PREVALENCE OF MODIFIABLE CARDIOVASCULAR RISK FACTORS AMONG MALAYSIAN PATIENTS WITH ACUTE CORONARY SYNDROME

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Summary

The growing epidemic of coronary heart disease in Asian countries can be prevented and controlled by identification and management of potentially modifiable risk factors. This article provides a single centre statistics of major modifiable risk factors among Malaysian patients presenting with acute coronary syndrome (ACS) and gives a brief discussion on preventive strategies. A single centre, prospective, observational, cohort study model was used. The subjects were patients of 18 years old or above who were admitted to University Malaya Medical Centre (UMMC), Malaysia within January 2009 to December 2010 and recruited under national ACS registry. Among 1525 consecutive ACS patients, 93% had at least one modifiable risk factor and nearly 70% had three or more risk factors. Overall, the prevalence of risk factors in descending order were: hypertension (70%), smoking (47%), diabetes (43%), dyslipidaemia (23%) and Body Mass Index (BMI)>24 (17%). Majority of male patients were smokers (67%) and most of the females were hypertensives (77%). Hypertension was the strongest predictor of mortality among all ACS patients [odds ratio 2.42, 95% CI, (1.43-4.10)]. Identification and primordial prevention of these risk factors are mandatory for prevention of coronary heart disease in the population.

Key words

Acute coronary syndrome; Hypertension; Dyslipidaemia.

Introduction

Coronary heart disease is a public health challenge of 21st century. Being the leading cause of death and major cause of disability, it claims about 7.2 million lives in a year across the globe and the number is increasing alarmingly in the developing world [1-3]. The pathogenesis of coronary heart disease has been studied over decades and the end result is proved to be the atherosclerosis of coronary arteries, provoked by cardiovascular risk factors [4]. Extensive clinical studies have identified several cardiovascular risk factors: major modifiable risk factors are smoking, hypertension, dyslipidemia, diabetes, obesity, sedentary life-style and major non-modifiable risk factors are increasing age, male sex and positive family history of coronary artery disease [5-9]. Hence most of the identified risk factors are potentially modifiable, it is essential to adopt effective preventive strategies with adequate awareness. Though there is plenty of data available from industrialized countries [10-13], such data are lacking in developing countries, hence, awareness is also lacking here [14-16]. The purpose of this article is to explore and analyze the major modifiable risk factors in patients presenting with ACS (Acute coronary syndrome) in a representative centre in Malaysia as well as to emphasize on the importance of preventive measures.

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Materials & methods

Study population: The study included all consecutive patients of 18 years old or above who were admitted to University Malaya Medical Centre (UMMC), Malaysia between January, 2009 to December, 2010 and had been diagnosed as ACS based on the definition of joint Committee of the European Society of Cardiology / American College of Cardiology [17].

UMMC is a university hospital located in Kuala Lumpur, Malaysia and it has been recruiting the highest number of ACS patients under National Cardiovascular Disease Database-Acute Coronary Syndrome (NCVD-ACS) registry since 2006 [18].

Study design and protocol: It was a single centre, prospective, observational study and the data were collected using the structured questionnaire in the case report form of National Cardiovascular Disease Database-Acute Coronary Syndrome (NCVD-ACS) registry. The concept and details of NCVD-ACS registry has been previously published [19]. All patients gave informed consent to process their anonymous data and the study was approved by the local research ethical committee.

Definition of risk factors: Five major modifiable cardiovascular risk factors considered in current study were smoking, dyslipidemia, hypertension, diabetes mellitus and high BMI (Body mass index). Current smoker was defined as one who consumed any tobacco within last 30 days of admission; ex-smoker was defined as one who quit smoking for more than 30 days prior to admission. Dyslipidemia, hypertension and diabetes mellitus were defined when patient had been diagnosed with those conditions prior to the admission, with or without treatment. Understanding that a moderate increase in BMI makes Asians more prone to insulin resistance and related diseases, the BMI of 24kg/m^2 was considered cut-off point as a risk factor for coronary artery disease [20-22].

Statistical analysis: The modifiable cardiovascular risk factors were analyzed across type of ACS, gender and in-hospital mortality. The association between risk factors and in-hospital mortality were tested using logistic regression models. All P values were the result of two-tailed tests, and values <0.05 were considered significant.

Results

A total of 1525 consecutive patients with acute coronary syndrome were recruited, male and female constituted 68% and 38% respectively. Mean age of male and female were 58±12 years and 66±12 years respectively. Mean BMI among male and female were 26±4kg/m^2 and 25±5kg/m^2 respectively.

Among all, 304 (20%) patients had STEMI (ST-elevation myocardial infarction), 1221(80%) patients had NSTEMI (non-ST-elevation myocardial infarction) and UA (unstable angina).

Table I presents prevalence of different modifiable cardiovascular risk factors across ACS stratum. Seventy percent of all ACS patients were hypertensive and 43% were diabetic. Sixty percents of STEMI patients were smoker, 55% were hypertensive and 36% were diabetic. Among STEMI patients who smoked, 55% were current smokers and 45% were ex-smokers (Considering all smokers of STEMI population as denominator). Among the NSTEMI and UA patients, 70% were hypertensive, 44% were smoker and 44% were diabetic. Multivariate analysis reveals that smoking (OR 1.47, 95% CI (1.17-1.84)] and hypertension [OR 1.24, 95% CI (0.98-1.54)] were associated with STEMI. Among NSTEMI and UA group, most significant association was hypertension [OR 2.75, 95% CI

Table II summarizes cumulative distribution of risk factors among all subjects. It shows that 93% of subjects had at least one modifiable risk factor and nearly 70% had three or more risk factors. Among all ACS patients, 24% had one risk factor, 36% had two risk factors, 26% had three risk factors, 6% had four risk factors, 1% had five risk factors and remaining 7% had no modifiable risk factor.

The overall in-hospital mortality of the entire cohort was 4.3%. Table III shows the results of logistic regression analysis for in-hospital mortality. Hypertension was the strongest predictors of mortality [odds ratio 2.42, 95% CI, (1.43-4.10)] among all ACS patients. However, smoking and diabetes showed closer odds ratios of 0.96 and 0.76 respectively. Though dyslipidemia and obesity showed lower odds ratio (0.27 and 0.18 respectively), the presence of multiple risk factors probably played important role influencing mortality of patients.

Figure 1 shows distribution of modifiable risk factors among male and female ACS patients. Smoking and high BMI were more prevalent among male, the other risks were higher among female patients.

Table I: Multivariate analysis of modifiable cardiovascular risk factors among ACS spectrum.

Risk factor	ACS (n=1525)	STEMI (n=304) Prevalence (%)	OR (95% CI) [d]	NSTEMI and UA (n=1221) Prevalence (%)	OR(95% CI)	P value[e]
Smoking	47%	60%	1.47 (1.17-1.84)	44%	0.79 (0.70-0.88)	0.009
Dyslipidemia	23%	22%	0.28 (0.21-0.36)	24%	0.31 (0.27-0.36)	<0.001
Hypertension	70%	55%	1.24 (0.98-1.54)	73%	2.75 (2.42-3.13)	0.007
DM	43%	36%	0.55 (0.44-0.70)	44%	0.79 (0.70-0.88)	0.003
BMI >24	17%	22%	0.28 (0.22-0.37)	3%	0.18 (0.15-0.20)	0.15

OR= Odds Ratio, CI= 95% Confidence Interval
P value <0.05 was considered significant.

Table II: Distribution of cumulative risk factors among all ACS patients (n=1525) admitted to University Malaya Medical Centre, Malaysia. (January 2009 - December 2010.)

Number of risk factor	Population (n=1525)
1. risk factors	24%
2. risk factors	36%
3. risk factors	26%
4. risk factors	6%
5. risk factors	1%
No risk factor	7%

Risk factors include Smoking, Dyslipidemia, Hypertension, Diabetes mellitus and BMI >24.

Table III: Multivariate analysis of modifiable cardiovascular risk factors for in-hospital mortality

Modifiable risk factor	No of death in presence of risk factor	Odds Ratio	95% confidence interval
Smoking	32	0.96	0.60-1.57
Dyslipidemia	14	0.27	0.15-0.49
Hypertension	48	2.42	1.43-4.10
Diabetes mellitus	28	0.76	0.47-1.23
BMI >24	10	0.18	0.09-0.35

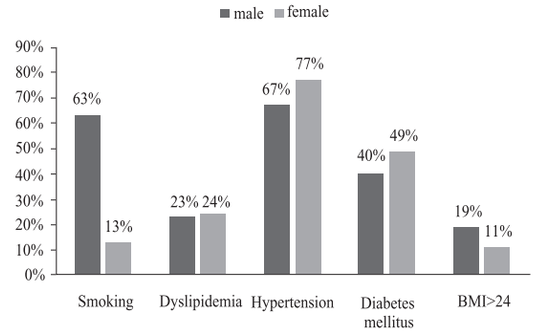

Fig 1: Distribution of modifiable cardiovascular risk factors among male and female patients of ACS in University Malaya Medical Centre, Malaysia

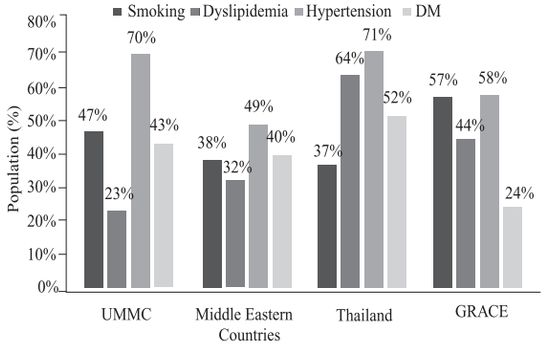

Fig 2 : Distribution of modifiable cardiovascular risk factors among ACS patients of UMMC (Malaysia), Middle Eastern countries, Thailand and GRACE

UMMC : University Malaya Medical Centre.

Middle Eastern Countries :
Bahrain, Kuwait, Qatar, Oman, United Arab Emirates, and Yemen.
(Source: Clin Cardiol. 2011; 34(1):51-58 &
Thai Heart Journal. 2006; 19 (4) :132-143).

GRACE : Global Registry of Acute Coronary Events
(Source: Arch Intern Med. 2003; 163: 2345-2353).

Discussion

The sample size of current study represents 23.5% of Malaysia national ACS registry during the closest timeline. The demographics of sample population followed almost similar pattern as national ACS registry. However, when compared to census, disproportionately increased percentage of Indians was noted in both sample and national ACS registry; the finding that correlates with the previous reports mentioning high risks of cardiovascular disease among migrant Indians [23,24].

Prevalence of modifiable cardiovascular risk factors varies according to type of ACS and gender. There was association of smoking and hypertension with STEMI [OR 1.47, 95% CI (1.17-1.84)] and [OR1.24, 95% CI (0.98-1.54) respectively]; Hypertension was associated with NSTEMI and UA [OR 2.75, 95% CI (2.42-3.13)] [Table II]. Males had remarkably higher prevalence of smoking (67%) and most of the females were hypertensive. (77%) [Figure 1].

Cumulative risk analysis shows the striking result of 93% of subjects with at least one modifiable risk factor and nearly 70% with three or more risk factors. The high prevalence of multiple risk factors explains relatively younger age and predicted poor outcome of Asian patients with ACS [25,26].

Hypertension was the strongest predictor of mortality among all ACS patients [OR 2.42, 95% CI (1.43-4.10)].

Figure 2 compares the prevalence of modifiable cardiovascular risk factors among patients from Malaysia (UMMC), other Asian countries (Thailand, Middle eastern countries) and GRACE (Global Registry of Acute Coronary Events). Among Asians, Malaysians had highest prevalence of smoking (47%), Thais had highest prevalence of dyslipidemias (64%), hypertension (71%) and diabetes (52%). However, the patients of GRACE had overall highest prevalence of smoking.

When compared to middle eastern countries, Malaysian patients had higher prevalence of all risk factors except dyslipidemia. Conversely, Thiland, which is geographically attached to Malaysia and share similar demographic features, showed remarkably higher prevalence of all risk factors except smoking [14,15]. However, sample sizes of different registries were variable, which might limit the degree to which samples represented the country. The GRACE is the largest, multinational ACS registry across four continents. When compared with GRACE, Malaysians had higher prevalence of hypertension and diabetes. Since different registries had different cut-off limits for BMI, it was not considered for comparison among the countries.

Limitations of the Study

Since most of the information in this study was collected from self-reported history on admission, it did not include newly diagnosed hypertension, diabetes or dyslipidemia. Physical inactivity and dietary score were not included in the study, which would make it more reasonable.

Conclusion

This article presents the findings of a prospective, observational cohort study regarding the prevalence of modifiable risk factors on ACS patient at a university hospital in Malaysia in the year 2009 to 2010. It shows that among 1525 patients, 93% had at least one modifiable risk factor and nearly 70% had three or more risk factors. Smoking and hypertension were mostly associated with STEMI. Among NSTEMI and UA group, most significant association was with hypertension. While smoking and high BMI were more prevalent among male, the other risks were higher among female patients. It is shown that there was uneven distribution of modifiable risk factors among Asian countries. Analysis of complex associations among different modifiable as well as non-modifiable risk factors and their potentiating impacts on outcome of ACS patients are expected in future studies.

Disclosure

All the authors declared no competing interest.

References

1. World Health Organization. The Top Ten Causes of Death. Fact sheet N 310. 2008;1-5.

2. Herman A. Tyroler. Coronary Heart Disease Epidemiology in the 21st Century. Epidemiol Rev. 2000;22:7-13.

3. Mathers CD, Loncar D. Projections of Global Mortality and Burden of Disease from 2002 to 2030. PLoS Medicine. 2006;11: e442.

4. Libby, P, P. Theroux. Pathophysiology of Coronary Artery Disease. Circulation. 2005;111:3481-3488.

5. Grundy, S.M., et al. Assessment of Cardiovascular Risk by Use of Multiple-Risk-Factor Assessment Equations : A Statement for Healthcare Professionals From the American Heart Association and the American College of Cardiology. Circulation. 1999;100:1481-1492.

6. Kurtulmus N, Bos S, Arslan S, et al. Differences in risk factors for acute coronary syndromes between men and women. Acta Cardiol. 2007;62:251–255.

7. Fourth Joint Task Force, Fourth Joint European Societies' Task Force on Cardiovascular Disease Prevention in Clinical Practice. European Guidelines on CVD Prevention. EJCPR. 2007;14:1-113.

8. Khan, S. Q., Narayan, H., Ng, K. H., Dhillon. N-terminal pro-B type natriuretic peptide complements the GRACE risk score in predicting early and late mortality following acute coronary syndrome. Clin. Sci. 2009;117:31-39.

9. Yusuf S, Hawken S, Ounpuu S, et al. INTERHEART Study Investigators. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. Lancet. 2004; 364:937-952.

10. Granger, C. B., Goldberg, et al. Predictors of hospital mortality in the global registry of acute coronary events. Arch. Intern. Med. 2003;163:2345-2353.

11. Palmieri L, Donfrancesco C, Giampaoli S, et al. Favorable cardiovascular risk profile and 10-year coronary heart disease incidence in women and men: results from the Progetto CUORE. European Journal of Cardiovascular Prevention and Rehabilitation. 2006;13:562-570.

12. C Power, K Atherton, O Manor. Co-occurrence of risk factors for cardiovascular disease by social class: 1958 British birth cohort. J Epidemiol Community Health. 2008;62:1030-1035.

13. Conroy RM, Pyörälä K, Fitzgerald AP, et al. SCORE project group. Estimation of ten-year risk of fatal cardiovascular disease in Europe: the SCORE project. European Heart Journal. 2003;24:987-1003.

14. El-Menyar A, Zubaid M, Shehab A, et al. Prevalence and impact of cardiovascular risk factors among patients presenting with acute coronary syndrome in the middle East. Clin Cardiol. 2011;34:51-58.

15. Pongchai Anukoolsawat, Piyamitr Sritara, Yot Teerawattananon. Costs of Lifetime Treatment of Acute Coronary Syndrome at Ramathibodi Hospital. Thai Heart Journal. 2006;19;132-143.

16. Chockalingam A, Balaguer-Vintro I, Achutti A, et al. The World Heart Federation's white book: impending global pandemic of cardiovascular diseases: challenges and opportunities for the prevention and control of cardiovascular diseases in developing countries and economies in transition. Can J Cardiol. 2000;16:227–229.

17. Cannon C P, Battler A, Brindis R G et al. American College of Cardiology key data elements and definitions for measuring the clinical management and outcomes of patients with acute coronary syndromes. A report of the American College of Cardiology Task Force on Clinical Data Standards (Acute Coronary Syndromes Writing Committee). J Am College of Cardiology. 2001; 38: 2114-2130.

18. Alan Fong Yean Yip, Chang Boon Cheng, Ong Tiong Kiam, Sim Kui-Hian. Chapter 2: patient Characteristics. In: Wan Azman Wan Ahmad, Sim Kui Hian, editors. Annual Report of the NCVD-ACS Registry. 2007 & 2008: 16-23.

19. Chin SP, Jeyaindran S, Azhari R, et al. Acute coronary syndrome (ACS) registry--leading the charge for National Cardiovascular Disease (NCVD) Database. Med J Malaysia. 2008 ;63:29-36.

20. Shigetake Sasayama. Heart Disease in Asia. Circulation. 2008;118:2669-2671.

21. C-H Tseng. Body mass index and waist circumference as determinants of coronary artery disease in Taiwanese adults with type 2 diabetes mellitus. International Journal of Obesity. 2006;30:816–821.

22. Zhou BF. Effect of body mass index on all-cause mortality and incidence of cardiovascular diseases--report for meta-analysis of prospective studies open optimal cut-off points of body mass index in Chinese adults. Biomed Environ Sci. 2002;3:245-252.

23. Yeo KK, Tai BC, Heng D, et al. Ethnicity modifies the association between diabetes mellitus and ischemic heart disease in Chinese, Malays and Asian Indians living in Singapore. Diabetologia. 2006;49:2866–2873.

24. Maniam T, Rumawas JSP, Schultink WJ, Khor GL. Cardiovascular disease risk factors among Indian subjects living in Kuala Lumpur, Malaysia. Asia Pacific Journal of Clinical Nutrition. 1996; 5:125.

25. Prashant Joshi, Shofiqul Islam, Prem Pais, et al. Risk Factors for Early Myocardial Infarction in South Asians Compared With Individuals in Other Countries. JAMA. 2007;297:286-294.

26. Chambers BA, Guo SS, Siervogel R, Hall G, Chumlea WC. Cumulative effects of cardiovascular disease risk factors on quality of life. J Nutr Health Aging. 2002;6:179-184.

27. Martiniuk AL, Lee CM, Lawes CM, et al, for the Asia-Pacific Cohort Studies Collaboration. Hypertension: its prevalence and population-attributable fraction for mortality from cardiovascular disease in the Asia-Pacific region. J Hypertens. 2007;25:73–79.

28. David KL Quek. Global Strategies in the Prevention of Cardiovascular Disease: Asia Pacific Perspectives. NHAM Pulse (Official newsletter of the National Heart Association of Malaysia). 2011;2-6.

29. Lloyd-Jones DM, Wilson PW, Larson MG, et al. Framingham risk score and prediction of lifetime risk for coronary heart disease. Am J Cardiol. 2004;9:20-24.

30. Thomas Pearson. The Prevention Of Cardiovascular Disease: Have We Really Made Progress?: Primordial Prevention Of Cardiovascular Disease. Health Affairs. 2007;26:49-60. © 2007 Project HOPE.

31. Simon Capewell, Donald M. Lloyd-Jones. Optimal Cardiovascular Prevention Strategies for the 21st Century. JAMA. 2010;304:2057-2058.

32. Prevention and control of noncommunicable diseases: implementation of the global strategy. Sixty-third world health assembly. Provisional agenda item 11.9. World Health Organization. 2010.