Antecedent risk factors and their control in young patients with a first myocardial infarction

Chan M Y, Woo K S, Wong H B, Chia B L, Sutandar A, Tan H C

ABSTRACT

Introduction: Identifying and controlling cardiovascular risk factors at an early age may prevent cases of young myocardial infarction (MI). We studied age-related differences in the cumulative incidence of risk factors and the adequacy of primary prevention by surveying 1,556 patients with a first MI admitted to a tertiary hospital in Singapore.

Methods: This is a single centre registry-based study on patients admitted with a first MI to a tertiary hospital in Singapore. We stratified the cohort into younger (45 years of age and younger) and older (older than 45 years of age) groups. The presence of five risk factors, namely: hypertension, diabetes mellitus (DM), smoking, a family history of premature MI, and hyperlipidaemia, was assessed at the point of care by interview and prior medical records when obtainable. We also determined by the same methods, if these patients were receiving active treatment for DM, hypertension or hyperlipidaemia prior to their first MI. Lipid levels were measured within 24 hours of admission.

Results: 96 percent of patients 45 years and younger and 92 percent of those older than 45 years had at least one antecedent risk factor. The 45 years and younger age group had a higher incidence of untreated hypertension (odds ratio 2.99, 95 percent confidence interval 2.00-4.46, p-value is less than 0.001) and hyperlipidaemia (odds ratio 1.71, 95 percent confidence interval 1.20-2.43, p-value is equal to 0.002).

Conclusion: A majority of young patients with a first MI have at least one identifiable antecedent risk factor. There is significant undertreatment of hypertension and hyperlipidaemia in this age group.

Keywords: cardiovascular risk factors, hyperlipidaemia, hypertension, myocardial infarction

Singapore Med J 2006; 47(1):27-30

INTRODUCTION

Most studies show that 4% to 10% of patients with acute myocardial infarction (MI) are below 45 years of age. Young and old patients have different risk factor profiles, clinical presentations, and prognoses[1]. Despite having a better short-term prognosis, the long-term outlook for young MI has recently been shown to be poor, with high mortality rates at 15 years after the index MI[2]. In order to prevent or delay onset of this devastating disease, adequate quality of care at the community level would be conceivably important for young adults with known risk factors. While Western data has shown a consistent bias against using proven interventions in older patients presenting with MI[3], there is as yet no data that examines differences in the quality of care of antecedent risk factors.

We hypothesised that for younger subjects, physicians and patients tend to be less stringent in risk factor modification. Assessing how aggressively we manage traditional risk factors in young adults prior to their first MI is mandatory to improving primary prevention. We also hypothesised that many young patients have identifiable risk factors, prior to infarction, that were amenable to control. We therefore aimed to study the age-related differences in risk factor profiles as well as the adequacy of primary prevention (prior to the index MI) in patients admitted with a first MI to a tertiary cardiac unit in Singapore.

METHODS

We performed a single centre registry-based study on patients enrolled in the National University Hospital division of Singapore Acute Coronary Syndrome Registry from January 1, 2000 to December 31, 2002. Singapore is a small but modernised multiethnic city-state with a relatively

Cardiac Department
The Heart Institute
National University Hospital,
5 Lower Kent Ridge Road
Singapore 119074

Chan M Y, MBBS, MMed, MRCP
Registrar

Sutandar A, MD, FACC
Consultant

Tan H C, MMed, FRCP, FACC
Senior Consultant and Chief

Department of Medicine
National University of Singapore

Chia B L, FRCP, FRACP, FACC
Professor and Senior Consultant

Clinical Trials and Epidemiology Research Unit
226 Outram Road
Blk B, #02-02
Singapore 169039

Wong H B, BSc, MSc
Biostatistician

Department of Medicine and Therapeutics
The Chinese University of Hong Kong
Prince of Wales Hospital
Shatin
Hong Kong

Woo K S, MD, FRACP, FRCP
Professor and Head

Correspondence to:
Dr Mark Y Chan
Tel: (65) 67725211
Fax: (65) 6872 2998
Email: chanyymark@mac.com

Table 1. Comparison of baseline demographics by age group.

	Age group (%)			Odds ratio
	≤45 years (n = 231)	>45 years (n = 1,325)	p-value	(95% CI)
Gender				
Male	208 (90%)	906 (68.4%)	<0.001	3.59
Female†	23 (10%)	419 (31.6%)		(2.37 - 5.44)
Ethnic group‡				
Chinese†	105 (45.5%)	848 (64.0%)	–	0.53 (0.42 - 0.67)
Malay	50 (21.6%)	283 (21.4%)	0.93	1.02 (0.76-1.35)
Indian	68 (26.4%)	171 (12.9%)	<0.001	2.05 (1.58 - 2.65)
Others	15 (6.5%)	23 (1.7%)	<0.001	2.77 (1.84 - 4.19)
Hypertension				
Yes	91(39.5%)	774 (58.4%)	<0.001	0.52
No†	140(60.5%)	551 (41.6%)		(0.41-0.67)
Diabetes mellitus				
Yes	50 (21.7%)	507 (38.3%)	<0.001	0.50
No†	181 (78.3%)	817 (61.7%)		(0.37-0.67)
Smoking status				
Current smoker	135(60.5)	455 (36.5%)	<0.001	2.28
Non/Ex – smoker†	88 (39.5%)	790 (63.5%)		(1.78 - 2.92)
Family history of premature MI				
Yes	46 (19.8%)	66 (5.0%)	<0.001	2.98
No†	185 (80.2%)	1259 (95.0%)		(2.26-3.94)
Hyperlipidaemia§				
Yes	178 (86.0%)	777 (76.3%)	0.002	1.74
No†	29 (14.0%)	242 (23.7%)		(1.20-2.52)

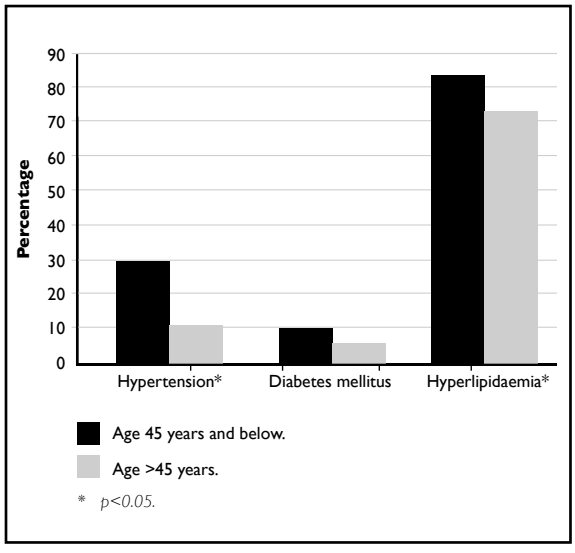
† Reference group.

‡ Multiple comparisons were performed and Bonferroni adjustment technique was used.

§ Hyperlipidaemia is defined as LDL >130 mg /dL, total cholesterol:LDL ratio >4.5 and/or non-HDL cholesterol >160mg/dL. Patients with lipids drawn later than 24 hours after admission were excluded from the analysis.

CI: confidence interval.

Fig. 1 Percentage of untreated antecedent risk factors.



young resident population of 3.38 million and a gross domestic product of S$178 billion. The median age is 34.9 years with 71.1% of the population under the age of 45 years[4]. The National University Hospital Acute Coronary Syndrome Registry is a database of all patients admitted to our institution with suspected or definite acute coronary syndromes. Potential cases of acute MI are identified from discharge summaries (based on the International Classification of Diseases, 9th revision, codes 410 to 414), cardiac enzyme results, the Registry of Births and Deaths, and post-mortem reports.

Patients are classified according to a local modification of the Glasgow MONICA algorithm under one of nine diagnostic categories, as previously reported[5]. We only included cases from the following diagnostic categories in our study:

definite acute MI or clinical acute MI (MONICA NF1), and death from acute MI with or without necropsy (MONICA F1, F2, and F9). We excluded patients with a history of prior MI. Using these criteria, a total of 1,556 patients admitted to the National University Hospital from January 1, 2000 to December 31, 2002 were classified as having a first MI. We stratified the cohort into younger (≤45 years) and older (>45 years) age groups using the cut-off of 45 years of age as defined in previous studies[1,6].

The presence of four risk factors: hypertension, diabetes mellitus (DM), smoking and a family history of premature MI, was assessed at the point of care by interview and prior medical records, when obtainable. We also determined by the same methods, if these patients were receiving active treatment for DM, hypertension or hyperlipidaemia prior to their first MI. We defined active treatment as physician-implemented and supervised therapeutic lifestyle changes, pharmacological measures or both. 1,226 patients (79%) had their lipid levels measured within the first 24 hours of admission.

All statistical analyses were carried out using Statistical Package for Social Sciences version 11.5 (SPSS Inc, Chicago, IL, USA). Associations between categorical variables were assessed using Pearson's chi-square or Fisher's exact tests. Statistical significance was set at $p<0.05$.

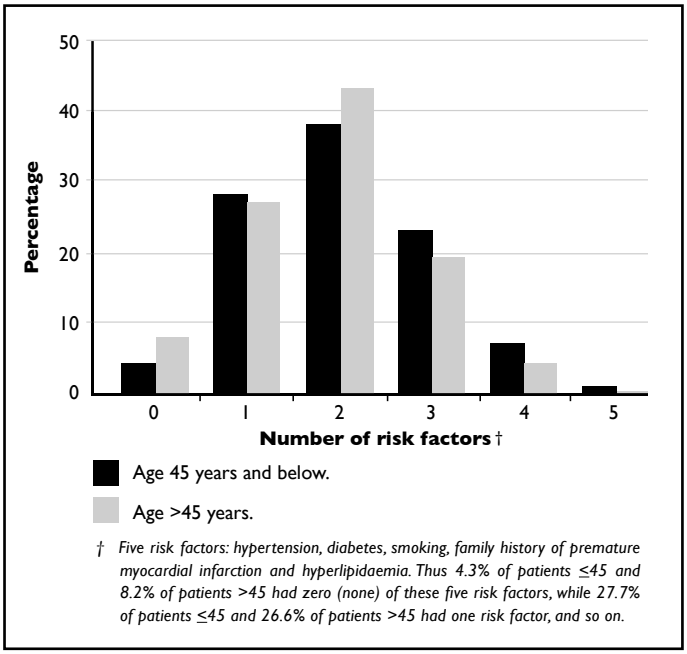
RESULTS

The demographical data by age group is shown in Table I. 14.8% (n=231) of the patients were in the younger cohort, with a mean age of 40.8±4.3 years (range 23.1 to 45.0). The mean age of the older cohort (n=1,325) was 65.9±11.4 (range 46.0 to 98.3) years. The younger cohort had a significantly greater proportion of untreated hypertension, odds ratio 2.99, 95% CI 2.00-4.46, $p<0.001$ and hyperlipidaemia, odds ratio 1.71, 95% CI 1.20-2.43, $p=0.002$ compared to the older cohort (Fig. I). While the proportion of untreated DM appeared greater in the young (odds ratio 1.68, 95% CI 0.75-4.13), this did not reach statistical significance ($p=0.21$). Most patients had at least one antecedent risk factor with 96% of the younger group and 92% of the older group having at least one antecedent risk factor (Table II and Fig. 2). Those with two risk factors comprised the largest group in both cohorts (38% of the younger cohort and 43% of the older cohort).

Table II. Number of risk factors by age group.

Number of risk factors†	Number within age group (%) Age ≤45 n=231	Age >45 n=1,325	p-value
0	10 (4.3)	108 (8.2)	1.00
1	64 (27.7)	353 (26.6)	0.75
2	87 (37.7)	563 (42.5)	0.19
3	53 (22.9)	252 (19)	0.18
4	15 (6.5)	48 (3.6)	0.05
5	2 (0.9)	1 (0.1)	0.06
Total	231 (100)	1,325 (100)	

Fig. 2 Percentage of cumulative risk factors in both age groups.



DISCUSSION

This study reinstates the typical risk factor profile of a young patient with MI. Our study showed that the younger cohort were roughly two times more likely to be active smokers. The role of smoking in the pathogenesis of young acute MI is well established, with most studies reporting between 76% to 90% of young acute MI patients being smokers[7]. A further reduction in accessibility to cigarettes and possibly newer pharmacological agents such as Rimonabant may be of use in reducing the rate of cigarette consumption[8]. There was also a higher incidence of lipid abnormalities in the younger cohort, a finding that generally reflects that of Western data[9]. In this study, there was also a greater proportion of young patients with a family history of premature MI, as seen in studies done in Caucasian populations[10]. Additionally, there were clear ethnic differences with Asian Indians forming 27.2% of the younger cohort, compared to 14.4% in the older cohort. This

is consistent with previous findings of a higher MI risk in Asian Indians as a whole[11]. This serves to highlight how genetic and ethnic variables can help identify young people at risk of premature MI.

Apart from a recently published paper that focused on lipids[12], reports on the adequacy of risk factor modification at the primary care level in adults presenting with acute MI are scarce. This study showed that the control of two main modifiable risk factors (hypertension and hyperlipidaemia) was poorer in the young cohort; presumably preventive measures tend to be focused on the older population who are traditionally viewed as a higher-risk cohort. It also highlights the pattern of prioritisation in terms of controlling risk factors. Physicians and patients appear to place greater emphasis on controlling diabetes mellitus compared to hypertension and dyslipidaemia. It is especially striking that a large proportion of patients with dyslipidaemia were left untreated (Fig. 1). As the role of early lifestyle modification and pharmacological intervention for hyperlipidaemia has proven to be effective in reducing cardiovascular events[13], this is one risk factor that we should place greater emphasis on controlling. The widespread availability of generic statins and fibrates will also make it increasingly cost-effective to do so.

In conclusion, many young patients with a first MI have identifiable antecedent risk factors that could have been better-controlled, especially antecedent hyperlipidaemia. By aggressively controlling these antecedent risk factors at an early stage, we can potentially delay the onset of MI in the young.

ACKNOWLEDGEMENTS

We would like to thank the staff from the National University Hospital division of the Singapore Acute Coronary Syndrome Registry for their painstaking efforts in data collection. We would also like to thank Dr Paul A Tambyah for his valuable advice.

REFERENCES

1. Hoit BD, Gilpin EA, Henning H, et al. Myocardial infarction in young patients: an analysis by age subsets. Circulation 1986; 74:712-21.
2. Cole JH, Miller JI, Sperling LS, Weintraub WS. Long-term follow-up of coronary artery disease presenting in young adults. J Am Coll Cardiol 2003; 41:521-8.
3. Buiatti E, Barchielli A, Marchionni N, et al. Determinants of treatment strategies and survival in acute myocardial infarction: a population-based study in the Florence district, Italy. Eur Heart J 2003; 24:1195-203.
4. Singapore Department of Statistics. Statistics Singapore. Available at: www.singstat.gov.sg. Accessed December 1, 2004.
5. WHO MONICA Project. MONICA manual. Office of Cardiovascular Diseases, World Health Organization, March 31, 1999. Available at: www.ktl.fi/publications/monica/manual. Accessed November 29, 2004.
6. Malmberg K, Bavenholm P, Hamsten A. Clinical and biochemical factors associated with prognosis after myocardial infarction at a young age. J Am Coll Cardiol 1994; 24:592-9.
7. Barbash GI, White HD, Modan M, et al. Acute myocardial infarction in the young – the role of smoking. The Investigators of the International Tissue Plasminogen Activator/Streptokinase Mortality Trial. Eur Heart J 1995; 16:313-6.
8. Haustein KO. What can we do in secondary prevention of cigarette smoking? Eur J Cardiovasc Prev Rehabil 2003; 10:476-85.
9. Navas-Nacher EL, Colangelo L, Greenland P, et al. Risk factors for coronary heart disease in men 18 to 39 years of age. Ann Intern Med 2001; 134:433-9.
10. Zimmerman FH, Cameron A, Fisher LD, et al. Myocardial infarction in young adults: angiographic characterization, risk factors and prognosis. Coronary Artery Surgery Study Registry. J Am Coll Cardiol 1995; 26:654-61.
11. Tambyah PA, Lim YT, Choo MH. Premature myocardial infarction in Singapore – risk factor analysis and clinical features. Singapore Med J 1996; 37:31-3.
12. Akosah KO SA, Cogbill C, Schoenfeld P. Preventing myocardial infarction in the young adult in the first place: how do the National Cholesterol Education Panel III guidelines perform? J Am Coll Cardiol 2003; 41:1475-9.
13. De Backer G, Ambrosioni E, Borch-Johnsen K, et al. European guidelines on cardiovascular disease prevention in clinical practice: third joint task force of European and other societies on cardiovascular disease prevention in clinical practice (constituted by representatives of eight societies and by invited experts). Eur J Cardiovasc Prev Rehabil 2003; 10:S1-S10.