Original Article

Study of lipid profile in young patients (age 40 years or below) with acute coronary syndrome

Sanjay Fotedar[1], Anubha Garg[1], Aman Arora[1], Sumit Chawla[2]

[1]Department of Medicine, Pt. BD Sharma Post Graduate Institute of Medical Sciences, Rohtak, Haryana, [2]Department of Community Medicine, Pt. JLNGMCH, Chamba, Himachal Pradesh, India

Abstract

Background: Acute coronary syndrome (ACS) refers to a group of clinical symptoms compatible with acute myocardial ischemia and includes unstable angina, non-ST segment elevation myocardial infarction and ST-segment elevation myocardial infarction. **Aims and Objectives:** To study the incidence of lipid profile abnormalities in young patients (age 40 years or below) with ACS with clinical and cardiovascular risk profile. **Material and Methods:** The study was conducted on 223 young patients of acute coronary syndrome with age 40 years or below. 89 young patients with acute coronary syndrome having lipid abnormalities were further followed up after 1 month. **Results:** Majority of patients (55.15%) in the study population belonged to 35–40 years age group. Mean age of study population was 35.65 + 4.62 years with 90.13% males and 9.86% females. Main presenting symptom was precordial chest pain in 93.72% patients. Smoking was the commonest risk factor in young adults (81.7%). Other risk factors like diabetes, hypertension, family history were less common in young adults. Drug addiction was also higher in younger population (16%). Majority of young adults with acute coronary syndrome had more than 1 (47.53%) risk factor. Majority of patients were in Killip class I (86.9%) and only few patients (13.1%) had Killip class II or above. ST elevation myocardial infarction was far more common than NTEMI/USA and was found in 164 (73.5%) patients. Most common type of infarction was anterior wall myocardial infarction (62.80%). Majority of young patients had negative TMT, so it suggests that ACS in younger population has lesser complications during presentation, hospital stay and on follow-up. **Conclusion:** ACS in young continues to increase in Indian subcontinent. Younger patient with an ACS have different clinical characteristics and a different prognosis than older patients. The extent of CAD and degree of myocardial necrosis has influence on presentation and subsequent MACE in ACS and in this study, it appears dyslipidemia do not play any significant role in influencing extent of CAD and has little effect on outcome whether during acute stage or on immediate follow-up after ACS.

Keywords: Acute coronary syndrome, age (MeSH), lipid profile

Introduction

The term acute coronary syndrome (ACS) refers to a group of clinical symptoms compatible with acute myocardial ischemia and includes unstable angina (UA), non-ST segment elevation myocardial infarction (NSTEMI) and ST-segment elevation myocardial infarction (STEMI).

Address for correspondence: Dr. Sumit Chawla, Associate Professor, Department of Community Medicine, PT. JLNGMCH, Chamba, Himachal Pradesh, India.
E-mail: drschawla86@gmail.com

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In developing countries, such as India, the focus for long has been on the control of acute and chronic infections and communicable diseases. Mortality data from Global Burden of Diseases Studies has revealed that cardiovascular diseases (CVDs) such as coronary heart disease (CHD) are important causes of death in low- and middle-income countries. Coronary artery disease (CAD) is the foremost single cause of mortality and loss of Disability Adjusted Life Years (DALYs) globally. A large number of this burden falls on low- and middle-income countries accounting for nearly 7 million deaths and 129 million DALYs annually. In 2015, CAD accounted for 8.9 million deaths and 164.0 million DALYs. In many regions

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of these countries CVDs, especially CHD, are more prevalent among the illiterate and low socioeconomic subjects.[1]

According to the most recent World Health Organisation (WHO) data, more than 80% of all cardiovascular deaths occurred in developing (low- and middle-income) countries compared to developed (high income) countries (WHO 2009; WHO, 2010). Age-standardized CVDs death rates (per 100, 000) demonstrate low rates in developed countries such as Canada (120) and Britain (180) and high rates in Brazil (320), China (280), India (405), Pakistan (400), Nigeria (410), and Russia (680) showing that in middle-aged subjects (30–69 years), the death rates are inappropriately high in developing countries. This is a seen change from the middle years of the last century when communicable diseases, under nutrition-related diseases and perinatal causes were major causes of mortality in these countries.[2] The epidemiological transition occurring in the low-income countries such as India which now has a fully developed epidemic of non-communicable diseases. As compared to previous years, there has been a reversal of socioeconomic differentials in prevalence of coronary risk factors and CVDs, especially CHD, in this country and these can no longer be considered diseases of affluence.

CVDs have been gaining importance in India recently because of increased incidence of the disease. It is the first among top 5 causes of deaths in Indian population.[3] In 2000, there were an estimated 29.8 million people with CHD in India out of a total estimated population of 1.03 billion, or a nearly 3% overall prevalence.[4,5] According to World Bank estimates, CVD had a 31% share in the total burden of disease in 2001.[6] In 2003, the prevalence was estimated to be 3–4% in rural areas and 8–10% in urban areas according to population-based cross-sectional surveys.[7,8] Apart from a high overall prevalence, there are regional variations in the prevalence of CVD. In the urban population, the prevalence has increased from 1.05% (Agra, 1962) and 1.04% (Delhi, 1962) to Delhi (9.67%, 1990), Jaipur (7.8%, 1995), Chennai (9.0%, 2001), Jaipur (8.1%, 2002), and Chandigarh (13.2%, 2004). In semi-urban populations of Haryana and Kerala, the prevalence has increased from 3.6% (1975) to 7.4% (1993). In rural populations, the prevalence increased from 2.06% (Haryana, 1974) and 1.69% (Vidarbha, 1988) to 2.71% (Haryana, 1989), 3.09% (Punjab, 1994), 3.46% (Rajasthan, 1997), and 5.00% (Himachal, 2002). Rural-urban comparison shows that while prevalence has increased two-fold in rural areas (2.06% in the 1970s to 4.14% in the 1990s) the prevalence in urban areas has increased nine-fold (1.04% in the early 1960sto 9.45% in the mid-1990s). There is evidence of increase in CHD as subjects migrate from rural to semi-urban to urban areas with the highest prevalence reported from metropolises.[4]

ACS in young adults continues to increase in Indian subcontinent. What are the factors operative in causation in young is still a matter of debate. Do lipid abnormalities found in some young patients of ACS contribute in anyway especially in causing extensive disease. Keeping in view these questions, the present study was conducted to study the incidence of lipid profile abnormalities in young patients (age 40 years or below) with ACS with clinical and cardiovascular risk profile.

Material and Methods

The study was carried out in 223 young patients of ACS with age 40 years or below admitted to Intensive Coronary Care Unit (ICCU) of medicine department. 89 young patients with ACS having lipid abnormalities were further followed up after 1 month. Patients were treated according to the current ACS guidelines and their serial ECG recording; blood test and clinical examination were done at regular intervals during first five days of hospital stay, to obtain their complete clinical, cardiovascular, and diabetic profile. The study included estimation of baseline lipid profile (after 12 hours fasting) done in patients within first 24 hours of ICCU admission.[9] The patients of ACS were included in the study as per the inclusion criteria.

Inclusion criteria

1) Age of patient should be 40 years or below.
2) Serum lipid level estimation should be done within 24 hours of admission. (after overnight fasting of 12 hours)[10]
3) Patient should fulfil the criteria of ACUTE CORONARY SYNDROME which involve.

I I. Acute, evolving, or recent MI is defined[10] as the typical rise and/or fall of biochemical markers of myocardial necrosis with at least one of the following:

a) Ischemic symptoms.
b) Development of pathologic Q waves in the ECG.
c) Electrocardiographic changes indicative of ischemia (ST-segment elevation or depression).
d) Imaging evidence of new loss of viable myocardium or new regional wall motion abnormality.

I II. Unstable angina is defined as angina pectoris (or equivalent type of ischemic discomfort) with at least one of three features:

a) Occurring at rest (or minimal exertion) and usually lasting >20 min (if not interrupted by the administration of a nitrate or an analgesic).
b) Being severe and usually described as frank pain; or
c) Occurring with a crescendo pattern (i.e., pain that awakens the patient from sleep or that is more severe, prolonged, or frequent than previously).

Patients not giving informed consent, having advanced comorbid conditions, including malignancies, advanced heart failure or valvular heart diseases, already on statins or any related drugs and expected transfer to another hospital within 48 hours or if follow-up not possible were excluded from the study.[5]

Method of study

The baseline lipid profile (after 12 hours fasting) was done in all young patients age 40 years or below within first 24 hours

of ICCU admission.[10] Patient having abnormality in any of lipid profile component was taken as dyslipidemic. The patients were further studied in two groups of dyslipidemic patient and those with normal lipid profile. These patients were compared in their cardiovascular risk profile and major acute coronary events (MACE) during hospital stay. Those patients with dyslipidemia were further followed after one month for MACE from discharge to 1 month.

At the time of ICCU admission, 12 lead ECG was be done and blood samples were tested for blood urea, blood sugar, serum sodium, serum potassium, and CPK-MB. Sample for serum lipid profile was to be sent within 24 hours of ICCU admission (after an overnight fasting of 12 hours). Patients were treated as per the standard treatment protocol.

Serial ECGs of the patients were done 12 hourly for first two days, and once daily till discharge, and were evaluated for the appearance of any fresh changes of ischaemia or arrhythmias. Various investigations CPK-MB: 12 hrs and 24 hrs., Blood sugar (fasting/postprandial), LFT/RFTs, Hb, TLC, DLC, Urine-Complete examination, ECG, Chest, and X-ray PA view were to be sent on day 1 after admission.

Clinical profile of the patients during hospital stay (0–5 days) was studied and was observed for any complications of ACS.

The patients were further studied in two groups of dyslipidemic patient and those with normal lipid profile. These patients were compared in their cardiovascular risk profile and MACE during hospital stay. Those patients with dyslipidemia were further followed after one month for their clinical profile, MACE from discharge to 1 month. TMT was done in those patients with dyslipidemia on follow-up. Echo evaluation was done if indicated.

Statistical analysis

At the end of the study, the data were collected and analysed by using Student t-test and Chi-square test. A *P* value of <0.05 was considered as significant.

Results

Mean age of study population was 35.65 + 4.62 years with 90.13% males and 9.86% females. 209 (93.72%) patients had precordial chest pain along with other symptoms. 48 (21.50%) patients had palpitations, 36 (16.14%) patients had dyspnoea, Mean Door to Needle time in the study population was 10.74 ± 12.82 hours. Total number of patients who smoked currently were 180 (81.71%). 19 (8.52%) patients had either history of diabetes. Thirty-two (14.34%) patients were known case of hypertension. 19 (8.52%) patients had family history of heart disease. BMI above 30 was found to be in 14 (6.27%) patients. 38.11% of study population was alcoholic. Thirty-six (16.14%) patients were drug addicts. Majority of young adults with ACS had more than 1 (47.53%) risk factor. Normal chest X ray was seen in 180 (81%) patients and 18 (8%) patients has cardiomegaly. Out of total 221 young adults of ACS, 89 (40.27%) patients were dyslipidemic [Table 1].

Out of total 223 cases, 164 (73.5%) patients were ST elevation myocardial infarction and 59 (26.5%) patients were NSTEMI/unstable angina. [Table 2].

Anterior wall MI was in 62.80% patients. Isolated lateral/inferior wall MI was 1.82% and 21.34%, respectively. Inferior wall MI with extension in right/lateral/both right and lateral were 4.87%., 6.70%, and 2.43%, respectively. Table 3.

Patients were divided into three groups according to the degree of ST-segment resolution: <30% (no resolution); 30% to ≤70% (partial resolution); and >70% (complete resolution). Out of total 89 in dyslipidemic group, 68 were thrombolysed 38.23% (24 cases) had complete resolution, 45.58% (31 cases) had partial resolution, and 19.11% (13 cases) had no resolution.

During hospital stay (day 0–5), MACE were recorded. These MACE were compared in 2 groups of study population.

Group A = Dyslipidemic group (n = 89)

Group B = Normolipidemic group (n = 132)

A. MAJOR TACHYARRYTHMIAS.
B. MAJOR BRADYARRYTHMIAS
C. POST-MI ANGINA
D. STROKE
E. LEFT VENTRICULAR FAILURE
F. CARDIOGENIC SHOCK
G. EXTENSION OF INFARCT
H. DEATH.

Mace in dyslipidemic population on 1 month follow-up

Main event that occurred was post-MI angina which occurred in 22.47% (20 patients) which followed by arrhythmias which occurred in 6.74% (6 patients). Table 4.

Table 1: Lipid profile components in study population

Lipid profile	Group A (*n*=89)	Group B (*n*=132)	*P*
Triglyceride	233.77+82.94	125.89+79.30	0.0001
Total cholesterol	200.69+39.22	160.69+38.65	0.0001
High density lipoprotein	36.82+5.09	42.03+5.11	0.0001
Low density lipoprotein	117.37+33.81	93.187+33.79	0.0001
Very low density lipoprotein	47.36+16.75	25.22+16.04	0.0001

Table 2: Distribution of type of ACS

Type of ACS	Group A (*n*=89)	% age	Group B (*n*=132)	% age	*P*
STEMI	69	77.52%	95	71.9%	NS
NSTEMI	6	6.74%	8	6.06%	NS
USA	14	15.73%	29	21.9%	NS

Table 3: Cardiac enzymes in young adults

CPK-MB level	Type of ACS	Dyslipidemic group	Normolipidemic group	*P*
On admission	UNSTABLE ANGINA (*n*=45)	33.10+10.97	31.84+10.31	NS
	NSTEMI (*n*=14)	93.33+41.05	80.27+34.10	NS
	STEMI (*n*=164)	111.28+102.37	96.80+83.85	NS
After 24 h of admission	UNSTABLE NGINA (*n*=45)	42.20+10.77	40.51+9.88	NS
	NSTEMI (*n*=14)	69.33+22.00	65.90+37.59	NS
	STEMI (*n*=164)	117.11+89.29	89.53+70.44	<0.05

Table 4: Mace in dyslipidemic population on 1 month follow-up

	Dyslipidemic patients (*n*=89)	%
Post-mi angina	20	22.47
Reinfarct	3	3.37%
Stroke/TIA	1	1.12%
LVF	3	3.37%
CHF	0	0
ARRYTHMIA	6	6.74%
Death	0	0%
Patients with >1 mace	8	8.98%

TMT done in dyslipidemic patients on follow-up showed that 43.75% of patients had positive TMT, and 47.91% patients had negative TMT whereas 8.33% had inconclusive report.

Discussion

CHD is a major health problem which imposes a significant burden on health care systems because of high morbidity and mortality.[11-13]

Mean age of study population was 35.65 ± 4.62 years. In a study done by Martin AD *et al.*[14] mean age of the whole group was 35.4 years. 90.13% were males while only 9.86% were females. The male to female ratio was 9:1. In a study done by Dwivedi *et al.*[15] out of 70 young adults below 40 years, there were 80% males and 20% females. 209 (93.72%) patients had precordial chest pain along with other symptoms. Some patient had >1 symptoms on presentation. In a study done by Sricharan *et al.*[16] they studied all patients of acute MI who were aged >40 years, a total of 49 patients. The most common symptom was chest pain, which was present in 90% of the patients.

Mean Door to Needle time in the study population was 10.74 ± 12.82 hours. Over 70% of patients presented within 12 hours of symptom onset, with 3–6 hours and 6–12 hours windows being 30.92% and 39.92% patients, respectively. In a study done by Sricharan *et al.*[16] on patients age <40 years, a total of 49 patients were included the mean time of presentation after the onset of the symptoms was 14.73 hrs.

Clinical examination was within normal limit in 85% patients, whereas 15% patients had abnormal findings. In a study done by Gotman *et al.*,[17] on angiography identified higher incidence of no-vessel or one-vessel disease in the young patients 43.8%.

Risk factors

Patients who were currently smoking 180 (81.71%), whereas only 18.29% were non-smokers. In a study done by Martin AD *et al.*,[14] they studied 240 patients age below 40 years, found 80% of the patients were smokers.

In our study population 19 (8.52%) patients had diabetes. In a study done by Dwivedi *et al.*[15] diabetes was noted in 7.14% young cases of ACS.

Thirty-two (14.34%) patients were known case of hypertension. In a study done by Martin AD *et al.*,[14] to study the risk factors of MI in young men in nine countries. 15% were either treated for hypertension before MI or had a raised blood pressure after MI.

19 (8.52%) patients had family history of CHD. In a study done by Dwivedi *et al.*,[15] family history of premature CAD was found in 18.8% cases.

Although BMI above 30 was found to be in 14 (6.27%) patients in the present study but a large number of patients, 74 (34.08%) patients were pre-obese. In a study done by Martin *et al.*,[14] they studied 240 patients age below 40 years, obesity was found in 19% of all patients.

38.11% of study population was alcoholic, whereas 61.89% was non-alcoholic. In a study done by Eva Andre *et al.*,[18] Northeastern Spain, they investigated the clinical profile of patients aged <46 years with acute MI.

Thirty-six (16.14%) patients were drug addict. Eva Andre *et al.*[18] found drug addiction in 7.59% of young adults. In our study, majority of young adults with ACS had more than 1 (47.53%) risk factor. Faisal *et al.*[19] reported most of the patients that is 94% had 3 or more risk factors. Alizadehas *et al.*[20] reported a total 300 patients below the age of 40 years underwent coronary angiography following an acute MI.

Mean SBP was 117.87 + 17.51 mmHg, whereas Mean DBP was 76.11 + 10.74 mmHg. Majority of patients 194 (86.9%) were in Killip class I, while Killip class II and above was found in 29 (13.1%). Andreas WS *et al.*,[21] they studied 182 patients below 35 yrs and less.

Serum uric acid which found to be increased in our study was 5.35 + 1.116 mg/dl. In a study done by Martin *et al.*,[14] serum uric acid levels over 0.5 mmol/l (8.5 mg/dl) in I7%.

Out of total 221 young adults of ACS, 89 (40.27%) patients were dyslipidemic. Martin *et al.*[14] studied risk factors of MI in young men in nine countries. They studied that 240 patients were aged below 40 years, increased cholesterol was found in 61 (25%) patients, increased triglyceride in 82 (35%) patients.

In present study, 73.5% patients presented with ST elevation MI and 59 (26.5%) patients were NSTEMI/unstable angina. Akram *et al.*[22] found that the most common anatomical location of the MI was the anterior wall and 92.3% of the cases were MIs with ST segment elevation.

Mean value of admission CPK MB were comparable in dyslipidemic and normolipidemic; however, 24-hour value of CPK MB of STEMI patients in dyslipidemic group was 117.11 + 89.29 IU and that of STEMI patients of normolipidemic group was 89.53 + 70.44 IU (p value <0.05).

Patients were divided into three groups according to the degree of ST-segment resolution: <30% (no resolution); 30% to ≤70% (partial resolution); and >70% (complete resolution). Out of total 89 in dyslipidemic group, 68 were thrombolysed 38.23% (24 cases) had complete resolution, 45.58% (31 cases) had partial resolution and 19.11% (13 cases) had no resolution.

Mace during hospital stay (Day 0-5)

Out of total 21 patients with these tachyarrythmias, 15 patients were from dyslipidemic group and 6 patients from group normolipidemic group ($p < 0.05$). Post MI angina occurred in 31 cases and out of these, 19 were from dyslipidemic group while the remaining 12 were from normolipidemic group ($p < 0.05$). Wong *et al.*[23] found overall in-hospital mortality was low with 4 (1.2%) deaths. Akram *et al.*[22] reported the hospital course in young adults was complicated by the development of CHF in 4.6%, cardiogenic shock in 4.6% patients, angina post-MI in 3.1% patients, and reinfarction 3.1%.

MACE - 1 month follow-up

Main event that occurred was post MI angina which occurred in 22.47% (20 patients) which was followed by arrhythmias which occurred in 6.74% (6 patients). In a study done by Chua SK *et al.*[24] at Taiwan, collected data on 849 consecutive young patients, mortality rate during follow-up significantly lower in younger patients (3.0%).

Conclusion

ACS in young continues to increase in Indian subcontinent. Younger patient with an ACS have different clinical characteristics and a different prognosis than older patients. There had been slight variation in lipid components levels in different part of world in young adults. These studies show that incidence of dyslipidemia in young adults of ACS is low. In Asian countries, most common lipid profile abnormality found in young adult of ACSs was raised triglycerides which were just followed by low high density lipoprotein. Although minor differences in MACE were seen between the dyslipidemic young patients and normolipidemic young patients, suggesting minimal effect of hyperlipidemia on young population with ACS. The extent of CAD and degree of myocardial necrosis has influence on presentation and subsequent MACE in ACS and in this study it appear dyslipidemia do not play any significant role in influencing extent of CAD and has little effect on outcome whether during acute stage or on immediate follow-up after ACS.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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