Original Article

A study on Acute Myocardial Infarction with special reference to age, sex, type of infarct and associated risk factors

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ABSTRACT

Objectives: To study the frequency of acute myocardial infarction (AMI) and its types in patients admitted in CCU of Divisional Headquarter Hospital (DHQ), Faisalabad Institute of Cardiology (FIC) Faisalabad and to investigate associated risk factors.

Methodology: It was an observational hospital based study conducted at Cardiac Care Centre, DHQ Hospital Faisalabad and FIC from 30th March 2009 to 30th June 2009. One hundred patients were included in the study at both centers. A Performa was filled with tabulated questions and information was recorded. The data was analyzed on SPSS version 13.

Results: It revealed statistically significant difference by patient's age and sex. AMI was higher in males (CI = 75 - 91%) than females (CI = 9 - 25%). Types of infarction including inferior and anteroseptal were observed in significantly higher number of patients, while extensive anterior, non-STEMI and lateral infarction was observed in significantly less number of patients. Results showed significant association (P<0.05) of fat sources in diet with types of AMI. Hypertension (CI = 36-56), smoking (CI = 30-50), family history of IHD (CI = 26-45) were stronger risk factors than others and 19% patients admitted with AMI had Diabetes Mellitus.

Conclusion: AMI was significantly higher in patients between 40 and 50 years of age. Age and sex and fat sources in the diet showed significant association with AMI, while family history of IHD, hypertension and smoking were other stronger risk factors.

KEY WORDS: Acute Myocardial Infarction, Diabetes Mellitus, Risk factors.

Pak J Med Sci January - March 2012 Vol. 28 No. 1 143-148

How to cite this article:

Javed I, Iqbal MJ, Arshad S, Javed MT, Masood MZ. A study on Acute Myocardial Infarction with special reference to age, sex, type of infarct and associated risk factors. Pak J Med Sci 2012;28(1):143-148

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* Received for Publication: October 22, 2011
* Revision Received: January 9, 2012
* Revision Accepted: January 22, 2012

INTRODUCTION

Acute myocardial infarction (AMI) is associated with about 35% of all acute emergencies. It is becoming an important health issue in developing countries.[1] Myocardial infarction occurs due to occlusion of blood vessels supplying the cardiac muscles thus causing their necrosis which may result into heart failure.[2] The latter, is characterized by diastolic dysfunction alone or with systolic dysfunction, which in about 3% of the people may remain asymptomatic and can be identified by echocardiography.[3] About 25% of AMI patients may not show classical signs and thus are termed as "silent". There are various risk factors predisposing to acute myocardial infarction. These include smoking, hypertension, high blood cholesterol, obesity, physical inactivity and diabetes. A recent

study from Pakistan reported a strong association of smoking, dyslipidemia and obesity with Myocardial Infarction.[4] AMI is one of the leading causes of mortality which is about nine times higher in patients with age more than 65 years.[5]

Diabetes is a worldwide problem and is on the increase mainly due to type-2 diabetes. It is speculated that the situation of diabetes may get worse in near future and may increase from 2.8% (2000) to 4.4% in 2030.[6] Diabetes has a strong association with AMI as AMI is about 2-4 times higher in diabetics.[7,8] A study from Pakistan revealed 43% prevalence of diabetes in patients having AMI, while another study reported it to be 32% in AMI patients.[4,9] Diabetic patients report late about the symptoms of AMI that delays the fibrinolytic therapy and PTCA in them.[10] It is recommended that diabetic patients having AMI should receive thrombolytic very early to reduce the mortality.[11,12] It is evident that, ischemic heart disease (IHD) is the common cause of deaths in diabetics.

The present study was conducted to find out the association of various risk factors with diabetes in AMI along with different types of myocardial infarction.

METHODOLOGY

The study was carried out on one hundred consecutive patients admitted during 30th March 2009 to 30th June 2009 with Acute Myocardial Infarction in cardiac centre, Divisional Headquarter Hospital, Faisalabad and Faisalabad Institute of Cardiology (FIC). A study questionnaire was designed and used to record observations.

The inclusion criteria was: age between 35-75 years of either sex; Chest pain of 30 minutes to 24 hours duration; Patients with acute MI in the presence of ECG changes of myocardial infarction of ST-segment elevation and non-elevation and raised cardiac enzymes (CK level to more than twice the normal value along with CK-MB fraction more than 6% of the CK value).[14] Determination of ST-segment morphology was done by noting two points on the initial, up-sloping portion of the elevated ST segment: the J point (the point at which the QRS complex ends and the ST segment begins) and the apex of ST-segment/T-wave complex.[13] Status of diabetes was determined on the basis of history (already known cases) or having fasting plasma glucose more than 126 mg/dl (more than 7.0 mmol/L) or two hours plasma glucose more than 200 mg/dl (11.1 mmol/L), during an oral glucose tolerance test at the time of hospital admission.

The exclusion criteria was: old myocardial infarction; Non-Q MI; Unstable Angina; Valvular Heart Diseases; Cardiomyopathy; Pre-existing systemic end stage disease. Admitted patients with acute myocardial infarction were divided in two groups, diabetics and non-diabetics. All patients were thrombolysed, excluding contraindication to thrombolysis. Other standard treatment of acute MI was given.

The data were analysed by using univariate and multivariate analysis procedures using Pearson chi-square test, Fisher's test and Mantel-Haenszel chi-square test. Odds ratio and 95% Confidence Intervals were also computed by using computer software package SAS 9.1.

RESULTS

Results revealed significant difference in patient's age who had AMI (Table-I). It was higher ($P<0.001$) in patients of 40-50 years of age, while lower in patients of 35 and less than 35 years of age and those had age higher than 60 years. The AMI was significantly higher in males (OR = 27.6). Inferior and anteroseptal infarctions were observed in significantly ($P<0.0001$) higher number of patients compared with other types of infarcts. Significantly higher numbers of patients reached to hospital by personal car or motorbike ($P<0.0001$) compared with other modes of travel. Dyslipidemia (CI = 16 – 34%), diabetes (CI = 12 - 28%), family history of IHD (CI = 26 - 45%), hypertension (CI = 36 - 56%) and smoking (CI = 30 - 50%) were not associated with AMI in patients under study (data not shown). However, there was significant difference observed in types of fat sources used in diet. Banaspati ghee was used by significantly higher number of patients, as compared to Desi Ghee (CI = 41 - 61%) vs (CI = 10 - 26%). About 79% patients (CI = 70 – 87%) were thrombolysed.

In diabetic, non-diabetic and after adjusting for diabetes, results revealed significant association of AMI with age (46-50 years), sex (male), type of fat sources (banaspati ghee) and type of infarction (inferior, anteroseptal) (Table-II). Dyslipidaemia was not associated with AMI in with diabetic, non-diabetic patients and after adjusting for diabetes. Family history of Ischemic heart disease showed significantly low association in non-diabetic and after adjusting for diabetes. Hypertension did not show association with AMI in diabetic, non-diabetic patients and after adjusting for diabetes. Smoking also showed significantly low association with AMI in diabetic.

Table-I: Frequency of Occurrence of Acute Myocardial Infarction in Patients of Different Groups.

	Frequency	*Percent*	*95% Conf. Limits*	
Age Groups				
35 & <	5*	5.0%	1.6	11.3
40 – 45	30**	30.0%	21.2	40
46 – 50	32**	32.0%	23	42.1
51 – 60	25	25.0%	16.9	34.7
61 & >	8*	8.0%	3.5	15.2
	Pearson's Chi-square P = 0.00; M-H Test for Trend P = 0.937			
Sex				
Female	16	16.0%	9.4	24.7
Male	84	84.0%	75.3	90.6
	ODDS RATIO = 0.04 [reciprocal = 27.56]			
Type of Myocardial Infarction				
Inferior	43**	43.0%	33.1	53.3
Anteroseptal	43 **	43.0%	33.1	53.3
Extensive Anterior	8 *	8.0%	3.5	15.2
Lateral	3 *	3.0%	0.6	8.5
Nstemi	3 *	3.0%	0.6	8.5
	Fisher's P = 0.0000			
Mode of Transport to Hospital				
Car	38 **	38.0%	28.5	48.3
Rickshaw	25	25.0%	16.9	34.7
1122 Ambulance	1 *	1.0%	0.0	5.4
Motor Bike	34 **	34.0%	24.8	44.2
General Ambulance	2 *	2.0%	0.2	7.0
	Fisher's P = 0.0000			
Type of Ghee/oil Used				
Desi Ghee	17*	17.0%	10.2	25.8
Banaspati Ghee	51**	51.0%	40.8	61.1
Vegetable Oil	32	32.0%	23.0	42.1
	Chi-sq. P = 0.000			

The types of infarcts varied significantly after adjusting age, sex, dysplipidaemia, diabetes, family history of ischemic heart disease, source of fat in diet, hypertension and smoking (Table-III). Similarly, after adjusting for types of infarction, AMI showed significant association with age, sex, dyslipidaemia, diabetes, family history of ischemic heart disease, fat sources in the diet and smoking. Different types of infarct including inferior, anteroseptal and extensive anterior showed significant difference between different age groups. All types of infarcts were significantly higher in males compared with females. Dyslipidaemia was present in 2 to 35% of patients, diabetes in 3 to 25% of patients and smoking in 25 to 52% of patients having different types of infarction. The odds of occurring lateral infarction were four times higher in patients having family history of ishaemic heart disease, while the other types of infarcts occurred less frequently. Inferior and extensive anterior infarction showed significant association with type of fat sources used in the diet. Hypertension was about 2.8 times higher in patients with extensive anterior infarction, while it was less important in other types of infarcts.

DISCUSSION

Acute myocardial infarction is emerging as one of the leading causes of human deaths in Pakistan. There are various risk factors associated with AMI. Our results showed significant association of age with AMI in diabetic, non-diabetic, after adjusting for diabetes and is significant at the age between 40 and 50 years (P<0.001), while it was less significant in people below 35 or more than 61 years old. We also found that with the increase in age up to 50 years the chances of AMI also increased. However, with further increase in age, chance of AMI significantly decreases. Furthermore, age showed significant association with type of myocardial infarction as extensive anterior infarction was significantly higher in patients of 51-60 years of age and the trend analysis (type of infarction with increase in age) also showed significant association of extensive anterior and lateral infarction with increase in age but not the other types of infarction. Earlier studies from Pakistan reported a mean age of 51 and 56 for AMI.[4,15] There is little difference in mean age in three studies, however, the results of these

Table-II: Frequency of Occurrence of AMI in diabetic and non-diabetic patients of different Groups.

Parameters	*Diabetic N (%)*	*Non-diabetic N (%)*	*Relative Risk*
Age Groups			
35 & <	0 (0.0)	5 (6.2)	0
40 – 45	3 (15.8)	27 (33.3)	0.47
46 – 50	9 (47.4)	23 (28.4)	1.67
51 – 60	5 (26.3)	20 (24.7)	1.07
61 & >	2 (10.5)	6 (7.4)	1.42
	Fisher's P = 0.0029	Fisher's P = 0.0000	
	Mantel-Haenszel P = 0.000		
Sex			
Male	14 (73.7)	70 (86.4)	0.85
Female	5 (26.3)	11 (13.6)	1.94
	Chi-square P = 0.004; OR = 7.84	Chi-square P = 0.000; OR = 40.50	
	Mantel-Haenszel P = 0.000; MH-OR = 25.20		
Dyslipidemia			
Yes	2 (10.5)	22 (27.2)	0.388
No	17 (89.5)	59 (72.8)	1.228
	Fisher's P = 0.000; OR = 0.01	Chi-square P = 0.000; OR = 0.14	
	Mantel-Haenszel P = 0.000; MH-OR = 0.11		
Family History of IHD			
Yes	7 (36.8)	28 (34.6)	1.066
No	12 (63.2)	53 (65.4)	0.91
	Chi-square P = 0.105; OR = 0.34	Chi-square P = 0.000; OR = 0.28	
	Mantel-Haenszel P = 0.000; MH-OR = 0.29		
Type of Fat Sources in Diet			
Desi Ghee	2 (10.5)	15 (18.5)	0.57
Banaspati Ghee	11 (57.9)	40 (49.4)	1.17
Vegetable Oil	6 (31.6)	26 (32.1)	0.98
	Fisher's P = 0.0095	Fisher's P = 0.0002	
	Mantel-Haenszel P = 0.000		
Hypertension			
Yes	7 (36.8)	39 (48.1)	0.765
No	12 (63.2)	42 (51.9)	1.218
	Chi-square P = 0.105; OR = 0.34	Chi-square P = 0.637; OR = 0.86	
	Mantel-Haenszel P = 0.260; MH-OR = 0.73		
Types of MI			
Inferior	6 (31.6)	37 (45.7)	0.69
Anteroseptal	10 (52.6)	33 (40.7)	1.29
Extensive	2 (10.5)	6 (7.4)	1.42
Lateral	1 (5.3)	2 (2.5)	2.13
Non-STEMI	0 (0.0)	3 (3.7)	0
	Fisher's P = 0.0001	Fisher's P = 0.0000	
	Mantel-Haenszel P = 0.000		
Smoking			
Yes	5 (26.3)	35 (43.2)	0.47
No	14 (73.7)	46 (56.8)	1.297
	Chi-square P = 0.004; OR = 0.13	Chi-square P = 0.084; OR = 0.58	

studies show that AMI is occurring now at relatively younger age compared with previous years.

The males (CI = 75 - 91) have higher chances for AMI than females (CI = 9-25%). However, the occurrence of AMI in diabetic males was far less (OR = 7.8) than in non-diabetic males (OR = 40.5). Earlier a study from Pakistan reported male to female ratio of 1.5:1 in diabetic and 5.8:1 in non-diabetic groups.[4] Thus results of both the studies suggest that diabetic females are at higher risk of developing AMI than non-diabetic females. This is also clarified by our results that the relative risk of AMI in diabetic males is lower than non-diabetic males (0.9), while it is about two times in diabetic females than non-diabetic females (1.9). Similarly, all types of AMI were significantly higher in males than female. A higher prevalence of IHD in male than female has been reported in a study from England[16] and a study from Pakistan.[9] However, previous studies reported higher death rates among diabetics than non-diabetic that was not studied in our investigations.[9,17,18]

Table-III: Frequency of Occurrence of different types of myocardial infarction in patients of different Groups.

	Types of Myocardial Infarction					*Statistic*
	Inferior N (%)	*Anteroseptal N (%)*	*Extensive Anterior N (%)*	*Lateral N (%)*	*Nstemi N (%)*	*(difference between types of infarction)*
Age						
35 & <	4 (9.3)	1 (2.3)	0 (0)	0 (0)	0 (0)	M-H P = 0.000
40 - 45	14 (32.6)	15 (34.9)	0 (0)	0 (0)	1 (33.3)	
46 - 50	13 (30.2)	16 (37.2)	2 (25.0)	0 (0)	1 (33.3)	
51 - 60	10 (23.3)	7 (16.3)	6 (75.0)	2 (66.7)	0 (0)	
61 & >	2 (4.7)	4 (9.3)	0 (0)	1 (33.3)	1 (33.3)	
	Fisher's P = 0.0011	Fisher's P = 0.0000	Fisher's P = 0.0002	Fisher's P = 0.6140	Fisher's P = 1.0000	
	Mantel-Haenszel P = 0.000					
Sex						
Male	33 (76.7)	37 (86.1)	8 (100)	3 (100)	3 (100)	M-H P = 0.000
Female	10 (23.3)	6 (13.9)	0 (0)	0 (0)	0 (0)	
	OR = 10.89	OR = 38.03	OR = infinity	OR = infinity	OR = infinity	
	Mantel-Haenszel P = 0.000; MH-OR = 22.50					
Dyslipidemia						
Yes	5 (11.6)	16 (37.2)	1 (12.5)	1 (33.3)	1 (33.3)	M-H P = 0.000
No	38 (88.4)	27 (62.8)	7 (87.5)	2 (66.7)	2 (66.7)	
	OR = 0.02	OR = 0.35	OR = 0.02	OR = 0.25	OR = 0.25	
	Mantel-Haenszel P = 0.000; MH-OR = 0.12					
Diabetes						
Yes	6 (14.0)	10(23.3)	2(25.0)	1 (33.3)	0 (0)	M-H P = 0.000
No	37 (86.0)	33 (76.7)	6 (75.0)	2 (66.7)	3 (100)	
	OR = 0.03	OR = 0.09	OR = 0.11	OR = 0.25	OR = 0.0	
	Mantel-Haenszel P = 0.000; MH-OR = 0.06					
Family History of Ischemic Heart Disease						
Yes	16 (37.2)	12 (27.9)	4 (50)	2 (66.7)	1 (33.3)	M-H P = 0.000
No	27 (62.8)	31 (72.1)	4 (50)	1 (33.3)	2 (66.7)	
	OR = 0.35	OR = 0.15	OR = 1.0	OR = 4.0	OR = 0.25	
	Mantel-Haenszel P = 0.000; MH-OR = 0.30					
Fat Sources in Food						
Desi Ghee	8 (18.6)	9 (20.9)	0 (0.0)	0 (0.0)	0 (0.0)	M-H P = 0.000
Banaspati Ghee	22 (51.2)	19 (44.2)	6 (75.0)	2 (3.9)	2 (3.9)	
Vegetable Oil	13 (30.2)	15 (34.9)	2 (25.0)	1 (5.6)	1 (5.6)	
	P = 0.005	P = 0.071	Fisher's P = 0.0069	Fisher's P = 0.6786	Fisher's P = 0.6786	
	Mantel-Haenszel P = 0.000					
Hypertension						
Yes	19 (44.2)	20 (46.5)	5 (62.5)	1 (33.3)	1 (33.3)	M-H P = 0.000
No	24 (55.8)	23 (53.5)	3 (37.5)	2 (66.7)	2 (66.7)	
	OR = 0.63	OR = 0.76	OR = 2.78	OR = 0.25	OR = 0.25	
	Mantel-Haenszel P = 0.264; MH-OR = 0.73					
Smoker						
Yes	18 (41.9)	15 (34.9)	3 (37.5)	1 (33.3)	3(100)	M-H P = 0.000
No	25 (58.1)	28 (65.1)	5 (62.5)	2 (66.7)	0 (0)	
	OR = 0.52	OR = 0.29	OR = 0.36	OR = 0.25	OR = infinity	
	Mantel-Haenszel P = 0.005; MH-OR = 0.46					

M-H = Mantel-Haenszel

Among other risk factors, hypertension (CI = 36-56%), smoking (CI = 30-50%) and family history of IHD (CI = 26-45%) were stronger risk factors compared with dyslipidemia (CI = 16-34%) and diabetes (CI = 12-28%). The dyslipidemia was considered when LDL-cholesterol was high along with high total cholesterol, triglycerides and low HDL-cholesterol. All these risk factors showed insignificant association with diabetes. A previous study reported smoking and dyslipidemia as major risk factors for STEMI.[4] Our results of lower percentage of diabetic (19%) patients having AMI were in concurrence with previous findings where 32% patients were found diabetic.[4] However, now we can see that this percentage has further decreased to almost half of previous suggesting that diabetic people are becoming more aware of what can happen to them and are caring more of their health, although diabetes is on the increase worldwide.

The results of the present study showed significant association of use of Banaspati ghee with AMI in diabetic, non-diabetic and after adjusting for diabetes, while the use of Desi ghee showed significantly less association suggesting that people who are using Banaspati ghee are at higher risk of having AMI, while those using Desi ghee are less likely to have AMI. The odds of occurring MI were 5 times higher when Banaspati ghee was used and the odds were 2.3 times higher when vegetable oil was used compared to when Desi ghee was used. Thus the patients who used Banaspati ghee or vegetable oil, the chances of occurrence of inferior infarction are greater in them compared with other types of AMI. However, it may be mentioned here that the use of Desi ghee is limited in general population due to its high cost and is mainly used by people with village background or living in villages and such people are also having active life style as they are more involved in physical work. Thus the suggestion about use of Desi ghee for general population should be made after thorough studies indicating its real usefulness. Furthermore, this is a small data and we cannot generalize these findings of better results of Desi ghee than other types of fats used in the diet. Further studies are required on large sample size to clarify these facts.

Among different types of AMI, inferior and anteroseptal infarction were recorded in significantly higher number of patients irrespective of diabetes and after adjusting for diabetes status. Previously, from Faisalabad in a study on STEMI patients, anterior infarction was the major finding.[4] Tipoo reported that anterior infarction was the major type,[9] and Culic et al also reported 47.7% anterior, 46.3% inferior and 6% lateral infarctions as the major types.[19] Our results were almost similar to the aforementioned studies with minor differences which are always expected to be there in different settings.[19]

We also studied the mode of transport to reach to the hospital. The mode of transport also suggests the kind of emergency service identified by people, conveyance they are having, social setup they belong or the place of occurrence of AMI at home of on the road. The use of 1122 service suggests that most of the cases did not happen on the road or the facility was not availed. The major mode of travel was car or motor bike, while the use of rickshaw was at third level.

CONCLUSION

AMI was significantly higher in patients between 40 and 50 years of age. Age and sex and fat sources in the diet showed significant association with AMI, while family history of IHD, hypertension and smoking were other stronger risk factors.

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Authors Contribution:

Iffat Javed: Concieved the idea, was involved in data collection, analysis and writing of the manuscript.

M. Javed Iqbal: Selection of topic, data collection, reviewed the results, discussion and gave final approval of the manuscript for publicaiton.

Sana Arshad: Participated in the study design, was involved in writing the proposal and the development of of questionaire.

M. Tariq Javed: Was involved in writing the proposal, performa designing, data analysis and write up of the manuscript including interpretation of results and discussion part.

Zahid Masood: Critically reveiwed the study and made suggestions in finalizing the study design. All aurthors have read and approved the final manuscript.