RISK FACTORS IN ACUTE MYOCARDIAL INFARCTION PATIENTS ADMITTED AT THREE HEALTH CENTRES OF SINDH, PAKISTAN: A CASE CONTROL STUDY

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ABSTRACT

OBJECTIVE: To determine the risk factors of acute myocardial infarction (AMI) among adults aged >40 years.

METHODS: A sample containing 100 cases and 200 controls were selected consecutively. Inclusion criteria for cases were patients with AMI, aged 40 years and above; while controls had patients with normal ECG interpretation, aged 40 years and above. Both genders (male/ females) were included as cases and controls. Patients with multiple admissions, with coma or critical condition or those who refused to participate in the study were excluded.

RESULTS: Among 300 subjects, there were 156 males (52%) and 144 females (48%). Majority of subjects (52%) belonged to 40-50 years of age group. Thirty-one percent subjects were over-weight. Majority was non-smokers and carried out exercise. Majority (67.7%) also reported normal cholesterol levels. Among them, 111 (37%) were hypertensive, 23% diabetic, while 51.66% reported stress in their previous life. Males were more likely to develop AMI versus females (OR=3.09, 95%CI=1.50-3.10). Age group 40-50 years was also highly associated with AMI (OR=5.36, 95%CI=2.70-10.72). Patients who were smokers, with positive family history of cardiac diseases, hyper-cholesterol levels, hypertension, diabetes, stress and having no physical activity were more likely to develop AMI versus their controls.

CONCLUSION: This study found that age group 40–50 years, male gender, over-weight, stress, hypertension and positive family history are the major risk factors for acute AMI in the study population and most of these risk factors are modifiable.

KEY WORDS: Acute myocardial infarction (Non-MeSH); Coronary Artery Disease (MeSH); Risk factors (MeSH); Stress (Non-MeSH), Hypertension (MeSH), Body Mass Index (MeSH).

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INTRODUCTION

Coronary artery disease (CAD) is one of the leading causes of death and disability worldwide.[1] Majority of the world population lives in the developing world and the increasing rate of cardiovascular diseases (CVD) in these countries is the driving force behind the continuing dramatic worldwide increase in CVD. In most of Eastern Europe, mortality for both CAD and CVD has shown increased trends up to the most recent period in countries including Bulgaria, Croatia, Romania, and especially the Russian Federation. An appreciable reversal of trends was observed in Poland, Germany, United Kingdom and the Czech Republic since the mid-1990s which is likely due to the improved dietary habits, smoking and other risk factors.[2] CAD is a major health issue in Pakistan in terms of morbidity and mortality, and in term of cost on the individual and the public health system. The incidence of acute myocardial infarction (AMI) in Pakistan was reported as one hundred thousand in the year 2002. One in four middle-aged adults in Pakistan has CAD.[3,4] Extensive clinical and statistical studies have identified several factors that increase the risk of heart attack. The most common cause of CVD is the CAD. Some of risk factors can be modified, treated or controlled such as smoking, high blood cholesterol, high blood pressure, physical inactivity, obesity and overweight and diabetes mellitus. Some of risk factors which cannot be modified include increasing age, sex, heredity and race.[5] This study was planned to determine the risk factors contributing to increased tendency for AMI in this hospital-based population since there is a dearth of quality data on the topic in this part of the world.

METHODS

This case-control study was conducted in three different hospitals of Sindh, Pakistan i.e. National Institute of Cardiovascular Diseases (NICVD), TABBA Heart Institute Karachi and Isra University Hospital Hyderabad. NICVD is a major public sector hospital while TABBA and Isra Hospitals are privately owned. The study was conducted from October 2007 to April 2008 after its approval from the respective institutions. A consecutive sample of 300 subjects was studied which included one hundred cases and two-hundred controls. For this study, a ratio of 1:2 for controls was taken

for convenience with 95% confidence interval to achieve the objectives. During the study period, patients with AMI admitted to wards were consecutively included in the study till sample size of 100 cases was achieved and controls were selected from close relatives and same community of the patients. Forty cases and 80 controls were taken from NICVD, 40 cases and 80 controls from TABBA and the rest of 20 cases and 40 controls were taken from Isra University Hospital on convenient basis. Inclusion criteria for cases included age 40 years and above with acute MI (elevated ST segment of ECG) admitted at these hospitals while controls included subjects with age > 40 years with normal ECG interpretation, since it was a comparative study. Both sexes (males and females) were included as cases and controls. Patients with multiple admissions in these hospitals, patients with coma or critical condition or those who refused to participate in the study were excluded. We also did not study the cardiac enzyme levels of the subjects as per study criteria. After permission from concerned Hospital Administration, a pre-tested questionnaire was used for data collection from subjects. Informed consent was obtained from the subjects or their relatives. Variables which were studied included: age, gender, marital status, race, occupation, level of education and income as well as smoking, Diabetes mellitus, Hypertension, Diet, Stress, family history and Hyperlipidemia. Obesity was measured on the basis of Body Mass Index > 25 which is a WHO cut off point for overweight and obese, while stress, as reported by the individual subjects. Finally, data analysis was performed through SPSS version 11.0. For this study, Odds Ratio (OR) was calculated for comparing cases and controls for different variables keeping the level of significance at 0.05.

TABLE I: SOCIO-DEMOGRAPHIC CHARACTERISTICS OF STUDY PARTICIPANTS

Variable	Frequency N=300	Percentage
Sex		
Male	156	52
Female	144	48
Age in years		
40-50 years	156	52
51-60 years	90	30
> 60 yeas	54	18
BMI (Body Mass Index)		
Normal (18.5-24.99)	107	35.67
Overweight (≥ 25, <30)	93	31
Obese (30 & above)	58	19.33
Underweight (below 18.5)	42	14
Smoking		
Yes	77	25.66
No	223	74.33
Exercise (walk & vigorous)		
Yes	227	75.67
No	73	24.33
Family history		
Yes	51	17
No	249	83
Hyperlipidemia profile (above normal)		
Yes	97	32.33
No	203	69.66
Hypertension		
Yes	111	37
No	189	63
Diabetes Mellitus		
Yes	69	23
No	231	77
Stress		
Yes	155	51.66
No	145	48.33
Eating fish and nuts		
Yes	261	87
No	39	13

RESULTS

In this study sample of 300, there were 156 males (52%) and 144 females (48%). Majority of subjects (52%) belonged to age group 40-50 years. Frequency of under-weight, normal weight, over weight and obese subjects is presented in table I. Among 300 subjects, majority (74.33%) was non-smokers and used to do exercise (75.66%) while 83% reported no family history of cardiac diseases. Details about cholesterol level, hypertension diabetes mellitus, and stress among subjects are also given in Table I-II. Regarding dietary pattern, when the study participants were asked about diet

TABLE II: RISK FACTORS ASSOCIATED WITH AMI AMONG CASES AND CONTROLS

Variable	Cases N= 100	Controls N= 200	Odds Ratio (OR)	95% CI
Sex				
Male	70	86	3.09	(1.50-3.10)
Female	30	114		
Age in years				
40-50	36	120	5.36	(2.70-10.72)
51-60	33	57	2.78	(1.34-5.78)
> 60 years	31	23		
BMI				
>25	51	100	1.04	(0.63-1.73)
<25	49	100		
Smoking				
Yes	43	34	3.68	(2.07-6.57)
No	57	166		
Exercise				
Yes	38	189	28.0	(12.85-62.48)
No	62	11		
Family History				
No	63	186	7.80	(3.78-16.30)
Yes	37	14		
Hyperlipidemia profile				
Yes	48	49	2.84	(1.66-4.88)
No	52	151		
Hypertension				
Yes	65	46	6.22	(3.53-10.85)
No	35	154		
Diabetes Mellitus				
Yes	52	17	11.66	(5.94-23.15)
No	48	183		
Stress				
Yes	97	58	79.6	(22.99-326.15)
No	3	142		
Eating fish and nuts				
No	34	5	20.09	(7.11-61.19)
Yes	66	195		

particularly eating fish and nuts, 78% responded positively. Table II also describes association of risk factors with MI among cases and controls. Males were three times more likely at risk of MI, compared to females (OR=3.09, 95%CI=1.50-3.10). When different age groups were compared, it was found that people aged 40-50 years were at more risk of AMI (OR=5.36, 95%CI=2.70-10.72). This study found no significant difference between BMI and AMI (OR=1.04, 95%CI=0.63-1.73). Cases who smoked and did not carry out physical activity or exercise were at higher risk of AMI versus their controls. It was found that most of the cases had family history of cardiac diseases. Those people who had positive family history of cardiac diseases were at higher risk of AMI as compared to controls. There was a significant association found between high lipid level in cases and AMI (OR=2.84, 95%CI=1.66-4.88) as compared to those who had normal lipid level.

DISCUSSION

Myocardial infarction is a leading cause of death among men and women globally. Women develop CAD later than men, yet the reasons for this are unclear. Nine modifiable risk factors are significantly associated with AMI in both men and women.[6] In the present study, out of 100 patients, 70% were males and 30% were females which indicates that this disease is more common in males as compared to females. MI can occur at any age but is more common in 40-50 years of age. According to one study,[7] South Asians have high rates of AMI at younger ages as compared to individuals from other countries but the reasons for this are unclear. The mean age for first AMI is also lower in South Asian countries (53 years) than in other countries (58.8 years).[7] Protective factors were lower in South Asian controls than in controls from other countries. When stratified by age, South Asians had more risk factors at ages younger than 60 years. The predictive probability of classifying an AMI case as being younger than 40 years was similar in individuals from South Asian countries and those from other countries.[7] The earlier age of AMI in South Asians can be largely explained by higher risk factor levels at younger ages. In the present study, the mean age of the participants was 53.28 (± 10.58) years, so the findings of present study are comparable with the international literature.

Exercise is a very important factor which can reduce the risk of MI. Light to moderate exercise can lead to vasodila-

tation and the cardiac output increases which is beneficial for the cardiac function but heavy exertion for prolonged time may lead to cardiac disease in the form of failure and ischemic heart diseases.[8] In the present study, there were 227 subjects out of 300 participants who were taking exercise. But among the 100 cases; there were only 38 patients who were doing exercises where as 62 patients were not doing the exercises. In 200 controls, 94.5% were doing exercise. So, it shows that exercise is a preventive factor for MI.

MI has also association with genetic and family history. According to one study,[9] the presence of multiple genetic and environmental risk factors greatly amplifies the risk of clinical thrombotic events which can lead to ischemic heart disease and MI. In the present study, all the cases and controls were asked about family history of MI and it was found that 70% of the cases had family history of MI which shows the significance of family history and its association with MI.

Smoking has a strong association with MI and the incidence of MI is more in smokers especially in chain smokers than non-smokers. According to one study,[10] the fall in cigarette smoking explained the greatest part of the decline in MI incidence (23% cessation of smoking greatly improves both symptoms and prognosis). Smoking cessation reduced CAD mortality by 36% as compared with mortality in persons who continued smoking.

Most patients stop smoking during acute phase but resumption is common after return home. Counseling should be provided to stop smoking and to avoid exposure to environmental smoking i.e. at work and home. In all patients who have history of smoking, a follow-up program should be planned for the future visits. They may be advised pharmacotherapy including nicotine replacement if smoking is difficult to quit. In the present study, there were 43% smokers in cases as compared to 17% in controls (OR 3.68), which also showed a possible association with AMI.

It is indicated that decreased fasting HDL cholesterol is associated with increased postprandial triglyceride which could be a target for life-style and therapeutic interventions in patients at risk for CVD.[11] According to one study,[12] obesity is associated with a 3 or more-fold increase in the risk of fatal and non-fatal MI. The dyslipidemia of obesity is commonly manifested as high plasma triglyceride levels, low high-density lipoprotein cholesterol (HDLc), and normal low-density lipoprotein cholesterol (LDLc) with preponderance of small dense LDL particles. In the present study, hyperlipdemia was present in 48% of cases as compared to 24.5% of controls (OR=2.84). So this finding of present study is also comparable with the international studies which have shown that hyperlipidemia is a major risk factor for developing AMI.[12]

High blood pressure for prolonged time can lead to changes in the blood vessel walls which can cause MI. According to one study,[13] abnormal lipids, smoking, hypertension, diabetes, abdominal obesity, psychosocial factors, alcohol, and physical inactivity account for most of the risk of MI worldwide in both sexes and at all ages in all regions. Our findings suggest that approaches to prevention can be based on similar principles worldwide and have the potential to prevent most premature cases of MI. In the present study, 65% of cases & 23% of controls had hypertension while the remaining study participants were normotensive. So there was a possible association between MI and hypertension in our subjects as well. Diabetes Mellitus can lead to ischemic changes in any organ of the body and such changes in cardiac muscles can lead to ischemia of the myocardium which causes MI. The prevalence of previously undiscovered glucometabolic abnormalities such as diabetes and impaired glucose tolerance (IGT) is shown to be high among selected groups with MI. According to a study,[14] 71% of the cohort had abnormal glucose metabolism, 29% IGT, 22% newly detected diabetes and 20% established diabetes. The prevalence of abnormal glucose metabolism in MI affected population is high. Among individuals with presumably normal glucose tolerance, 37% were classified as IGT and 27% as diabetics. Hence, association between common risk factors for both abnormal glucose regulation and MI could not explain these findings.

In this study, 52% cases gave history of DM while among 200 controls only 8.5% were diabetics. Anxiety-prone dispositions appear to be a robust and independent risk factor of MI among older men.[15] Anxiety characteristics independently and prospectively predict MI incidence after controlling for age, education, marital status, fasting glucose, body mass index, high-density lipoprotein cholesterol, and systolic blood pressure in proportional hazards models. Stress is also an important risk factor for MI and it was found in this study that 76% of patients were in stress while it was positive only in 35% of the controls. The findings of this study are comparable with latest national and international literature on the topic.[16-18]

CONCLUSION

This study found that age group 40-50 years, male gender, over-weight/obersity, stress, hypertension and positive family history are the major risk factors for acute AMI in the study population and most of these risk factors are modifiable.

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CONFLICT OF INTEREST

Authors declared no conflict of interest

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AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under:

BAS: Concept & study design, acquisition of data, drafting the manuscript, final approval of the version to be published

IAK: Analysis and interpretation of data, drafting the manuscript, critical revision, final approval of the version to be published

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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