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

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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 NSTEMI/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).

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...
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.[9] 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.[9,10] According to World Bank estimates, CVD had a 31% share in the total burden of disease in 2001.[9] 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.[9] 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 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 1960s to 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.[9]

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)[9]
3) Patient should fulfill the criteria of ACUTE CORONARY SYNDROME which involve.

I I. Acute, evolving, or recent MI is defined[9] 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.

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.[9]

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. 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.

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**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 history of diabetes. Thirty-two (14.34%) patients were known case of hypertension. 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 TACHY ARRHYTHMIAS
B. MAJOR BRADY ARRHYTHMIAS
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±38.65 | 160.69±38.65 | 0.0001|
| LDL cholesterol  | 125.89±79.30 | 93.18±33.79 | 0.0001|
| HDL cholesterol  | 45.76±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 | UNSTABLE ANGINA (n=45) | 42.20±10.77   | 40.51±9.88         | NS |
| admission     | 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              | 22.47 |
| Reinfarct                   | 3.77 |
| Stroke/TIA                  | 1.12 |
| LVF                         | 3.37 |
| CHF                         | 0   |
| ARRYTHMIA                   | 6.74 |
| Death                       | 0   |
| Patients with >1 mace       | 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.

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., it was 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., diabetes was noted in 7.14% young cases of ACS.

Mean age of study population was 35.65 ± 4.62 years. In a study done by Martin AD et al., 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., 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 Srircharan et al., 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 Srircharan et al., 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., on angiography identified higher incidence of no-vessel or one-vessel disease in the young patients 43.8%.

Discussion

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

Mean age of study population was 35.65 ± 4.62 years. In a study done by Martin AD et al., 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., 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 Srircharan et al., 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.

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Clinical examination was within normal limit in 85% patients, whereas 15% patients had abnormal findings. In a study done by Gotman et al., on angiography identified higher incidence of no-vessel or one-vessel disease in the young patients 43.8%.
Out of total 221 young adults of ACS, 89 (40.27%) patients were dyslipidemic. Martin et al. 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. 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. found overall in-hospital mortality was low with 4 (1.2%) deaths. Akram et al. 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. 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.

References

1. Zhang G, Yu C, Zhou M, Wang L, Zhang Y, Luo L. Burden of ischaemic heart disease and attributable risk factors in China from 1990 to 2015: Findings from the global burden of disease 2015 study. BMC Cardiovasc Disord 2018;18:18.
2. Gupta R, Gupta KD. Coronary heart disease in low socioeconomic status subjects in India “An evolving epidemic”. Indian Heart J 2009;61:358-67.
3. Gupta R, Guptha S, Sharma KK. Regional variations in cardiovascular risk factors in India: India Heart Watch. World J Cardiol 2012;4:112-20.
4. Joshi P, Gupta R, Mohan V. Epidemiology and causation of coronary heart disease and stroke in India. Heart 2008;94:16-26.
5. Chauhan S, Aeri BT. Prevalence of cardiovascular disease in India and its economic impact- A review. Int J Sci Res Publ 2013;10:1-5.
6. Peters D, Yazbeck A, Raman G, Sharma R, Pritchett L, Wagstaff A. Raising the sights: Better health systems for India's Poor. Washington DC: The World Bank; 2001.
7. Gupta R. Burden of coronary heart disease in India. Indian Heart J 2005;57:632-8.
8. Ghaffar A, Reddy KS, Singh M. Burden of non communicable diseases in South Asia. Br Med J 2004;328:807-10.
9. Patrick T, Fredrick GK, Deborah DA, Donald EC, Mina KC, James CF, et al. 2013 ACCF/AHA guideline for the management of ST-elevation myocardial infarction. J Am Coll Cardiol 2013;61:78-140.
10. Zimmerman FH, Cameron A, Fisher LD, Ng G. Myocardial infarction in young adults: Angiographic characterization, risk factors and prognosis (Coronary Artery Surgery Study Registry). J Am Coll Cardiol 2015;26:654-61.
11. Janus ED, Postglione A, Singh RS. The modernisation of Asia. Implication of coronary artery disease. Circulation 2019;94:2671-3.

12. Mammi MVI, Pavithram K, Abdurahman P. Acute myocardial infarction in North Kerala – A 20 years hospital based study. Indian Heart J 1991;34:93-9.

13. Parbhakaran D, Singh K. Premature coronary heart disease risk factors and reducing the CHD burden in India. Indian J Med Res 2011;134:8-9.

14. Martin A, Dolder S, Oliver MF. Myocardial infarction in young men Study of risk factors in nine countries. Br Heart J 1975;37:493-503.

15. Dwivedi S, Girish D, Chaturvedi A. Coronary artery disease in the young: Heredofamilial or faulty life style or both. Indian Acad Clin Med 2000;1:222-9.

16. Sricharan KN, Rajesh S, Meghana HC. Study of acute myocardial infarction in young adults: Risk factors, presentation and angiographic findings. J Clin Diag Res 2012;6:257-60.

17. Gotsman I, Lotan C, Mosseri M. Clinical manifestations and outcome of acute myocardial infarction in very young patients. Isr Med Assoc J 2003;5:633-6.

18. Andre SA, Montserrat L, Magallo CR. Cardiovascular risk factors and lifestyle associated with premature myocardial infarction diagnosis. Rev Esp Cardiol 2011;64:527-9.

19. Faisal AW, Ayub M, Waseem T. Risk factors in young patients of acute myocardial infarction. J Ayub Med Coll Abbottabad 2011;23:10-3.

20. Alizadehas A, Farnaz SM, Toufan M. Risk factors, clinical manifestations and outcome of acute myocardial infarction in young patients. J Cardiovasc Thorac Res 2010;7:29-34.

21. Andreas WS, Dragana R, Stauffer JC. Acute coronary syndromes in young patients: Presentation, treatment and outcome. Int J Cardiol 2011;148:300-4.

22. Akram H, Al-Khadra. Clinical profile of young patients with acute myocardial infarction in Saudi Arabia. Int J Cardiol 2003;91:9-13.

23. Wong CP, Loh SY, Lueng PJ. Acute myocardial infarction: Clinical features and outcomes in young adults in Singapore. World J Cardiol 2012;4:206-10.

24. Chua SK, Hung HF, Shyu KU. Acute ST-elevation myocardial infarction in young patients: 15 years of experience in a single center. Clin Cardiol 2010;33:140-8.