Acute Coronary Syndrome (ACS) Registry - Leading the Charge for National Cardiovascular Disease (NCVD) Database

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SUMMARY

Coronary artery disease is one of the most rampant non-communicable diseases in the world. It begins indolently as a fatty streak in the lining of the artery that soon progresses to narrow the coronary arteries and impair myocardial perfusion. Often the atherosclerotic plaque ruptures and causes sudden thrombotic occlusion and acute ST-elevation myocardial infarction (STEMI), non-ST-elevation MI (NSTEMI) or unstable angina (UA). This phenomenon is called acute coronary syndrome (ACS) and is the leading cause of death not only in Malaysia but also globally. In order for us to tackle this threat to the health of our nation we must arm ourselves with reliable and accurate information to assess current burden of disease resources available and success of current strategies. The acute coronary syndrome (ACS) registry is the flagship of the National Cardiovascular Disease Database (NCVD) and is the result of the dedicated and untiring efforts of doctors and nurses in both public and private medical institutions and hospitals around the country, ably guided and supported by the National Heart Association, the National Heart Foundation, the Clinical Research Centre and the Ministry of Health of Malaysia. Analyses of data collected throughout 2006 from 3422 patients with ACS admitted to the 12 tertiary cardiac centres and general hospitals spanning nine states in Malaysia in this first report has already revealed surprising results. Mean age of patients was 59 years while the most consistent risk factor for STEMI was active smoking. Utilization of medications was high generally. Thirty-day mortality for STEMI was 11%, for NSTEMI 8% and UA 4%. Thrombolysis (for STEMI only) reduced in-hospital and 30-day mortality by nearly 50%. Percutaneous coronary intervention or PCI also reduced 30-day mortality for patients with non-ST elevation MI and unstable angina. The strongest determinants of mortality appears to be Killip Class and age of the patient. Fewer women received thrombolysis or underwent PCI on same admission although women make up 25% of the cohort.

KEY WORDS:
Acute coronary syndrome, Registry, ST-elevation MI

INTRODUCTION

Coronary artery disease (CAD) is officially the world's number one killer disease. It is characterized pathophysiologically by progressive occlusive atherosclerosis, acute plaque rupture and atherothrombosis[1]. Atherothrombosis manifests clinically as acute coronary syndrome (ACS). ACS encompasses a broad spectrum of clinical conditions from unstable angina (UA) to non-ST-segment elevation infarct (NSTEMI) with micro-necrosis and through to transmural ST-elevation myocardialinfarction (STEMI). Formerly associated with more wealthy and developed countries, it has now cut across socio- economic and geographical lines locally and universally. In order to reduce the global burden of CAD, many strategies have been put in place. These strategies have been implemented over a decade ago in countries like the U.S., Sweden and Norway and are only starting to bear fruit now, reflective of the indolent silently progressive nature of CAD. The strategies were also formulated after extensive clinical and epidemiological research[2-4]. The three target areas for treatment and prevention of CAD are 1) the identification of persons at risk of developing CVD and predisposing factors, 2) the development and clinical evidence of drugs and other interventional procedures that halt or modulate atherosclerosis, and 3) the implementation of clear strategies based on sound clinical evidence at all stages of the disease and clinical manifestation. Therefore, if we want to have a fighting chance at reducing the risk and burden of CAD in Malaysia before 2020, when we hope to have achieved first world status, we should start now!

When we began searching for epidemiological databases of cardiovascular disease in Malaysia, there was none to be found. None at least that met our standards nor that we could conclusively verify as true and more so, one that encompasses the whole nation. Furthermore, despite the paucity of real useful data, the records of government hospital admissions and deaths collected by the Ministry of Health clearly indicate that CAD is the leading cause of admission and non-accidental death for the last 10 years. Even then, as is true now, cardiovascular disease accounted for 25% of all deaths in Malaysia[5]. In 2001, ACS apparently accounted for nearly 35,000 acute admissions into Government hospitals in

Malaysia[6]. The epidemic of the deadly cardiovascular disease was not only destined to arrive in Malaysia, it apparently reached our shores more than a decade ago. The government already spends about 10% of its health budget providing resources to fight CAD and the private sector as well has played its role to fill the gaps not covered by government facilities. But why are we still losing the battle? The answer could lie in the approach used by clinicians and administrators alike, because we have been fighting the consequences of CAD rather than attacking its cause. Until this fire-fighting strategy changes, until we adopt a pro-active strategy based upon intelligence, information and evidence, we may never triumph.

Why not adopt the statistics and guidelines issued by key opinion leaders from countries that have expended Considerable budget for understanding and fighting cardiovascular disease? Indeed, much of what we understand about risk and likelihood of CVD, its incidence and prevalence are derived from 'western' data. However, there is now an increasing awareness of ethnic variations and risk, socio-cultural and socio-economic influences as well as geographical variations[7-11]. The risk prediction of ACS is also unclear and may be different from patients with chronic stable angina.

Therefore, against this bleak backdrop, blind and without hindsight, armed only with lessons from other countries but, fortunately, and with a new canvas to plot our strategy, we spread across the land to improve the cardiovascular health landscape of our nation. This registry for Acute Coronary Syndrome (ACS), is the first of the National Cardiovascular Database (NCVD) to report its results since it was established in 2006. Yet the report has already revealed some startling facts about the health of the nation. We are confident the registry will be able to successfully meet its objectives that ultimately will lead to reducing the burden of heart disease in Malaysia. (See Table I as a milestone of development)

Objectives of the NCVD

- Determine the number and the time trend of ACS in Malaysia.
- Determine the socio demographic profiles of patients to better identify the high-risk group in Malaysian population.
- Determine the efficiency of, and adherence to current guidelines treatment guidelines.
- Determine cost to the nation by cardiovascular disease and the cost-effectiveness of treatment and prevention programs.
- Stimulate and facilitate cardiovascular disease research using this database.

The objectives listed above, are clearly rather ambitious and will certainly not be met right away, especially for a first effort. Realistically, it has to be implemented in phases with the later phases building upon the foundation laid by the earlier phases while expanding the scope and coverage of the database. Beyond that, the database also provides a less tangible but no less important input in the form of expertise and experience gained by staff in the course of operating the database. In the long term, this will be an extremely useful asset to support cardiology research in Malaysia.

MATERIALS AND METHODS

The ACS registry was drawn up by content experts in the discipline led by representatives from the departments of cardiology the Ministry of Health, universities and the National Heart Institute and the department of medicine at Kuala Lumpur Hospital. The dataset amalgamates existing individual registries that existed separately in each hospital. It was designed to be compatible with international registries and to comply with guidelines issued by Australia's National Data Elements for ACS, the European's Cardiology Audit and Registration Data Standards (CARDS), and the American College of Cardiology Clinical Data Standards. The full version was designed to collect detailed demographic, past medical history, clinical and procedural information and pharmacotherapy. This was later abridged to make it more user-friendly, to encourage completion without compromising the objectives of registry and to ensure international compatibility. Thirty-days and 12-months follow-up forms have been attached to document the progress of patients, in particular the occurrence of any major adverse cardiovascular events (MACE) following discharge from hospital. The first meeting of the NCVD Steering Committee was convened in October 2005. (See https://www.macr.org.my/encrd/zAu-data-standard.jsp for the case report form)

Participating Sites

The ACS database was piloted in six coronary care units (CCU) on January 1st, 2006. The CCUs were based at the National Heart Institute, Kuala Lumpur Hospital, University Malaya Medical Centre, Penang Hospital, Sultanah Aminah Hospital, Johore and Sarawak General Hospital. One month later, following minor adjustments and review of the work flow process; the CRF was approved for nationwide use. An additional five MOH general hospitals joined the six pilot centres. They are Tuanku Fauziah Hospital Kangar, Perlis; Tuanku Ja'afar Hospital Seremban, Negeri Sembilan; Sultanah Bahiyah Hospital Alor Setar, Kedah; Raja Perempuan Zainab II Hospital Kota Bahru, Kelantan; and Tengku Ampuan Afzan Hospital Kuantan, Pahang. In addition the medical department of Sarawak General Hospital also participated. More hospitals have joined NCVD since 2006. They are Ipoh Hospital, Perak; Queen Elizabeth Hospital, Sabah; Seberang Jaya Hospital, Penang; Sultanah Nur Zahirah Hospital, Terengganu; Tengku Ampuan Rahimah Hospital Klang, Selangor; and Malacca General Hospital.

Patient Enrolment

The registry records any patient age 18 and above who is diagnosed with ACS including ST-elevation myocardial infarction (STEMI), non-STEMI and unstable angina (UA) and admitted to the participating centres. ACS is defined as the presence of at least two of the following a) clinical presentation, b) electrocardiography and c) cardiac enzyme elevation. [See Table II]

After discharge, the patient will be contacted by telephone or seen in the clinic for follow-ups after 30 days and 12 months. For the purpose of the registry, any new episodes of chest pain or diagnosis of ACS within 30 days of discharge are considered recurrent episodes or complications of the index event. Symptoms that occur more than 30 days later are considered as new episodes in which new event notification forms are submitted. The Medical Research and Ethics Committee (MREC) waived informed consent for this national registry.

Notification and Web Application
Notification is served electronically to provide real-time updates. For centres without broadband internet connection, CRC has allowed centres to submit data in hardcopy forms to be delivered via the postal service and entered into the computer database by CRC. This temporary measure has ensured that more centres participate right from the inception of the registry while awaiting Internet connection. The application applies two-tiers of security whereby users will access the web application by using their username and password given by the registry manager. Once the details have been submitted, an authentication code will be sent to the particular user to log in into the system. The encryption system further enhances security. Although the participating centre shares the same pool of patients, they are not given access to patient database of other centres. Used correctly, these measures should ensure security of database and confidentiality of patient details.

RESULTS

Baseline Characteristics
There were 3422 patients with confirmed ACS admitted to the 11 participating sites in 2006. Out of these, there were 1445 patients or 42% of ACS patients with STEMI, 1132 patients or 32% with NSTEMI, and 845 patients or 25% with UA. [Figure 1] Ratio of men to women was 3:1 while mean age was 59 years. The highest incidence of ACS for men was in the 50-60 year age group. The highest incidence of ACS for women was in the 70-80 year age group with a clear linear increasing trend. [Figures 2a and 2b] The ethnic composition of the patients were 49% Malay, 23% Chinese, 23% Indian and 1% each of Iban, Bidayuh, other races.

Mean Body Mass Index or BMI was 25.8 kg/m2 and Waist Hip Ratio or WHR was 0.97. Seventy-five percent of all patients had BMI greater than 23 (the cut-off point for overweight for Asian population) Dyslipidaemia was present in 33% of patients and unknown in 41%. Hypertension was present in 23% and unknown in 16%. Diabetes was present in 36% and unknown in 20%. Thirty-three percent were active smokers while 24% quit smoking over one month previously. Coronary disease (including previous myocardial infarction for documentation of significant coronary disease) was present in 64% and unknown in 20%. Other co-morbidities were heart failure (8%), chronic renal disease or failure (7%), cerebrovascular disease (4%), chronic lung disease (4%) and peripheral vascular disease (1%). Only 2% of patients did NOT have any of the co-morbidities or risk factors mentioned above. [Figures 3 and 4]

Baseline Characteristics and co-morbidities according to ACS stratum
The mean age of patients with STEMI was 56 years, which is younger than the NSTEMI group (62 years) and UA group (60 years). Males comprised 85% in the STEMI group that is much more than the NSTEMI group (69%) and UA group (66%). There were also more Malays that make up the STEMI group (54%) compared to NSTEMI and UA groups (both 45%). Active smoking was significantly higher in the STEMI group (50%) compared to NSTEMI and UA groups (23% and 18% respectively). However, STEMI patients have lower number of co-morbidities and risk factors. Dyslipidaemia was present in 19% of STEMI patients but in 41 to 46% of NSTEMI/UA patients. Hypertension was present in 47% of STEMI patients but 70 to 73% of NSTEMI/UA patients. Diabetes was present in 36% of STEMI patients and 47 to 51% of NSTEMI/UA patients. Coronary disease was present in 54% of STEMI patients but 70-75% of NSTEMI/UA patients. Heart failure was present in 3% of STEMI patients and 10 to 14% of NSTEMI/UA patients.

Clinical Examination and Investigation
Most of the patients were in Killip Class I or II. Five percent of STEMI patients were in Killip Class IV (signs consistent with cardiogenic shock) compared to 3% in NSTEMI group and none in UA. There was no difference in baseline blood pressure, heart rate, cholesterol or blood sugar levels. Left ventricular ejection fraction by bedside echocardiography was also similar (47% in STEMI and NSTEMI groups and 50% in UA group).

ACS Management
Patients with ACS stayed an average of six days in hospital including about three days on CCU. [Table III] Younger patients (age 20 to 40 years) stayed for an average of five days while older patients (age 60 years and above) stayed for an average of seven days. For the STEMI patients, 70% received thrombolysis, 13% missed thrombolysis, 8% proceeded directly to primary angioplasty and 8% were not given thrombolysis because of contraindication or other reasons. Seventy-eight percent of younger age group received thrombolysis and from this only 12% missed thrombolysis because of delay or contraindications. In contrast for the older age group, 62% received thrombolysis while 24% missed thrombolysis because of delay or contraindications.
Twenty-one percent of STEMI patients underwent PCI during the same admission including primary and rescue angioplasty. PCI was also performed on the same admission in 14% and 9% of NSTEMI and UA patients respectively. Besides PCI, 1% of STEMI patients underwent CABG as compared to 4% and 2% of NSTEMI and UA patients respectively. There was no difference between rates of PCI and CABG for STEMI patients among different age groups. For NSTEMI and UA patients however, younger patients more often underwent PCI (19% versus 13% of middle and older age groups).

More men underwent PCI than women. For the STEMI group, 22% of men in all underwent PCI on the same admission compared to 16% of women. For the NSTEMI and UA groups, 14% of men underwent PCI compared to 9% of women. Also 71% of men received thrombolysis compared to 67% of women. It is interesting to note also that use of thrombolysis in STEMI was highest in the Malay ethnic group (73% compared to 67% for other ethnic groups) while same-admission PCI in STEMI was highest for Indians (29% compared to 20% for other ethnic groups).

Prescription and utilization of adjunctive proven pharmacological therapy were high in all groups. Aspirin and cholesterol-lowering "statins" were given during admission in over 90% of patients in all groups. ADP antagonists (clopidogrel or ticlopidine) was used in 60% of STEMI

patients, 64% of NSTEMI patients and 50% of UA patients. Unfractionated heparin or low molecular weight heparin (all enoxaparine) were used in 86% of NSTEMI and UA patients. Fourty-four percent of STEMI patients also received enxaparine including those that received thrombolysis. Beta-blockers and Angiotensin Converting Enzyme (ACE) inhibitiors were used in over 60% of patients in all groups. There was no difference in rates of prescription of these admission drugs among different age groups and gender.

Outcome

We report the results of ACS patient outcomes during admission (in-hospital) and 30 days after discharge (including in-hospital deaths). Total in-hospital mortality was 7% (229 deaths) while 30-day total mortality was 8% (288 deaths). [Table IV]

In-hospital death was highest for the elderly age group (10%) compared to the younger (2%) and middle (4%) age groups. Thirty-day cumulative mortality was highest for the elderly age group (13%) compared to the younger (4%) and middle (5%) age groups. There was no difference between gender or presence of dyslipidaemia, diabetes and hypertension.

For the NSTEMI group, in-hospital mortality was 7% and cumulative 30-day mortality was 8%. For the UA group, in-hospital mortality was 3% and cumulative 30-day mortality was 4%. For both NSTEMI and UA patients, those who underwent PCI on the same admission had lower 30-day cumulative mortality rate (5%) compared to those who did not undergo PCI (7%). [Table V]

For the STEMI group, in-hospital mortality was 9% and cumulative 30-day mortality was 11%. For patients who received thrombolysis, the in-hospital mortality was 7% and cumulative 30-day mortality was 9%. Significantly those who missed thrombolysis due to delay or contraindications had nearly double the mortality rate, that is 13% for in-hospital and 16% cumulative 30-day. [Table VI] In contrast, there was no difference in outcome between those who underwent PCI on the same admission or not (both groups 8% in-hospital mortality and 11% 30-day mortality). [Table VII]

DISCUSSION

The results of this inaugural report of ACS in Malaysia were collected from 11 hospitals around the country in 2006. The 3422 patients represented only a fraction of the true number of new ACS cases each year. We are satisfied with the accuracy of the results in this pilot NCVD survey. The 11 hospitals and departments taking part have allocated valuable resources and time to ensure the correctness of entry. Staff were sent for regular training and updates and specialists representing all participating centres were invited to review the results and provide feedback. A Governance Board for NCVD was established to oversee the operations. The Board has provided leadership and direction for the NCVD and ensured the continuing relevance to the database. Furthermore we were able to verify the results by comparing it with published reports on the prevalence of co-morbidities. In addition, the 11 pilot centres were among the largest and busiest receiving hospitals for ACS in Malaysia as these included government-funded facilities for tertiary cardiology services and intervention. Through the participation of these hospitals, most of the states in Malaysia were thereby represented.

It is still too early to draw definitive conclusions. Nevertheless these preliminary results have revealed several important and surprising points. ACS remains a disease that affects all races.

Table I: Milestones of the Registry

15th October 2005	Approval of grant
9th December 2006	1st National Cardiovascular Disease Database (NCVD) meeting
	NCVD – Acute Coronary Syndrome: 1st stage of realizing the objective
1st January 2006	e-NCVD web application uploaded online
	Pilot Sites initiation in 6 centres
2nd March 2006	Involvement of state hospitals in NCVD
31st March 2006	Officially launched by Deputy DG
12th July 2006	1st Technical Committee meeting
14th April 2007	Milestones of NCVD database, during NHAM Annual scientific meeting at the Le Meridien Hotel
	First meeting for all ground-staffs, operators, lab nurses, research nurses of all initiated sites
13th August 2007	Designing the dummy tables for ACS Registry Annual Report 2006
30th August 2007	2nd Technical Committee meeting
23rd October 2007	Reviewed the first draft of Annual Report
19th December 2007	Formed the ACS Report Writing Committee
5th January 2008	First ACS Report Writing Committee meeting

Table II: Acute Coronary Syndrome Criteria (Any 2 of the 3 following):

a) Clinical Presentation:	Typical anginal pain at rest lasting more than 20 minutes
	New-onset angina of at least CCS grade III severity
	Previously diagnosed angina that has become more frequent, longer in duration or more easily provoked
	Acute decompensated heart failure in a patient with known ischemic heart disease.
b) Electrocardiography:	ST segment depression by more than 0.05mV in 2 or more contiguous leads.
	Marked symmetrical T-wave inversion by more than 0.2mV in the precordial leads.
	New bundle branch block
	Sustained ventricular tachycardia
c) Cardiac enzymes:	Typical pattern of elevation of conventional cardiac enzymes including creatine kinase (CK), aspartate transaminase (AST) and lactate dehydrogenase (LDH).
	Elevated Troponin T or I
	Elevated isoenzyme CK-MB

Table III: Summary of treatments for patients with ACS by ACS stratum, Malaysia 2006

	STEMI N=1445	NSTEMI N=1132	UA N=845
Mean, SD of Total admission days	6 (3)	6 (4)	5 (4)
Mean, SD of Number of days on CCU	3 (3)	4 (3)	3 (3)
Fibrinolytic therapy, no. %			
• Given	1018 (70)	NA	NA
• Not given–proceeded directly to primary angioplasty	117 (8)	NA	NA
• Not given-Contraindicated	70 (5)	NA	NA
• Not given–Missed thrombolysis	193 (13)	NA	NA
• Not given–Others	47 (3)	NA	NA
Cardiac catheterization, no. %	298 (21)	251 (22)	106 (13)
Percutaneous coronary intervention, no. %	308 (21)	162 (14)	80 (9)
CABG, no. %	10 (1)	42 (4)	15 (2)
Pharmacological therapy given during admission, no. %			
• ASA	1368 (95)	1018 (90)	765 (91)
• ADP antagonist	868 (60)	719 (64)	422 (50)
• GP receptor inhibitor	77 (5)	47 (4)	19 (2)
• Unfrac heparin	181 (13)	203 (18)	197 (23)
• LMWH	446 (31)	767 (68)	537 (64)
• Beta blocker	951 (66)	737 (65)	587 (69)
• ACE inhibitor	865 (60)	597 (53)	510 (60)
• Angiotensin II receptor blocker	66 (5)	131 (12)	70 (8)
• Statin	1333 (92)	1022 (90)	769 (91)
• Other lipid lowering agent	54 (4)	79 (7)	54 (6)
• Diuretics	393 (27)	464 (41)	241 (29)
• Calcium antagonist	94 (7)	253 (22)	195 (23)
• Oral hypoglycaemic agent	373 (26)	364 (32)	236 (28)
• Insulin	379 (26)	320 (28)	183 (22)
• Anti-arrhythmic agent	135 (9)	72 (6)	49 (6)

Table IV: Overall outcomes for patients with ACS by ACS stratum, Malaysia 2006

Outcome	In-hospital						30-day*					
	STEMI		NSTEMI		UA		STEMI		NSTEMI		UA	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
• Discharged / Alive	1312	91	1056	93	818	97	939	65	796	70	567	67
• Transferred to another centre	0	0	0	0	0	0	0	0	0	0	0	0
• Died	129	9	75	7	25	3	158	11	92	8	38	4
• Lost to follow-up	NA	NA	NA	NA	NA	NA	348	24	244	22	240	28
• Missing	4	0	1	0	2	0	0	0	0	0	0	0

*Including patients who died in-hospital

Table V: Overall outcomes for patients with NSTEMI/UA by percutaneous coronary intervention, Malaysia 2006

Outcome	In-hospital				30-day*			
	Percutaneous coronary intervention				Percutaneous coronary intervention			
	Yes		No		Yes		No	
	No.	%	No.	%	No.	%	No.	%
• Discharged / Alive	233	96	1641	95	207	86	1156	67
• Transferred to another centre	0	0	0	0	0	0	0	0
• Died	9	4	91	5	12	5	118	7
• Lost to follow-up	NA	NA	NA	NA	23	10	461	27

*Including patients who died in-hospital.

Table VI: Overall outcomes for patients with STEMI by fibrinolytic therapy, Malaysia 2006

Outcome	In-hospital				30-day*			
	Fibrinolytic therapy				Fibrinolytic therapy			
	Yes		No		Yes		No	
	No.	%	No.	%	No.	%	No.	%
• Discharged / Alive	940	92	372	87	686	67	253	59
• Transferred to another centre	0	0	0	0	0	0	0	0
• Died	74	7	55	13	90	9	68	16
• Lost to follow-up	NA	NA	NA	NA	242	24	106	25
• Missing	4	0	0	0	0	0	0	0

*Including patients who died in-hospital

Table VII: Overall outcomes for patients with STEMI by percutaneous coronary intervention at admission, Malaysia 2006

Outcome	In-hospital				30-day*			
	Percutaneous coronary intervention				Percutaneous coronary intervention			
	Yes		No		Yes		No	
	No.	%	No.	%	No.	%	No.	%
• Discharged / Alive	283	92	1029	91	242	79	697	61
• Transferred to another centre	0	0	0	0	0	0	0	0
• Died	25	8	104	9	34	11	124	11
• Lost to follow-up	NA	NA	NA	NA	32	10	316	28

*Including patients who died in-hospital

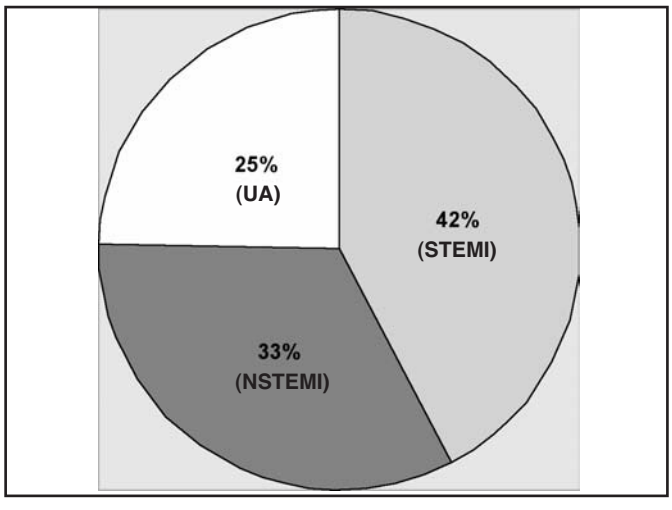


Fig. 1: Stratum distribution for patients with ACS, Malaysia 2006 (Number and Percentage)

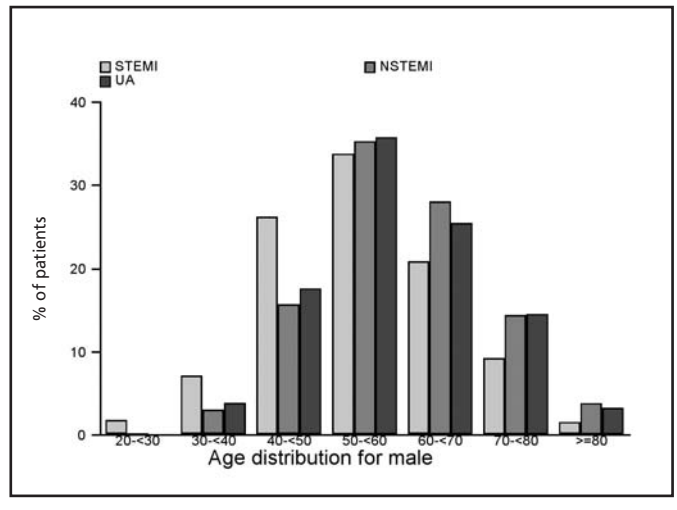


Fig. 2a : Age-gender distribution for male patients with ACS by ACS stratum, Malaysia 2006

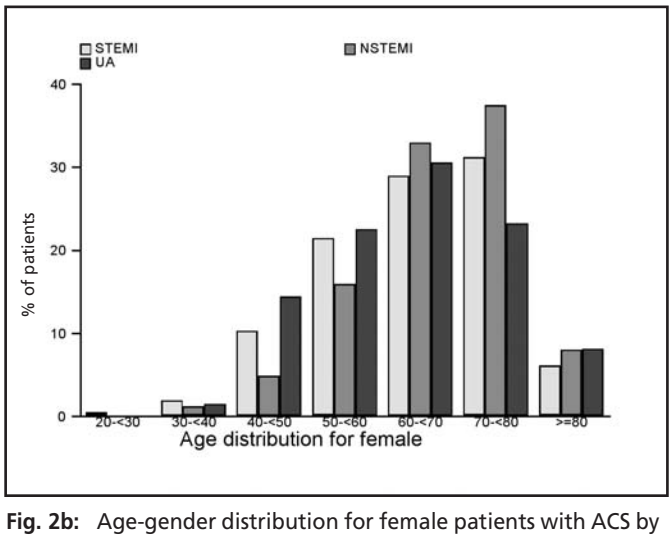
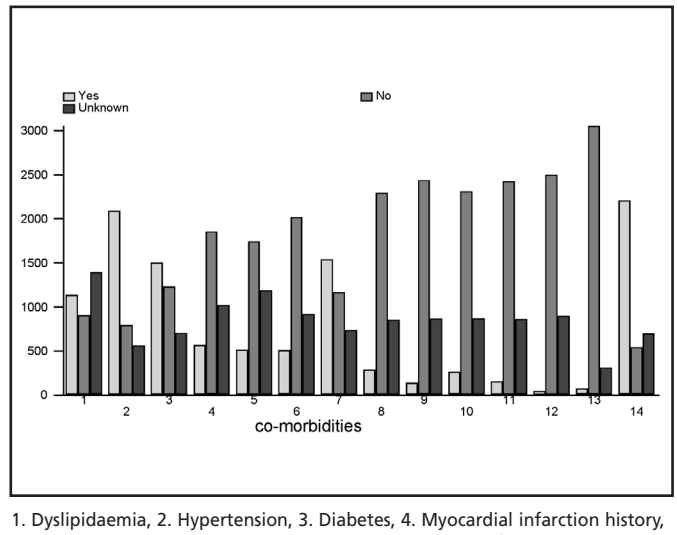


Fig. 2b: Age-gender distribution for female patients with ACS by ACS stratum, Malaysia 2006



1. Dyslipidaemia, 2. Hypertension, 3. Diabetes, 4. Myocardial infarction history, 5. Documented CAD > 50% stenosis, 6. Chronic angina (onset more than 2 weeks ago), 7. New onset angina (less than 2 weeks), 8. Heart failure, 9. Chronic lung disease, 10. Renal disease, 11. Cerebrovascular disease, 12. Peripheral vascular disease, 13. None of the above, 14. Any Coronary artery disease

Fig. 3: Co-morbidities for patients with ACS, Malaysia 2006

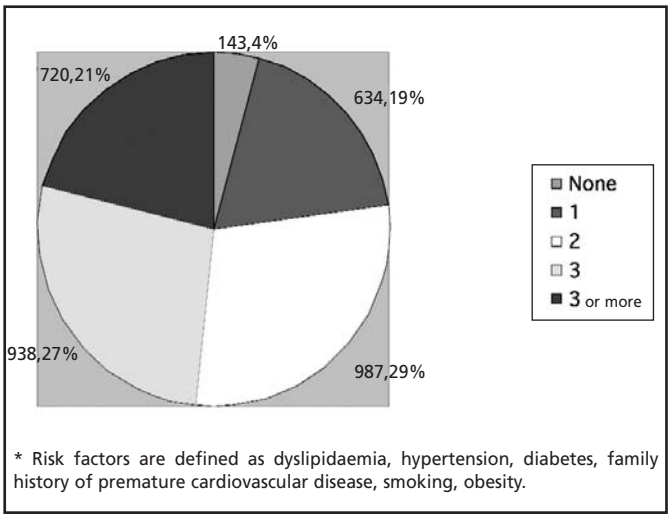


Fig. 4: Distribution of the presence of cumulative risk factors (Number and Percentage)

Men were three times more likely than women to have ACS. However, the number of women in the database confirmed that more women get ACS each year than had been previously thought with a clear increasing trend from the 3rd decade of life onwards. Traditional cardiovascular risk factors such as diabetes, dyslipidaemia, smoking and hypertension were present in less than half of the ACS patients. Infact patients with STEMI had lower prevalence of diabetes, hypertension and dyslipidaemia compared to NSTEMI and UA patients. The only traditional risk factor that was highest in STEMI compared to other groups is active smoking. This could indicate that active smoking habit is probably the most important risk factor for STEMI.

The mortality for ACS, in particular STEMI, remains unacceptably high. Over 75% of STEMI patients received thrombolysis or proceeded to primary angioplasty. Patients who missed thrombolysis were nearly twice as likely to die than those who received them. PCI reduced mortality in the NSTEMI and UA groups but not the STEMI groups. This is most probably because the indication for same admission PCI in Malaysia appear to be "rescue" in response to failure to revascularization by thrombolysis or otherwise when the patient is in severe heart failure. Such patients are normally at highest risk of mortality. Therefore the results in this survey, which indicates no difference in outcomes between the PCI and non-PCI groups, may actually favour PCI. Besides thrombolysis and PCI, other factors that may affect mortality include increasing age and high killip class.

It is clear to us now that Malaysia has a high incidence of ACS and a resultant high mortality rate. Nevertheless, although medical therapy and utilization are appropriate and have made significant impact in improving survival, interventional therapies such as PCI and CABG remained under-utilized. We are confident that even more results with be revealed to us in the coming years by way of the NCVD.

Who are we? We are the National Heart Association of Malaysia (NHAM), the National Heart Foundation (NHF), and the Clinical Research Centre for Malaysia (CRC). We are doctors and nurses dedicated to the treatment and prevention of heart disease in our daily practice. We are based at government hospitals, private hospitals, cardiologists, physicians, and nurses. We are together in solving this problem. Are you with us? Please join us! The NCVD and its objectives can only be achieved through your participation and contribution.

ACKNOWLEDGEMENT

We would like to thank the governance board of NCVD, steering committee of ACS registry, doctors in charge of participating sites and their study coordinators involved; and the Clinical Research Centre, Ministry of Health for their support in epidemiological advice, statistics, project management and IT infrastructure especially to Dr Jamaiyah Haniff, Ms. Gunavathy Selvaraj and Ms Noor Amirah Muhamad. We also wish to thank the Ministry of Health, Malaysia and National Heart Association of Malaysia for their continued support and generous funding towards this project.

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