The present hospital based case-control study was carried out in a tertiary care centre. The study period was two years from November 2009 to November 2011. About 100 cases of acute coronary syndrome and an equal number of age and sex matched controls were studied after getting approval from institutional ethical committee. All the subjects were interviewed, examined and investigated according to proforma that was pre-designed. Cardiometabolic risk factors were studied in cases and controls. In the study by Burazeri G.et al (2007)[7], the prevalence of hypertension in cases was 29.3% and in controls it was 16.2%. With power (1-β) of 80% and α-error of 20%, sample size of 90 patients was required for completion of the study. About 100 consecutive cases of acute coronary syndrome admitted in intensive care unit of the tertiary care centre during the study period were included in the study.

Inclusion Criteria for Cases: Diagnosis of acute coronary syndrome was made by the presence of atleast 2 of the following 3 criteria:

1. Typical clinical symptoms: Chest pain is most common presenting complaint in patient of myocardial infarction. The pain is deep and visceral; heavy, crushing and squeezing. Most commonly it involves central portion of chest and/or epigastrium, and on occasion may radiate to arm may be associated with dyspnoea, syncope and vomiting.
2. ECG diagnosis of Unstable angina/ NSTEMI/ STEMI
3. Cardiac enzymes: CPKMB values raised by more than 2 and half times the normal value.

Exclusion criteria for cases:

1. Cases that had significant chronic illness (e.g. - liver disease, untreated hyper or hypothyroidism, renal disease, bleeding tendency or malignancy) were excluded as these conditions would have led to change in lifestyle or alteration in the risk factors of acute coronary syndrome
2. Cases who did not give consent were not included in the study.

Selection of controls:

Age and sex matched healthy controls were randomly selected. Controls were randomly selected from the patients attending OPD or IPD for minor ailments (like headache, fever, gastritis or for physical checkup). Unrelated attendance or neighborhood healthy subjects who visited the cases, who had no history or evidence of heart disease.

Exclusion criteria for controls:

(1) Controls having evidence of ischemic heart disease, significant chronic illness (e.g.-liver disease, hyper or hypothyroidism, renal disease, bleeding tendencies or malignancy).

(2) Symptoms suggestive of angina or past history of acute coronary syndrome.

(3) Those who were not willing to participate in the study.

Methods

About 100 patients of ACS fulfilling the inclusion and exclusion criteria were include in the study along with age and sex matched controls. All patients were evaluated by detailed history taking. History of chest pain, breathlessness, palpitations and syncope were noted, past history of hypertension, diabetes and coronary artery disease were enquired and personal history with specific reference to addictions were noted. Five cardiometabolic risk factors were evaluated in the present study: obesity, hypertension, hyperglycemia, dyslipidemia and smoking**).** All the subjects of ACS and controls were evaluated by following cardiometabolic risk factors: anthropometric measures like BMI, waist circumference and WHR. Blood pressure, dyslipidemia (total cholesterol, LDL, TG and HDL) and fasting blood sugar level was also noted.BMI was calculated according to the following formula- BMI= (Weight in Kg)/ (Height in m)^2 according to WHO- BMI- <18 –Underweight; 18.1-24.9- Normal; 25-29.9- Overweight and >30- Obese. Waist circumference was measured to the nearest of 0.1cm using a non-stretchable standard tape. Measurements were taken over the unclothed abdomen at the smallest diameter between the costal margin and the iliac crest. The tape measure was kept horizontal. Subject was made to relax with the arms held loosely by the sides. Two measurements were recorded. It was measured to the nearest of 0.1cm using a non-stretchable standard tape. Measurements were taken over light clothing at the level of greater trochanter (usually the widest diameter around the buttocks). The tape measure was kept horizontal. Subject was made to relax with the arms held loosely by the sides. Two measurements were recorded. Waist hip ratio (WHR) was calculated by dividing waist measurement by hip measurement.

WHR = (Waist circumference in cm)/ (Hip circumference in cm)

According to the WHO, WHR should be <0.9 for males and WHR<0.85 for females. More than that was taken as a risk factor for coronary artery disease. For measuring blood pressure mercury sphygmomanometer was used. A standard 12 lead electrocardiogram (ECG) was recorded for all patients using BPL Cardiart 8108R machine. 2D Echocardiography of all patients included in the study was done on Toshiba Nemio XG SSA-580A machine with a 3MHz cardiac probe. Patients were screened in supine and/or left lateral position which ever was suitable. Parasternal short-axis, parasternal long-axis, apical four chamber, apical two chamber and subcostal views, along with M-Mode Echo and doppler-pulse wave echo were used to assess for regional wall motion abnormality (RWMA), left ventricular systolic and diastolic function.Continuous variables (Age, anthropometry, biochemical and clinical parameters) were presented as Mean ± S.D. Categorical variables were expressed in percentages. Continuous variables were compared between cases and controls by performing unpaired t- test. Categorical variables were compared by Chi-2 statistics. Chi-2 test for linear trend was used to assess trend between cardiometabolic risk factors and mortality. Odd's ratio (OR), 95% Confidence Interval (C.I.) were estimated for various risk factors. Multiple logistic regression analysis was performed to identify the independent risk factors for acute coronary syndrome. $p<0.05$ was considered as statistically significant. Data was analyzed using statistical software STATA version 10.0.

Results

This study was a hospital based case control study carried out in a tertiary care hospital to determine the association between wide array of risk factors and the acute coronary syndrome. In this study we tried to compare the impact of different cardiometabolic risk factors on the occurrence of acute coronary syndrome and to study the outcome of patients of acute coronary syndrome at the end of one week according to presence of cardiometabolic risk factors. The study group comprised of 100 patients of acute coronary syndrome admitted at the tertiary care centre over a period of 2 years from November 2009 to November 2011 and an equal number of age and sex matched controls.

Table 1: Age and sex-wise distribution of study subjects

Age (Years)	Cases			Controls		
	Male	Female	Total	Male	Female	Total
30-39	4	0	4(4%)	4	1	5(5%)
40-49	20	5	25(25%)	20	8	28(28%)
50-59	20	7	27(27%)	19	5	24(24%)
60-69	18	13	31(31%)	19	11	30(30%)
70-79	8	5	13(13%)	8	5	13(13%)
Total	70	30	100	70	30	100
Mean Age	54.51± 10.82	59.13± 8.67	55.9± 10.40	54.75± 10.83	56.63± 10.48	55.32± 10.71

Table 1 shows the age distribution of the study subjects. It is seen that maximum number of patients in both cases (31%) and controls (30%) are seen in the age group of 60 – 69 years, and minimum number of patients in both cases (4%) and controls (5%) are seen in the age group of 30-39 years. The mean age of cases was 55.9±10.40 years and mean age of controls was 55.32±10.71years. The difference was not statistically significant (p=0.6982), hence they were comparable. Further it was seen that there was a male preponderance in the study group with 70 males and 30 females. The mean age of males was 54.51± 10.82 and mean age of females was 59.13± 8.67. The difference was statistically significant (p=0.0413). Thus the female cases were older as compared to male cases.

Table 2: Presenting complaints of study participants coronary artery disease

Symptoms	Number	Percentage
Chest Pain	98	98%
Breathlessness	76	76%
Palpitation	55	55%
Syncope	4	4%

Table 2 shows the presenting symptoms in patients of acute coronary syndrome. It was seen that in the 100 patients with acute coronary syndrome, 98 (98%) had presented with chest pain, 76 (76%) breathlessness, 55 (55%) palpitations and 4 (4%) had syncope on presentation.

Table 3: Presentation of acute coronary syndrome

Presentation	Number
Unstable Angina	31 (31%)
NSTEMI	17 (17%)
STEMI	52 (52%)
Total	100

Table 3 shows the different presentations of acute coronary syndrome. Out of 100 cases, 31 (31%) presented with unstable angina, 17 (17%) with Non-ST Elevation Myocardial Infarction (NSTEMI) and the majority i.e.52 (52%) with ST Elevation Myocardial Infarction (STEMI).

Table 4: Association of acute coronary syndrome with smoking, alcohol and tobacco

Addiction	Present	Case (N=100)	Controls(N=100)	Or	95%C.I.	Chi-2	P-Value
Smoking	Yes	43 (43%)	29 (29%)	1.84	0.98 – 3.46	4.25	0.0392
	NO	57 (57%)	71 (71%)				
Alcohol	Yes	28 (28%)	32 (32%)	0.82	0.43 – 1.58	0.38	0.5371
	NO	72 (72%)	68 (68%)				
Tobacco Chewing	Yes	40 (40%)	27 (27%)	1.80	0.95 – 3.42	3.79	0.0515
	NO	60 (60%)	73 (73%)				

Table 4 shows the association of acute coronary syndrome with smoking, alcohol consumption and tobacco chewing. It was seen the prevalence of smokers in cases was 43% as compared to 29% in controls. Thus a smoker had a 1.8 times increased risk of developing acute coronary syndrome (p=0.0392). The prevalence of alcohol consumption in cases was 28% and in controls was 32%. Prevalence of tobacco chewing was 40% among cases and

27 % among controls. Thus alcohol consumption and tobacco chewing were not associated with acute coronary syndrome (p=0.5371 and p=0.0515 respectively).

Table 5: Association of acute coronary syndrome with hypertension, diabetes, past and family history of ischemic heart disease

Risk Factor	Present	Cases (N= 100)	Controls (N= 100)	Or	95%C.I.	Chi-2	P-Value
Hypertension	**Yes**	47 (47%)	26 (26%)	2.52	1.33 – 4.72	9.51	0.0020
	No	53 (53%)	74 (74%)				
Diabetes	**Yes**	49 (49%)	27 (27%)	2.59	1.38 – 4.90	10.27	0.0014
	No	51 (51%)	73 (73%)				
Past history of IHD	**Yes**	15 (15%)	0 (0%)	-	-	16.21	0.000
	No	85 (85%)	100 (100%)				
Family history of IHD	**Yes**	17 (17%)	17 (17%)	-	-	0.00	1.000
	No	83 (83%)	83 (83%)				

Table 5 shows the association of acute coronary syndrome with hypertension, diabetes, past and family history of ischemic heart disease (IHD). It was seen that prevalence of hypertension was higher in cases (47%) as compared to controls (26%). Thus the risk of developing acute coronary syndrome was 2.5 times higher in patients with hypertension (p=0.020). The prevalence of diabetes was also higher in cases (49%) as compared with controls (27%). Thus the risk of a diabetic patient of developing acute coronary syndrome was 2.5 times higher as compared to a non-diabetic individual (p=0.0014). There were 15 patients with past history of IHD among the cases, while there were none in the control group. Thus patients with a past history of IHD had a significantly higher risk of developing acute coronary syndrome (p=0.000). Both cases and controls had an equal number (17 (17%)) of people with a family history of IHD. Thus family history of IHD was not associated with acute coronary syndrome
.

Table 6: Comparison of anthropometric and biochemical parameters in study subjects

Variable	Cases (N=100)	Controls(N=100)	p-value
BMI	24.59±2.91	22.63±2.22	0.0000
Waist Circumference	87.2±11.53	83.73±7.18	0.0114
Waist-Hip Ratio	0.88±0.10	0.82±0.08	0.0000
Total Cholestrol	179.60±41.11	143.45±21.11	0.0000
S. Triglycerides	123.19±37.29	109.35±22.86	0.0018
HDL	45.89±14.90	52.44±8.52	0.0001
LDL	109.05±37.62	69.02±19.30	0.0000
Non-HDL	133.71±40.52	90.99±20.20	0.0000
Serum Uric Acid	5.17±2.55	3.78±1.54	0.0000

Table 6 shows the comparison of anthropometric and biochemical parameters between cases and controls. It was seen the BMI was significantly more (24.59±2.91 vs. 22.63±2.22kg/m^2) in cases as compared to controls (p=0.000). The Waist-Hip ratio in cases (0.88±0.10) was higher as compared to controls (0.82±0.08). The difference was statistically significant (p= 0.0114). Total cholesterol was significantly (p=0.000) increased in cases (179.60±41.11 vs. 143.45±21.11mg/dl). Serum triglycerides (123.19±37.29 vs.

109.35±22.86mg/dl), LDL (109.05±37.62 vs. 69.02±19.30mg/dl) and Non-HDL (133.71±40.52 vs. 90.99±20.20mg/dl) were also significantly raised in cases as compared to controls (p=0.0018, p=0.000 and p=0.000 respectively). HDL levels were significantly (p=0.0001) lower in cases (45.89±14.90mg/dl) in comparison to controls (52.44±8.52mg/dl). The mean serum uric acid levels in cases were 5.17±2.55, while in the controls it was 3.78±1.54. This difference was statistically significant (p=0.000).

Table 7: Comparison of anthropometric and biochemical parameters according to gender in patients of acute coronary syndrome

Variable	Value	Males (N=70)	Females (N=30)	Or	95% C.I.	Chi-2	P-Value
TC	>200	25 (35.7%)	8 (26.7%)	1.52	.54-4.55	0.78	0.3779
	≤200	45 (64.3%)	22 (73.3%)				
TG	>150	16 (22.8%)	4 (13.3%)	1.92	0.54 –8.65	1.19	0.2752
	≤150	54 (77.2%)	26 (86.7%)				
LDL	>100	39 (55.7%)	16 (53.3%)	1.10	0.42 –2.82	0.05	0.8264
	≤100	31 (44.3%)	14 (46.7%)				
HDL	<40 (M) <50 (F)	26 (37.1%)	25 (83.3%)	08.46	2.67 - 13.21	17.93	0.001
	≥40 (M) ≥50 (F)	44 (62.9%)	5 (16.7%)				
Non-HDL	>130	37 (52.8%)	14 (46.7%)	1.28	0.48 – 3.30	0.32	0.5704
	≤130	33 (47.5%)	16 (53.3%)				
S. Uric Acid	>7.2 (M) >6 (F)	23 (32.8%)	9 (30%)	1.14	0.42 – 3.29	0.08	0.7790
	≤7.2 (M) ≤6 (F)	47 (67.2%)	21 (70%)				
BMI	≥25	31 (44.3%)	13 (43.3%)	1.03	0.40 – 2.71	0.01	0.9299
	<25	39 (55.7%)	17 (56.7%)				
WC	>90 (M) >80 (F)	23 (32.8%)	18 (60%)	0.32	0.12-0.86	6.40	0.0114
	≤90 (M) ≤80 (F)	47 (67.2%)	12 (40%)				
WHR	>0.9 (M) >0.85(F)	37 (52.8%)	15 (50%)	1.12	0.43-2.88	0.07	0.7933
	≤0.9 (M) ≤0.85(F)	33 (47.2%)	15 (50%)				

Table 7 shows the comparison of anthropometric and biochemical parameters according to gender in patients of acute coronary syndrome.

Biochemical Parameters: It was seen that 25 (83.3%) female patients with acute coronary syndrome had decreased HDL level, while 26 (37.1%) male patients had decreased HDL levels. This difference was statistically significant (p=0.001). Out of 70 male patients with acute coronary syndrome, 25 (35.7%) had a raised total cholesterol level, while out of 30 females, 8 (26.7%) had a raised total cholesterol level. This difference was not statistically significant (p=0.3779). There were 16 (22.8%) males with raised serum triglyceride levels as compared to 4 (13.3%) females with raised serum triglyceride levels. This difference was not statistically significant (p=0.2752). About 39 (55.7%) males had a raised level of LDL and there were 16 (53.3%) females with raised LDL levels. This difference was not statistically significant (p=0.8264). Similarly out of 70 male patients, 37 (52.8%) had raised Non-HDL levels, while out of 30 female patients, 14 (46.7%) had raised Non-HDL levels respectively. This difference was also not statistically significant (p=0.5704). There was no significant difference in number of male and female patients with raised serum uric acid levels (32.8% vs. 30%) (p=0.7790).

Anthropometry: It was seen that 18 (60%) females had a raised waist circumference (>80 cm), while only 23 (32.8%) of males had a raised waist circumference (>90cm). This difference was statistically significant (p=0.0114). It was seen that there were 31 (44.3%) males and 13 (43.3%) females with raised BMI. This difference was not statistically significant (p=0.9299). About 37 (52.8%) of male patients had a raised WHR (>0.9) and 15 (50%) of females had a raised WHR (>0.85). This difference was also not statistically significant (p=0.7933).

Table 8: Frequency of conventional risk factors according to presentation of acute coronary syndrome

Risk Factor	Unstable Angina(n=31)	NSTEMI(n=17)	STEMI(n=52)	p-value
Smoking	10 (32.3%)	4 (23.5%)	29 (55.7%)	0.023
Alcohol	9 (29%)	1 (5.9%)	18 (34.6%)	0.072
Tobacco	11 (35.5%)	7 (41.2%)	22 (42.3%)	0.824
Hypertension	10 (32.3%)	9 (52.9%)	28 (53.8%)	0.141
Diabetes	19 (61.3%)	15 (88.2%)	6 (11.5%)	0.000
Past history of IHD	7 (22.6%)	2 (11.8%)	9 (17.3%)	0.636
Family history of IHD	5 (16.1%)	3 (17.6%)	9 (17.3%)	0.987
Obesity (BMI>30Kg/M^2)	2 (6.5%)	5 (29.4%)	0 (0%)	0.398

Table 8 shows the frequency of conventional risk factors according to the presentation of acute coronary syndrome. It was seen that smoking was more common in patients presenting with STEMI (55.7%) as compared to unstable angina (32%) and NSTEMI (23.5%). The difference was statistically significant (p=0.023). Diabetes was more commonly associated with patients with NSTEMI (88.2%) as compared to unstable angina (61.3%) and STEMI (11.5%). This difference was found to be highly significant (p=0.000). The prevalence of other risk factors like alcohol consumption, tobacco chewing, hypertension, obesity, past and family history of ischemic heart disease was not significantly different among patients with different presentations of acute coronary syndrome.

Discussion

This study of 'cardiometabolic risk factors in patients of acute coronary syndrome' was a hospital based case-control study carried out in a tertiary care center over a period of two years from November 2009 to November 2011. The study was done to compare the impact of different cardiometabolic risk factors on the occurrence of acute coronary syndrome and to study the outcome of patients of acute coronary syndrome at the end of one week according to presence of cardiometabolic risk factors. The present study included 100 patients of acute coronary syndrome admitted at the tertiary care centre and 100 age and sex matched controls

Age and sex distribution of cases and controls

In the present study the mean age of cases was 55.9±10.40 years and mean age of controls was 55.32±10.71years (p=0.6982), hence they were comparable. Further it was seen that there was a male preponderance in the study group with 70 males and 30 females. The mean age of males was 54.51± 10.82 and mean age of females was 59.13± 8.67. The difference was statistically significant (p=0.0413). This signifies the ACS occurred at younger age group in males as compared to female.Burazeri G. et al [7] in their case control study had included 370 men with mean age of 59.1 ± 8.7 years and 97 women with mean age of 63.3±7.1 years. Male: Female ratio in Cases was 3.79:1 and in the control group there were 469 men with mean age of 53.1±10.4 years and 268 women aged 54.0± 10.9 years. Jafary M H. et al [8] showed that the mean age of ACS patients was 52.2±10.7 years, which matched with the present study but in their study it was seen that only 22.5% patients were over 60 years of age where as 44% of patients were over 60 years in the present study. Xian-tao S. et al [9] also found that female patients with ACS were older than male patients (67.23 years vs. 61.80, p<0.0001). Perer et al [10] and Chrysohoou et al [11] found similar results.

Different presenting complaints in patients with acute coronary syndrome

It was seen in the present study that out of 100 patients with acute coronary syndrome, 98 (98%) had presented with chest pain, 76 (76%) breathlessness, 55 (55%) palpitations and 4 (4%) had syncope on presentation. Brieger D et al [12] in their study found 8.4% of patients with ACS did not present with chest pain. Jafary M.H. et al [8] in their study found that 92.7% patients of ACS presented with chest pain.

Presentation of acute coronary syndrome

The present study shows that out of 100 cases of ACS, 31% had unstable angina (UA), 17% had non-ST elevation myocardial infarction (NSTEMI) and 52% had ST elevation myocardial infection (STEMI). Rosengren A et al [13] in their study found that 43% of patients had STEMI, 13% had unstable angina and

54% had NSTEMI. In the study by Jafary M H et al [8] it was seen that UA and STEMI were the major types of ACS (43.0% and 40.5% respectively) and rest were NSTEMI (16.5%).

Association of acute coronary syndrome with smoking, alcohol and tobacco

In the present study it was seen the prevalence of smokers in cases was 43% as compared to 29% in controls. Thus a smoker had a 1.8 times increased risk of developing acute coronary syndrome (p=0.0392). However alcohol consumption and tobacco chewing were not associated with acute coronary syndrome (p=0.5371 and p=0.0515 respectively).

Risk Factors	Present Study	CHA	MRFIT	FHS	SBH
Smoking	43%	55%	50%	64%	55%

[CHA: Chicago heart association detection project in industry; MRFIT: Multiple risk factor interventional trial; FHS: Framingham heart study; SBH: St. Barnabas Hospital study]. In the SBH population 48% were smokers, in CHA 55%, MRFIT 50% and FHS 64% were smokers [14]. Lanas F et al [15] (INTER HEART study) showed that current smoking (OR, 2.31, 95% Cl 1.97 to 2.71) was associated with higher risk of acute MI. Rosengren A et al [13], Babu A S [16] et al and Kabagambe E K et al [17] showed in their study that smoking was significantly associated with ACS. Yusuf S.et al [18] (INTER HEART study) in their study showed that smoking (OR 2.87, PAR 35.7%) was significantly related to AMI. Bhasin et al [19], Joshi P et al [20] (INTER HEART Study) and Burazeri G et al [7] in their study found majority of the patient of ACS are (53.3%, 61.1% and 49% respectively) are smokers. In the study by Jaffary M.H. et al [8] it was seen that prevalence of smoking was 52% in Acute MI patients. Pais P et al [21] in their case control study showed that the most important predictor of AMI was current smoking (odds ratio [OR] 3.6, p<0.001). However Arriola L. et al [22] showed that Alcohol intake in men was associated with a more than 30% Lower incidence of Coronary artery disease. Similarly Schroder H.et al [23] found an inverse association between alcohol consumption and the risk of nonfatal myocardial infection. Janszky I. et al [24] found that among middle aged women with coronary heart disease, moderate alcohol consumption (5g/day) was protective for coronary atherosclerosis progression.

Association of acute coronary syndrome with hypertension, diabetes, past and family history of ischemic heart disease

In the present study it was seen that prevalence of hypertension was higher in cases (47%) as compared to controls (26%) (p=0.020). The prevalence of diabetes was also higher in cases (49%) as compared with controls (27%) (p=0.0014). Patients with a past history of IHD had a significantly higher risk of developing acute coronary syndrome (p=0.000). Both cases and controls had an equal number (17%) of people with a family history of IHD. Therefore family history of IHD was not associated with acute coronary syndrome.

Anthropometric and biochemical parameters in cases and controls

In present study it was seen the BMI was significantly more (24.59±2.99 vs. 22.63±2.22kg/m^2) in cases as compared to controls (p=0.000). The Waist-Hip ratio in cases (0.88±0.17) was higher as compared to controls (0.82±0.08). The difference was statistically significant (p= 0.0114). Burazeri G. et al [7] in their case control study showed that ACS patients had a higher body mass index. In men this difference (27.2±3.7 vs. 26.6±3.5) was significant (p=0.006), whereas in women it was not significant (27.9±3.8 vs. 26.6±3.9, p<0.0001). Lanas F et al [15] (INTER HEART Study) showed increased WHR (OR, 2.49, 95% CI-1.97 to 3.14) was associated with higher risk of AMI. In the present study the total cholesterol was significantly (p=0.000) increased in cases (179.60±41.11 vs. 143.45±21.11 mg/dl). Serum triglycerides (123.19±37.29 vs. 109.35±22.86 mg/dl), LDL (109.05±37.62 vs. 69.02±19.30 mg/dl) and Non-HDL (133.71±40.52 vs. 90.99±20.20 mg/dl) were also significantly raised in cases as compared to controls (p=0.0018, p=0.000 and p=0.000 respectively). HDL levels were significantly (p=0.0001) lower in cases (45.89±14.90 mg/dl) in comparison to controls (52.44±8.52 mg/dl). Thus patients with ACS had dyslipidemia.This correlated with the study by Manurung et al [25] wherein they found the patients with ACS to have dyslipidemia; the mean value of total cholesterol was 205.23±54.84 mg/dl, LDL was 136.16±47.29 mg/dl, HDL was 42.84±10.28 mg/dl and TG was 157.25±10.16 mg/dl. In the present study the mean serum uric acid level in cases was 5.17±2.55 mg/dl, while in the controls it was 3.78±1.54 mg/dl. This difference was statistically significant (p=0.000). This result correlated with the study by Nadkar M Y et al [26], found that in 100 cases of acute myocardial infarction the mean serum uric acid level was 5.22±1.94 mg/dl, compared to 50 controls having mean serum uric acid level of 3.77±0.74mg/dl.

Conclusion

In this study the impact of different cardiometabolic risk factors on the occurrence of acute coronary syndrome were compared and the outcome of patients of acute coronary syndrome at the end of one week according to presence of cardiometabolic risk factors was studied. Female cases of acute coronary syndrome were older than male cases. Raised WHR, BMI, Hypertension, diabetes, alcohol consumption, smoking, raised total cholesterol, serum triglycerides, LDL, Non-HDL cholesterol, serum uric acid and decreased HDL were the risk factors associated with acute coronary syndrome. Hypertension, diabetes, BMI, Total cholesterol, HDL and Serum uric acid were found to be the independent predictors of acute coronary syndrome. Though the incidence of acute coronary syndrome increased with increasing number of cardiometabolic risk factors, the number of cardiometabolic risk factors did not correlate with mortality.

References

1. Lloyd-Jones DM, Hong Y, Labarthe D, Mozaffarian D, Appel LJ, Van Horn L, et al. American Heart Association Strategic Planning Task Force and Statistics Committee. Defining and setting national goals for cardiovascular health promotion and disease reduction: the American Heart Association's strategic Impact Goal through 2020 and beyond. Circulation. 2010; 121 (4):586-613.
2. Poulter N. Global risk of cardiovascular disease. Heart. 2003 May;89 Suppl 2(Suppl 2): ii2-5; discussion ii35-7.
3. Ghaffar A, Reddy KS, Singhi M. Burden of non-communicable diseases in South Asia: BMJ 2004; 328: 807–10
4. Cannon CP, Braunwald E. Unstable Angina and Non-ST Elevation Myocardial Infarction; In: Fauci AS, Kasper DL, Longo DL, Braunwald E, Hauser SL, Jameson J.L. Editors. Harrisons Principles of Internal Medicine, 17th Edition. Mc Graw Hill Publication, 2008; p1527-1532.
5. Brunzell JD, Davidson M, Furberg CD. Lipoprotein management in patients with cardiometabolic risk: Consensus conference report from the American Diabetes Association and the American College of Cardiology Foundation. J Am Coll Cardiol. 2008; 51(15):1512-1524.
6. National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) final report. Circulation. 2002 ;106 (25):3143-421.
7. Burazeri G, Goda A, Sulo G, Stefa J, Roshi E, Kark JD. Conventional risk factors and acute coronary syndrome during a period of socioeconomic transition: population-based case-control study in Tirana, Albania. Croat Med J. 2007;48(2):225-33.
8. Jafary MH, Samad A, Ishaq M, Jawaid SA, Ahmad M, Vohra EA, et al. Profile of acute myocardial infarction in Pakistan. Pak J Med Sci 2007; 23(4): 485-489
9. Song XT, Chen YD, Pan WQ, Lü SZ; CRACE investigators. Gender based differences in patients with acute coronary syndrome: findings from Chinese Registry of Acute Coronary Events (CRACE). Chin Med J (Engl). 2007; 120 (12):1063-7.
10. Perers E, Caidahl K, Herlitz J, Sjölin M, Karlson BW, Karlsson T, Hartford M. Spectrum of acute coronary syndromes: history and clinical presentation in relation to sex and age. Cardiology. 2004;102(2):67-76.
11. Chrysohoou C, Panagiotakos DB, Pitsavos C, Kokkinos P, Marinakis N, Stefanadis C, Toutouzas PK. Gender differences on the risk evaluation of acute coronary syndromes: the CARDIO2000 study. Prev Cardiol. 2003 Spring;6(2):71-7.
12. Brieger D, Eagle KA, Goodman SG, Steg PG, Budaj A, White K, Montalescot G; GRACE Investigators. Acute coronary syndromes without chest pain, an underdiagnosed and undertreated high-risk group: insights from the Global Registry of Acute Coronary Events. Chest. 2004 ;126(2):461-9.
13. Rosengren A, Wallentin L, K Gitt A, Behar S, Battler A, Hasdai D. Sex, age, and clinical presentation of acute coronary syndromes. Eur Heart J. 2004 ;25(8):663-70.
14. Bennett W, Lombardi D, Eisenhart A, Acosta J, Cerbone D, McCoy L, et al. Risk factors for acute myocardial infarction in our patient population: A retrospective pilot study: New York medical journal; November 2008
15. Lanas F, Avezum A, Bautista LE, Diaz R, Luna M, Islam S, Yusuf S; INTERHEART Investigators in Latin America. Risk factors for acute myocardial infarction in Latin America: the INTERHEART Latin American study. Circulation. 2007 ;115(9):1067-74.

16. Babu AS, Haneef M, Joseph AN, Noone MS. Risk factors among patients with acute coronary syndrome in rural kerala. Indian J Community Med. 2010;35(2):364-5..
17. Kabagambe E K, Baylin A, Campos H. Non-fatal acute myocardial infarction in Costa Rica. Circulation; 2007; 115:1075-81.
18. Yusuf S, Hawken S, Ounpuu S, Dans T, Avezum A, Lanas F. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries: The Lancet: 2004; 364(9438):937-52.
19. Bhasin SK, Dwivedi S, Dehghani A, Sharma R. Conventional risk factors among newly diagnosed coronary heart disease patients in Delhi. World J Cardiol. 2011;3(6):201-6.
20. Joshi P, Islam S, Pais P, Reddy S, Dorairaj P, Kazmi K, Pandey MR, Haque S, Mendis S, Rangarajan S, Yusuf S. Risk factors for early myocardial infarction in South Asians compared with individuals in other countries. JAMA. 2007; 297(3):286-94.
21. Pais P, Pogue J, Gerstein H, Zachariah E, Savitha D, Jayprakash S, Nayak PR, Yusuf S. Risk factors for acute myocardial infarction in Indians: a case-control study. Lancet. 1996; 348(9024):358-63.
22. Arriola L, Martinez-Camblor P, Larrañaga N, Basterretxea M, Amiano P, Moreno-Iribas C, et al. Alcohol intake and the risk of coronary heart disease in the Spanish EPIC cohort study. Heart. 2010 ; 96(2):124-30.
23. Schröder H, Masabeu A, Marti MJ, Cols M, Lisbona JM, Romagosa C, Carión T, Vilert E, Marrugat J; REGICOR investigators. Myocardial infarction and alcohol consumption: a population-based case-control study. Nutr Metab Cardiovasc Dis. 2007; 17(8):609-15.
24. Janszky I, Mukamal KJ, Orth-Gomér K, Romelsjö A, Schenck-Gustafsson K, Svane B, et al. Alcohol consumption and coronary atherosclerosis progression--the Stockholm Female Coronary Risk Angiographic Study. Atherosclerosis. 2004; 176 (2):311-9.
25. Manurung D. Lipid profiles of acute coronary syndrome patients hospitalized in ICCU of Cipto Mangunkusumo Hospital. Acta Medica Indonesiana. 2006; 38 (4):196-201.
26. Nadkar MY, Jain VI. Serum uric acid in acute myocardial infarction. J Assoc Physicians India. 2008; 56:759-62.

Conflict of Interest: Nil
Source of support:Nil