COMPARISON OF THE CLINICAL PROFILE, RISK FACTORS, ANGIOGRAPHIC FINDINGS AND IN-HOSPITAL OUTCOME OF ST-ELEVATION MYOCARDIAL INFARCTION (STEMI) IN YOUNG PATIENTS (AGE < 45 YRS) VS OLD PATIENTS (AGE ≥45 YEARS) – A SINGLE CENTRE OBSERVATIONAL STUDY

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Received	August	2015
Accepted	November	2015

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Abstract:

Aim: The purpose of our study is to compare the clinical profile, risk factors, angiographic findings and in-hospital outcome of ST Elevation Myocardial infarction in young patients (Age <45 years) and old patients (Age ≥45 years).

Methodology: A prospective observational, comparative study was conducted on 30 young and 30 old patients admitted with STEMI between 2012-2013 in Cardiology Department of GMC Srinagar. Detailed history, clinical examination, relevant investigations including CRP, serum Homocysteine, profile for hypercoagulable states (in selected cases), Echocardiography and Coronary Angiography (CAG) were done in the patients and in-hospital outcome in terms of successful thrombolysis, complications and death was compared between two groups.

Results: Male predominance was found in both groups. Compared with old patients, current smoking was the most common risk factor in young (84% vs. 56%; p <0.01), positive family history of premature CAD was more common in young (p <0.05). Hypertension and Diabetes mellitus were more prevalent in old patients. Dyslipidemia was common in both the groups with hypertriglyceridemia more common in young. The most common angiographic finding was SVD (single vessel disease) in young as compared to old (69% vs 40 %; p <0.05). Mortality and morbidity (LV dysfunction) was less in young.

Conclusions: Smoking and positive family history of premature CAD was the most common risk factor among young patients. Dyslipidemia being common in both, hypertriglyceridemia and low HDL was commoner in young patients. SVD was the most common CAG finding in young and in-hospital outcome was not statistically significant in young patients as compared to old patients.

Keywords: Acute Myocardial Infarction (AMI), Smoking, Dyslipidemia, Single vessel disease (SVD), Hypertension, Type 2 Diabetes Mellitus (T2DM).

JK-Practitioner2016;21(1-2):4-11

Introduction

Acute Myocardial Infarction continues to be major public health problem in industrialized as well as developing countries, despite impressive advances in the diagnosis and management. Although AMI is more commonly seen in patients older than 45 years, there is a recent trend towards presentation at younger age, especially in Indian patients. In recent years coronary heart disease has been recognized more frequently in young age groups[1,2]. In most studies however, the vast majority of young myocardial infarction (MI) patients described are in their fourth decade. Previous studies have estimated that young patients of less than 40 years, old make up between 2% and 6% of all AMI.[3,4,5] AMI in young patients has different characteristics from that in older. They may or may not

have atherosclerosis. The classic presentation of worsening angina culminating in MI is rare in younger patients. The first onset of angina that rapidly progresses to fully evolved MI is often the case in patients less than 45 years of age.[6] Notably, young patients are at increased risk to be misdiagnosed, since they do not frequently have traditional coronary risk factors.[7] The causes of AMI among patients less than 45 years of age can be divided into 4 categories; (1) Atheromatous coronary artery disease, (2) Non-atheromatous coronary artery disease, (3) Hyper-coaguable states and (4) AMI related to substance abuse. Coronary angiography (CAG) performed in young patients with acute myocardial infarction has identified a relatively high incidence of normal coronary arteries, non-obstructive stenosis or single-vessel disease. Risk factor analysis in young AMI patients has revealed a high prevalence of current smoking, hyperlipidemia and family history.[8,9] AMI in young adults assumes significance because of its devastating effect on active life style, psychological trauma and the financial constraints for the person, treating physician and the family.[10] We chose to compare the young and old group of acute STEMI patients vis-a-vis their clinical presentation, risk factors, coronary angiography findings and in-hospital outcome.

METHODS

The present study is a single center, prospective, observational study conducted on consecutive patients admitted with Acute ST - Elevation Myocardial Infarction, comparing 30 young (Age < 45 years) and 30 old patients (Age ⩾ 45 years). Patients were admitted in cardiology department of GMC Srinagar. Study included 30 patients in each group (young and old) of either sex admitted in intensive cardiac care unit, between year 2012-13 needing detailed evaluation, close monitoring and care in an effort to study and compare their clinical status, risk factors, coronary angiography findings and in-hospital clinical outcome.

Study Protocol

A detailed history was taken and meticulous physical examination was done to assess the clinical presentation and risk factors associated with myocardial infarction. Conventional risk factors like age, smoking, hypertension, diabetes, dyslipidemia, family history of CAD were studied.

- **CURRENT SMOKING** was defined as per CDC guidelines as any patient who had smoked at least 100 cigarettes in his/her entire life time and who at the time of survey smoked either everyday or some days.
- **DIABETES MELLITUS** was defined as patients diagnosed on the basis of fasting glucose ⩾ 126 mg/dl or Serum HbA1C > 6.5% or symptoms of diabetes plus random blood glucose ⩾ 200mg/dl or patients on anti-diabetic drugs.[11]
- **SYSTEMIC HYPERTENSION** was considered to be present if the patient was taking anti-hypertensive medication at the time of presentation or if blood pressure recorded was equal to or greater than 140 mmHg systolic and, equal to or greater than 90 mmHg Diastolic, at least on two separate occasions.[11]
- **POSITIVE FAMILY HISTORY OF PREMATURE** CAD was defined as any first degree relative that has documented CAD below the age of 55 years in males and 65 years in females.[11]
- **DYSLIPIDEMIA** was considered if total Cholesterol was equal to or greater than 200 mg/dl, LDL Cholesterol equal to or greater than 130mg/dl, HDL Cholesterol less than 40mg/dl and Serum Triglycerides > 150 mg/dl or combination of these criteria.[11]
- **BODY MASS INDEX** was derived from Quetlets formula (Wt. (kg)/ Ht. $(m)^2$). Members were labeled obese, if BMI was equal to or greater than 30.[11]
- **WAIST HIP RATIO** was measured according to standard technique. A ratio of greater than 0.9 was taken as abnormal in females and greater than 1.0 in males.[11]

All baseline investigations including complete blood count, kidney function tests, blood glucose levels, liver function tests, ECG, Chest X ray, Urine examination were done to begin with. In

addition Lipid profile, Serum Homocysteine levels were also done in every patient and other relevant investigations for hypercoagulable states were done in selected cases only. Echocardiography was done in order to assess the regional wall motion abnormality and LV function. Coronary angiography was done to study the pattern of coronary artery disease and decide about the further management (PTCA / CABG / Medical management).

Finally, clinical outcome during the hospital stay was studied in each patient and a comparison was drawn between the young and old group of patients. Following parameters were taken to study the clinical outcome:

1. Mortality / Death in hospital.
2. Response to thrombolysis.
3. Haemodynamic instability (Heart Failure and Shock).
4. Arrythmias (Tachyarrythmias and Bradyarrythmias).
5. Need of resuscitation.
6. Need of percutaneous revascularization.
7. Mechanical Complications (VSD and MR).
8. Echocardiographic features at the time of discharge (LV ejection fraction and clot).
9. Post-MI angina.
10. Pericarditis.

Criteria of inclusion

Patients of all age group fitting in the diagnostic criteria of Acute STEMI.

Criteria of exclusion

Critically ill patients with a predicted life span of less than 6 months like:

- Solid organ / Hematological Malignancies.
- Transplant patients.
- Patients suffering from AIDS who are at the terminal stage of illness.
- Patients suffering from Chronic Liver Disease (Child class C, MELD score > 30).

Statistical analysis

Descriptive analysis was carried out. Continuous variables are presented as mean ± standard deviation (SD) and were categorized into groups, and categorical variables are presented as frequencies and percentage. Nominal categorical data between the groups were compared using Chi-square test or Fisher's exact test as appropriate. The comparison of normally distributed continuous variables between the groups was performed using Students 't' test. $P<0.05$ was considered statistically significant. All statistical testing was conducted with the statistical package for the social science system version SPSS 17.0.

RESULTS

The mean age distribution was 38±4.65 years in young group and 55±7.15 years in old group (table 1)

Male predominance was found in both young and old patients (86.7% vs. 83.3%). Anterior Wall MI (30%) was more common in young group, followed by Inferior Wall MI (23.3%). On the other hand, Inferior Wall MI (26.7%) was more common in old group, followed by Anterolateral MI (23.3%) and Anterior Wall MI (20.0%). Chest pain (90.0% vs. 86.7%), Breathlessness (40 % vs. 23.3%) , features of Heart Failure (33.3% vs. 13.3 %), Syncope (6.7 % vs 3.3%) and Arrhythmias (16.7 % vs 10.0 %) were found more common in old group as compared to young group. Diaphoresis (40.0% vs. 30%) and Palpitations (30.0% vs 20.0%) were found more common in young group as compared to old group. But, the difference in each of these presentations was not statistically significant. The Waist Hip Ratio was significantly more (> 1 in males and > 0.9 in females) in 53.3% young patients as compared to 23.3 % old patients. (p=0.017).

76.7 % young patients were Killip Class 1 as compared to 40.0% old patients with (p= 0.031). HDL Cholesterol was < 40 mg/dl in 66.7% young patients as compared to 36.7% old patients with (p =0.020). Triglycerides were > 150 mg/dl in 76.7% young as compared to 50.0 % old patients with (p=0.032).(table 2)

When risk factors were compared between the two groups, hypertension was significantly found in 73.3% old patients as compared to 26.7% young patients (p

<0.001) . T2DM was also more in old group (43.3%) as compared to young group(16.7%)(p=0.027). Smoking was found to be more common in young group (83.3%) as compared to old group (53.3%) with p value of 0.012. 6.7% young patients were drug abusers as compared to 3.3% old. One young patient was found to have Opioid abuse and second was found to be cocaine abuser. Single Old patient was found to be Cannabis abuser. Family History of CAD was found in 46.7% young as compared to 20% old patient with p value of 0.028. (table 3)

Comparing the angiographic profile of two groups, SVD was more common in young group (66.7%) as compared to old group (40%) (p = 0.020). LAD was most common CAG finding in SVD patients in young group (53.3%) as compared to old group (23.3%) (p=0.017); (Fig.1&2)

Successful thrombolysis (ECG ST elevation subsidence > 50%, 90 minutes post thrombolysis) was found in 93 % young and 83.3% old patients (p=0.424). In-hospital outcome was slightly favorable in young group but it was not statistically significant (Table 4)

Table – 1: Age distribution

Age Groups		Frequency	%	Mean ± SD
< 45 yrs	**25 - 34 yrs**	9	15.0%	38.27 ± 4.65
	35 - 44 yrs	21	35.0%	
⩾45 yrs	**45 - 54 yrs**	17	28.3%	55.57 ± 7.15
	⩾ 55 yrs	13	21.7%	
Total		60	100%	

Table – 2: Lipid profile

	Total	Age Groups				P value
		< 45 yrs	%	⩾ 45 yrs	%	
T.Cholesterol>200	**28**	16	53.3%	12	40.0%	**0.301**
LDLCholesterol>130	**39**	19	63.3%	20	66.7%	**0.787**
HDLCholesterol <40	**31**	20	66.7%	11	36.7%	**0.020**
TGs>150	**38**	23	76.7%	15	50.0%	**0.032**

DISCUSSION

Acute Myocardial infarction is now-a-days becoming increasingly prevalent in young population; reasons may be manifold, more apparent being changes in lifestyle, stress, drug abuse, and smoking. Our study was aimed to draw a comparison between patients of Acute STEMI in young and old age groups. In our study, 30 young (< 45 years) patients were compared with 30 old (⩾ 45 years) patients admitted with Acute STEMI. Mean age of presentation was 38 ± 4.65 years in young group and 55 ± 7.15 years in old group. It was comparable with the study of Panduranga P, et al[12] in which mean age of young vs. old group was 36 ± 4 vs. 61 ± 11 years. Thus it can be said that young

patients suffer from AMI in their fourth decade.

Male predominance was found in both the groups. Males comprised 86.7% and females comprised 13.3% in young group as compared to 83.3% and 16.7% in old group, suggesting that male sex is a common non-modifiable risk factor in both the groups. Baudi E et al[13] found in their study of young MI that males were 87% and females were 13% which was consistent with our study. However Panduranga P, et al[20] found that more men were seen in the younger age group (81% vs. 60%; P <0.001) which was in contrast to our study where we found no statistically significant difference between the male predominance in both the groups (86.7% vs. 83.3%). Comparing the clinical profile of the young and old group, Chest pain was most common presenting symptom in both the groups. 86.7% young and 90% old patients presented with Chest pain. Woon VC et al[14] also found that chest pain was the most common presentation in both age groups, but more likely in the young than the elderly (89.3 % vs. 66.3 %; P < 0.001) which was not consistent with our study.

Table – 3: Risk Factors

Risk Factors	Total	Age Groups				P value
		< 45 yrs	%	⩾ 45 yrs	%	
None	3	3	10.0%	0	0.0%	0.237
Obesity	20	11	36.7%	9	30.0%	0.584
HTN	30	8	26.7%	22	73.3%	<0.001
Type 2 DM	18	5	16.7%	13	43.3%	0.024
Alcoholic	8	6	20.0%	2	6.7%	0.254
Smoker	41	25	83.3%	16	53.3%	0.013
Drug Abuse	3	2	6.7%	1	3.3%	1.000
Family History of CAD	20	14	46.7%	6	20%	0.029

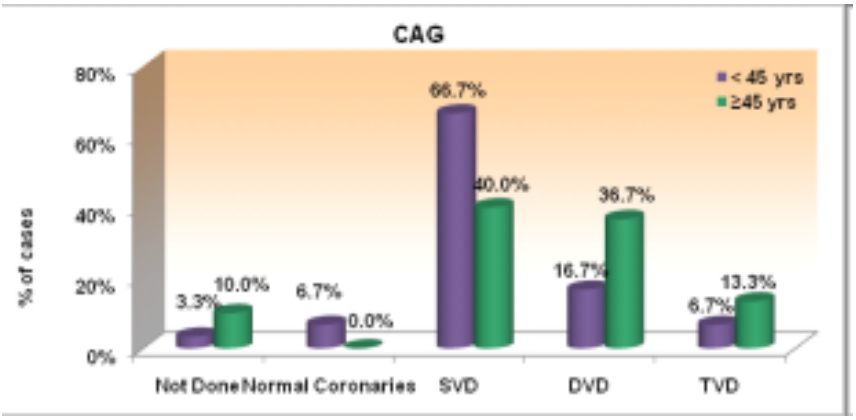

Fig. 1: Coronary Angiography profile

In our study majority of young patients (76.7%) were Killip Class 1 as compared to the old patients (40%) (p=0.040) whereas 10% young patients were admitted with Killip Class 4 with features of Heart failure and shock as compared to 36.7% old patients (p=0.015). Ranjith N, et al[15] found in their study 92% young patients were Killip class 1 and 0.8% young patients were Killip Class 4.

Comparing the risk factor profile, 3 young patients (10%) had no risk factors. In contrast every patient in the old group was found to have single or multiple risk factors. Smoking was the most common risk factor in the young group (83.3% vs 53.3%; p=0.012). It was consistent with the study of Brain D. Hoit, et al[9]. 82% of the

patients (Age < 45 years) were current smokers. Wolfe MW, et al[16] also found smoking as the most common risk factor in young patients amounting to 89% of patients (Age < 35 years) , which was consistent with our study. Mark G. Kanitz, et al[17] found tobacco use in 81% of the patients, results consistent with our study. Fournier JA et al[5] found cigarette smoking as the most common risk factor in 94.5% young patients, which is also comparable with our study. Pedro J. Morillas, et al[18] found greater prevalence of cigarette smoking (80.9% young vs 34.1% old patients; p<0.0001) which is comparable with our study. Family history of CAD was also found more common in patients belonging to the young group (46.7% vs 20%; p=0.028). It was consistent with the studies of Brain D. Hoit et al[8] who found family history of CAD in 41% of the young patients (Age < 45 years) and Mark G. Kanitz et al[17] who found history of CAD reported in 40% of the patients (Age <40 years). Hosseini SK et al[19] also family history of CVD more in young (Age ⩽ 40 years) as compared to old patients (Age > 40 years) (50.5% vs 23.4%) which is consistent with our study. Chen L et al[6] found it in 39% young vs. 11% old patients (p <0.001) comparable with our study. Hypertension was the most common risk factor in the patients of old group (73.3% vs 26.7% ; p <0.001) which was consistent with many previous studies.[13,16,17,19,20] Type 2-Diabetes Mellitus was also a major risk factor among the old patients (43.3% vs 16.7%; p=0.027) similar to earlier studies.[13,16] Dyslipidemia was a major risk factor in young patients as compared to the old patients. HDL

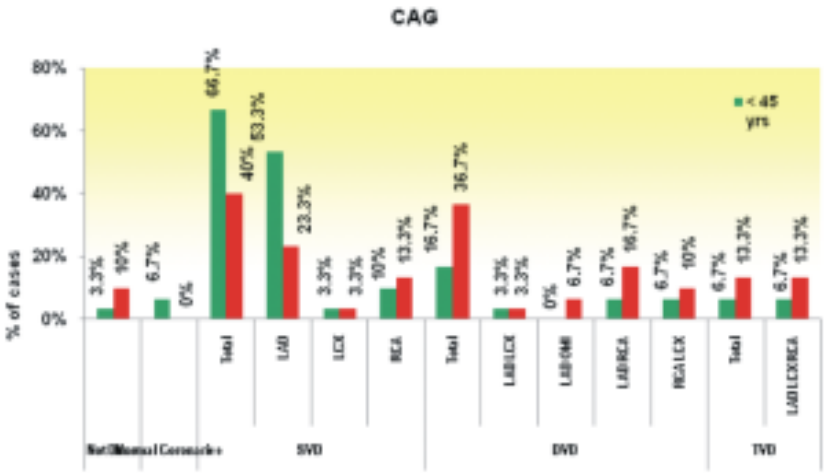

Fig.2: Coronary Angiography profile

		Age Groups				P value
		< 45 yrs	%	⩾ 45 yrs	%	
Heart failure		3	10.0%	8	26.7%	**0.181**
Shock		2	6.7%	6	20.0%	**0.254**
Tachyarrythmias		2	6.7%	3	10.0%	**1.000**
Bradyarrythmias		2	6.7%	6	20.0%	**0.254**
Need of Resuscitation		2	6.7%	5	16.7%	**0.424**
Need of Percutaneous vascularisation	**Total**	22	73.3%	25	83.3%	**0.347**
	Early	3	10.0%	4	13.3%	**1.000**
	Late	19	63.3%	21	70.0%	**1.000**
VSD		0	0.0%	1	3.3%	**1.000**
MR		2	6.7%	7	23.3%	**0.145**
LVEF<50%		2	6.7%	8	26.7%	**0.612**
Clot		0	0.0%	1	3.3%	**1.000**
Post MI angina		1	3.3%	3	10.0%	**0.692**
Pericarditis		0	0.0%	2	6.7%	**0.492**
Death		2	6.7%	4	13.3%	**0.671**

Cholesterol <40 mg/dl was found in 66.7% young and 36.7% old patients (p=0.020). Hypertriglyceridemia (S.TGs> 150mg/dl) was also common in young group as compared to the old group (76.7% vs 50.0%; p=0.032). Our study was comparable with the results of Chen L et al[6], Su-Kiat Chua et al[21] who also found Lower HDL and higher plasma triglyceride levels more in young group as compared to the old group.

Comparing the coronary angiography profile, SVD was more common in young group (66.7%) as compared to old group (40%) (p=0.020). LAD was most common CAG finding in SVD patients in young group (53.3%) as compared to old group (23.3%). The results were consistent with the study of Hussein A. Fakhir et al[22] who found LAD as the most common vessel involved in 41% young (Age <45 years) patients. The study of Chen L et al[6] showed a preponderance of SVD (54% vs 36%; p<0.001) in young as compared to old patients which is comparable with our study. Mark G. Kanitz et al[17] found in their study of young patients (Age <40 years) that approximately 24% of patients had multi-vessel coronary atherosclerosis; 62% had single vessel disease; and 14% had normal coronary arteries. Difference in in-hospital outcome measured by various parameters of morbidity and death was statistically insignificant in two groups.

LIMITATIONS

There are several limitations of this study as medium and long term outcomes of these patients are not available. Due to affordability issues of the patients, thrombolytic agent was also not the same for every patient.

CONCLUSIONS

Male predominance was found in both young and old group. Majority of young patients were Killip class 1 as compared to their older counterparts. Hypertension and Diabetes was significantly commoner in old group but current smoking, family history of CAD, dyslipidemia (HDL < 40 and TGs > 150) was common in young as compared to old patients. Single vessel disease (SVD) was the most common angiographic finding in young group and LAD being the most common culprit artery among these. Differences in the parameters of in-hospital outcome was statistically insignificant.

REFERENCES

1 MA Dolder and MF Oliver, Myocardial infarction in young men. *Br Heart J* **1975; 37**: pp. 493–503. 19.

2 Bergstrand R, Vedin A, Wilhelmsson C, Wilhelmsen L. Myocardial infarction among men below age 40 in Goteborg. In ref. 2: 23-8.

3 Murray CJ, Lopez AD. Mortality by cause for eight regions of the world Global burdens of disease study. Lancet 1997; 349: 1269- 1276.

4 Imazio M, Bobbio M, Bergerone S, Barlera S, et al. Clinical and epidemiological characteristics of juvenile myocardial infarction in Italy : The GISSI experience. G Ital Cardiol 1998; 28: 505-512.

5 Fournier JA, et al; Sánchez A, Quero J, Fernández-Cortacero JA, González-Barrero. Myocardial infarction in men aged 40 years or less: a prospective clinical angiographic study. 1996; 19(8): 631.

6 Chen L, Chester M, Kaski JC. Clinical factors and angiographic features associated with premature coronary artery disease. Chest. 1995; 108(2): 364.

7 Rey P. Vivo, and Selim R, Krim. ST Elevation Myocardial Infarction in a Teenager; Case Report and Review of the literature. Southern Medical Journal 2009; 102: 523 – 526.

8 Barbash GI, White HD, Modan M, Diaz R, Hampton JR, Heikkila J, et al. Acute myocardial infarction in the young-the role of smoking. Eur Heart J 1995; 16: 313-316.

9 Brian D. Hoit, Elizabeth A. Gilpin et al. From the Division of Cardiology, Department of Medicine, University of California, San Diego; Myocardial infarction in young patients: an analysis by age subsets . Circulation 1986; 74, No. 4: 712-721.

10 Egred M, Vishvanathan G, Davis GK, Myocardial infarction in young adults. Postgrad. Med. J. 2005; 81: 741-745.

11 Alvin Powers. Diabetes Mellitus: Management and Therapies. Chapter 48,Harrison's Principles of Internal Medicine 19th ed: Pg 1407-1416.

12 Panduranga P, Sulaiman K, Al-Zakwani I, Abdelrahman S. Acute coronary syndrome in young adults from Oman: results from

the gulf registry of acute coronary events. Heart Views. 2010 Oct; 11(3): 93-8.

13 Badui E, Rangel A, Valdespino A, Graef A, Plaza A, Chávez E, Ramos MA, Lepe L, Cruz H, Enciso R. Acute myocardial infarct in young adults. A report of 142 cases. Arch Inst Cardiol Mex. 1993 Nov-Dec; 63(6): 529-37.

14 Woon VC, Lim KH. Acute myocardial infarction in the elderly - the differences compared with the young. Singapore Med J. 2003 Aug; 44(8): 414-8.

15 Ranjith N, Verho NK, Verho M, Winkelmann BR. Acute myocardial infarction in a young South African Indian-based population: patient characteristics on admission and gender-specific risk factor prevalence. Curr Med Res Opin. 2002; 18(4): 242-8.

16 Wolfe MW, Vacek JL. Myocardial infarction in the young. Angiographic features and risk factor analysis of patients with myocardial infarction at or before the age of 35 years. Chest. 1988; 94(5): 926.

17 Mark G. Kanitz, Sam J Giovannucci, Jeffery S Jones, Michael Mott. Myocardial infarction in young adults: Risk factors and clinical features. March-April 1996; 139-145.

18 Pedro J. Morillas, Adolfo Cabadés, Vicente Bertomeu et al. Acute Myocardial Infarction in Patients Under 45 Years. Rev Esp Cardiol 2002; 55(11): 1124-31.

19 Hosseini SK, Soleimani A et al. Clinical features, management and in-hospital outcome of ST elevation myocardial infarction (STEMI) in young adults under 40 years of age. Monaldi Arch Chest Dis. 2009 Jun; 72(2): 71-6.

20 Kaul U, Dogra B, Manchanda SC, Wasir HS, Rajani M, Bhatia ML. Myocardial infarction in young Indian patients: risk factors and coronary arteriographic profile. Am Heart J. 1986 Jul; 112(1): 71-**5.**

21 Su-Kiat Chua et al. Acute ST-elevation Myocardial Infarction in Young Patients: 15 Years of Experience in a Single Center. Clin. Cardiol. 2010; 33(3): 140-148.

22 Hussein A. Fakhir Nafakhi. Coronary angiographic findings in young patients with coronary artery disease. International Journal of Collaborative Research on Internal Medicine & Public Health 2013; Vol. 5, No. 1.