

**RAMA – EGAT HEART SCORE VALIDITY AMONG
ACUTE CORONARY SYNDROMES PATIENTS IN SIRIRAJ
HOSPITAL**



**A THESIS SUBMITTED IN PARTIAL FULFILLMENT
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MAJOR IN INFECTIOUS DISEASES AND EPIDEMIOLOGY
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MAHIDOL UNIVERSITY
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HOSPITAL**



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RAMA – EGAT HEART SCORE VALIDITY AMONG ACUTE CORONARY SYNDROMES PATIENTS IN SIRIRAJ HOSPITAL**PATTANAPORN SUPINA 5037147 PPH/M****M.Sc. (PUBLIC HEALTH) MAJOR IN INFECTIOUS DISEASES AND EPIDEMIOLOGY****THESIS ADVISORY COMMITTEE: KITIPHONG HARNCHAROEN, Ph.D. (BIOLOGICAL SCIENCE), SUKHONTHA SIRI, Ph.D. (TROPICAL MEDICINE), ADISAK MANEESAI, M.D., DIP.THAI BOARD OF CARDIOLOGY.****ABSTRACT**

Rama – EGAT heart score is a screening test for the early detection of coronary heart disease (CHD) in Thai people. It was introduced for use in EGAT personnel as a specific population. This case – control study aimed to test validity of the Rama – EGAT heart score for the assessment of Acute Coronary Syndromes (ACS) patients in Siriraj Hospital, Bangkok. There are three algorithms of the Rama - EGAT heart score-for public health providers, general population, and general population without blood tests. There were two groups in this study: 163 patients with coronary heart disease as a case group and 314 patients without coronary heart disease as a control group.

The screening results of the Rama – EGAT heart score found that the risk assessment used by the general population had a higher accuracy for screening ACS than that used by public health providers and the general population without blood tests. In addition, the study found that the risk assessment used by public health providers when modified for females was the most accurate for screening ACS. The areas under the ROC curve (AUC) were 0.724, and 0.849 in the Rama – EGAT heart score section for public health providers (male and female, respectively). The areas under the ROC curve were 0.763, and 0.691 for the general population and general population without blood tests, respectively.

There were three optimal cutoff point values of the Rama – EGAT heart score for screening ACS, determined by the three groups of users: 2 points in public health provider group (80% sensitivity and 50% specificity for males and 90% sensitivity and 59% specificity for females), 8 points in the general population group (88% sensitivity, 46% specificity), and 9 points in the general population without blood test group (83% sensitivity, 50% specificity). The positive predictive value (PPV) and the negative predictive values (NPV) of the public health providers were 47% and 51%, and 82% and 93% in males and females, respectively. The PPV and NPV were 45% and 46%, 88% and 85% in the general population and general population without blood test group, respectively.

The Rama – EGAT heart score can be used as an alternative screening test for early detecting ACS in Thai people, especially in women.

KEY WORDS: RAMA – EGAT HEART SCORE / VALIDITY / ACUTE CORONARY SYNDROME / SIRIRAJ HOSPITAL

61 pages

การทดสอบความแม่นยำของแบบประเมินความเสี่ยงโรคหลอดเลือดหัวใจ Rama – EGAT heart score ในผู้ป่วย ACUTE CORONARY SYNDROME โรงพยาบาลศิริราช
RAMA – EGAT HEART SCORE VALIDITY AMONG ACUTE CORONARY SYNDROMES PATIENTS IN SIRIRAJ HOSPITAL

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บทคัดย่อ

Rama – EGAT heart score เป็นแบบประเมินความเสี่ยงต่อโรคหลอดเลือดหัวใจในประเทศไทย แบ่งเป็น 3 ประเภท คือ แบบประเมินที่ทำโดยบุคลากรทางการแพทย์, แบบประเมินด้วยตนเองของประชาชน และแบบประเมินอย่างง่ายด้วยตนเองของประชาชน (ไม่ใช่ผลเลือด) การศึกษาในครั้งนี้เป็นแบบ case-control study มีวัตถุประสงค์เพื่อทดสอบความแม่นยำของแบบประเมินความเสี่ยง Rama – EGAT heart score ในผู้ป่วย Acute Coronary Syndromes (ACS) โรงพยาบาลศิริราช อาสาสมัครในการศึกษาเป็นกลุ่มผู้ป่วยโรคหลอดเลือดหัวใจ 163 ราย และกลุ่มผู้ป่วยที่ได้รับการตรวจสุขภาพประจำปีที่ไม่เป็นโรคหลอดเลือดหัวใจ 314 ราย

ผลการศึกษา พบว่าแบบประเมินที่ทำโดยบุคลากรทางการแพทย์ที่ดัดแปลงมาใช้กับเพศหญิงให้ค่าความแม่นยำสูงสุด โดยมีค่า area under the ROC curve (AUC) เท่ากับ 0.724 และ 0.849 ในเพศชายและเพศหญิง ตามลำดับ สำหรับแบบประเมินที่ทำด้วยตนเองของประชาชนและแบบประเมินอย่างง่ายด้วยตนเองของประชาชน (ไม่ใช่ผลเลือด) จะมีค่า AUC เท่ากับ 0.763 และ 0.69 ตามลำดับ จุดตัดคะแนนที่ใช้ทำนาย ACS สำหรับแบบประเมินที่ทำโดยบุคลากรทางการแพทย์ มีเท่ากับ 2 คะแนน ซึ่งจะให้ค่าความไวและค่าความจำเพาะ ร้อยละ 80, 50 ในเพศชาย และร้อยละ 90, 59 ในเพศหญิง สำหรับแบบประเมินที่ทำด้วยตนเองของประชาชนมีจุดตัดคะแนนที่ 8 คะแนน มีค่าความไวร้อยละ 88 และค่าความจำเพาะร้อยละ 46 และแบบประเมินอย่างง่ายด้วยตนเองของประชาชน (ไม่ใช่ผลเลือด) จะมีจุดตัดคะแนนที่ 9 คะแนนให้ค่าความไวร้อยละ 83 และค่าความจำเพาะร้อยละ 50 ค่าความน่าจะเป็นที่จะทำนายโรคได้ถูกต้องถ้าผลการทดสอบเป็นบวกและผลการทดสอบเป็นลบในแบบประเมินที่ทำโดยบุคลากรทางการแพทย์เท่ากับร้อยละ 47 ร้อยละ 82 ในเพศชาย และร้อยละ 51 ร้อยละ 93 ในเพศหญิง แบบประเมินที่ทำด้วยตนเองของประชาชนจะมีค่าเท่ากับร้อยละ 45 ร้อยละ 88 และเท่ากับร้อยละ 46 ร้อยละ 85 ในแบบประเมินอย่างง่ายด้วยตนเองของประชาชน (ไม่ใช่ผลเลือด)

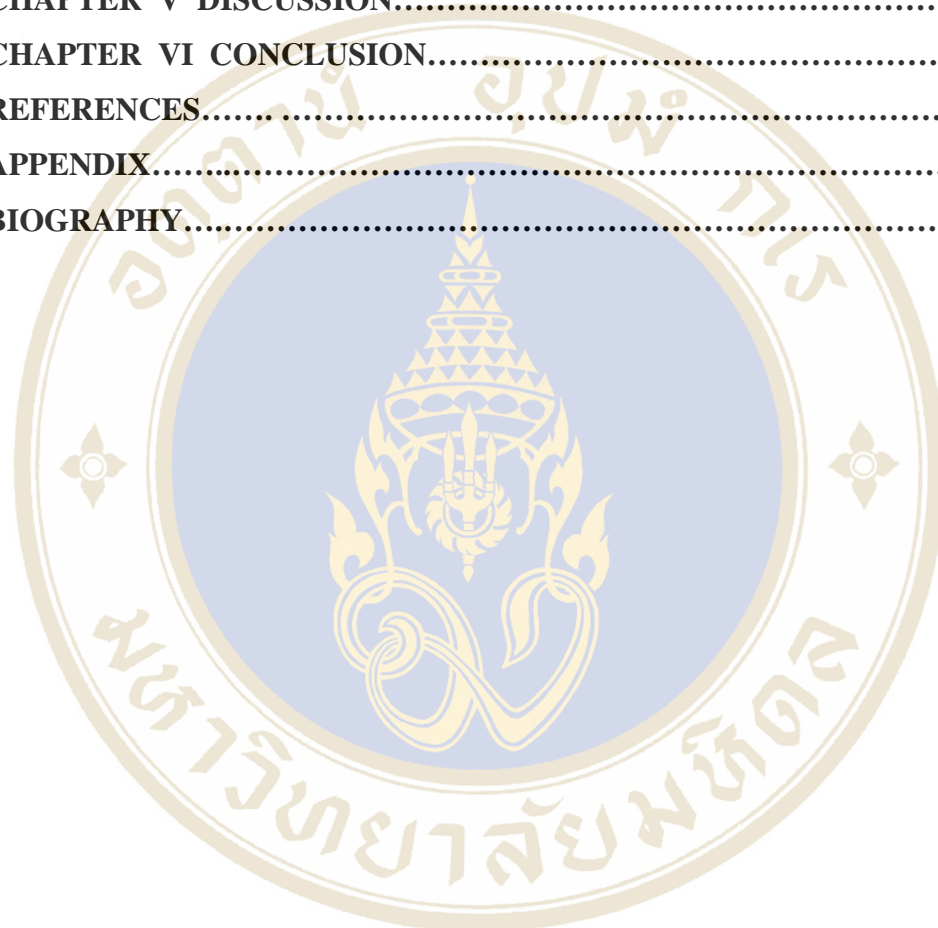
แบบประเมินความเสี่ยงนี้เป็นแนวทางเลือกหนึ่งที่ใช้ในการคัดกรองความเสี่ยงต่อภาวะ ACS ในประเทศไทย โดยมีความเหมาะสมกับเพศหญิง

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CHAPTER I

INTRODUCTION

Rationale

In the period of advancing industry and technology such as communication, electronic devices and consumable products have affected changing of lifestyle and caused of morbidity, mortality, later. One of the disease affected by changing of lifestyle is coronary heart disease (CHD) (1). CHD is now the leading cause of death worldwide and have 3.8 million men and 3.6 million women die each year from this disease. It is expected that 82% of the future increment in coronary heart disease mortality will occur in developing countries (2). The rapid socioeconomic growth in developing countries enhance exposure to risk factors for coronary artery disease (CAD), such as diabetes, factors, hypercholesterolemia, hypertension, and smoking. There is a relative lack of prevention and control measurement to decrease exposure to these risk factors in developing countries (3). In Thailand patients of CAD increased from 22,080 to 112,352 cases since 1995 to 2005. During this ten years period, the mortality of CAD increase from 2,784 to 11,627 cases (4).

Coronary artery disease (CAD) is a chronic disease and patients have to be treated lifelong and consequently impact on their health and their economic burden. There was a study comparing the quality of life of CAD patient before and after treatment. Six months after treatment, 37% of patients could return to their normal work, 43.2% could do their jobs with some limitation, 2.5% had to change career or job position, 4.9% could not return to their jobs and 12.4% stopped working (1). The estimate lifetime cost of Acute Coronary Syndromes (ACS) was studied at Ramathibodi Hospital using both a government and a societal perspective. The result show median direct health care costs from 330 records in first year 120,298 baht. Median direct non health care costs were 3,215 baht per month from 193 records in

year 2005. Median indirect costs for the first year of the records from both 2002-3 and 2005 were 30,477 baht (5).

CHD risk reduction can be decrease the probability of disease occurrence. The concept of risk assessment and reduction, introduced initially by the Framingham Heart Study and refined in other models, forms the cornerstone of preventive cardiology(6). The Framingham Heart Study helped to establish tools to assess CHD risk, but the homogeneous nature of the Framingham population prevents simple extrapolation to other populations. The original Framingham functions overestimated the risk of CHD for Chinese Multi-provincial Cohort Study (CMCS) participants. Recalibration of the Framingham functions improved the estimation and demonstrated that the Framingham model is useful in the Chinese population. The recalibration of Framingham functions could permit various regions of the world to adapt Framingham tools to local populations (7).

Rama- EGAT heart score is the estimation equation model to assess the risk of CHD in Thailand. This study was retrospective cohort study in 3,499 employees of the Electricity Generating Authority of Thailand and collect data since 1985 until 2002. Rama - EGAT heart score divide 3 sections; (1) using by public health provider (age, blood pressure, total cholesterol level, HDL level, current smoker, diabetics, waist, circumference and alcohol drinker), this section in the thesis will use abbreviation PB*, (2) general population,(GN-age, sex, total cholesterol level, current smoker, diabetics, hypertension and waist circumference), (3) general population without blood test, (GB-age, sex, current smoker, hypertension and waist circumference). This study compared the ability of Framingham functions in the EGAT cohort study and Rama – EGAT heart score. The result show Rama – EGAT heart score is more accuracy than Framingham functions. The area under the receiver operating characteristic curve of Rama – EGAT heart score was 0.772, 0.716, 0.670 respectively and 0.699, for original Framingham score. However, Rama- EGAT heart score has some limitation such as insufficient of female and elderly to create equation accurate for risk assessment and the population of EGAT employees are only specific in group of sex, high education,

*PB; used by public health provider

GN; used by general population

GB; used by general population without blood test

high income and dwelling in urban therefore it cannot represent general population in Thailand and cause bias for in this study(8).

Because of bias in Rama – EGAT heart score previous study, this study intended to test the validity of Rama – EGAT heart score in patients at Siriraj hospital.

Objectives of the study

1. General objective

To test validity of the Rama – EGAT heart score for assessment in patients who have Acute Coronary Syndromes.

2. Specific objective

2.1 To determine sensitivity, specificity, accuracy, positive predictive value (PPV) and negative predictive value (NPV) of Rama – EGAT heart score.

2.2. To compare the performance of the Rama- EGAT heart score; using by public health provider, general population, general population with out blood test.

Operational Definitions

Acute Coronary Syndromes (ACS): The patients who had Acute Coronary Syndromes and were taken the Coronary angiography on appointing date. The result found that patients have coronary artery stenosis or obstruction.

Blood pressure was measure after 5 minutes rest, using a calibrated mercuracy sphygmomanometer with systolic blood pressure and diastolic blood pressure recored as the first and fifth Korotkoff sounds respectively. Blood pressure was recorded twice using seated measurements (9). In some case blood pressure level were collected from OPD card before received hypertension diagnosis or medicine to control blood pressure.

Total cholesterol and HDL cholesterol were collected from OPD card before received dyslipidemia diagnosis or medicine to control cholesterol level. In case, do not have this data be able to use currently total cholesterol level.

Waist circumference was measured using tape, holding it parallel to the floor, around abdomen at 1 cm above the umbilicus. Measurement were made with subject standing erect, abdomen relaxed, arms at the side. Hold tape snug but do not compress the skin (10).

Diabetic was following criteria of EGAT; (1) a prior clinical diagnosis, (2) a fasting capillary glucose ≥ 6.1 mmol/l, (3) a fasting plasma glucose ≥ 7.0 mmol/l or (4) a 2 hour capillary or plasma glucose ≥ 11.1 mmol/l.(9).

Hypertension was following criteria of EGAT: blood pressure $\geq 140/90$ mmHg. or on anti-hypertensive drug treatment(9).

Smoker: Persons who intake cigarette and reported their cigarette smoking as;

Non-smokers: Person who never smoke cigarette in their live and / or who smoked previously but had already ceased smoking at least 18 year for certain period prior to the study.

Current smokers: Person who had smoked up to the time or ceased smoking less than 18 year of study.

Alcohol drinker: Subject who drank every kinds of alcohol classify as;

Non - drinkers: persons who never drank alcoholic beverages in their lives and or who drank alcoholic beverages previously and had ceased alcohol consumption at least 18 year for a certain period prior to the study.

Current drinkers: person who drank alcoholic beverages when they participated in social activity and/ or who drank alcoholic beverages regularly and had ceased alcohol consumption less than 18 year for a certain period prior to the study.

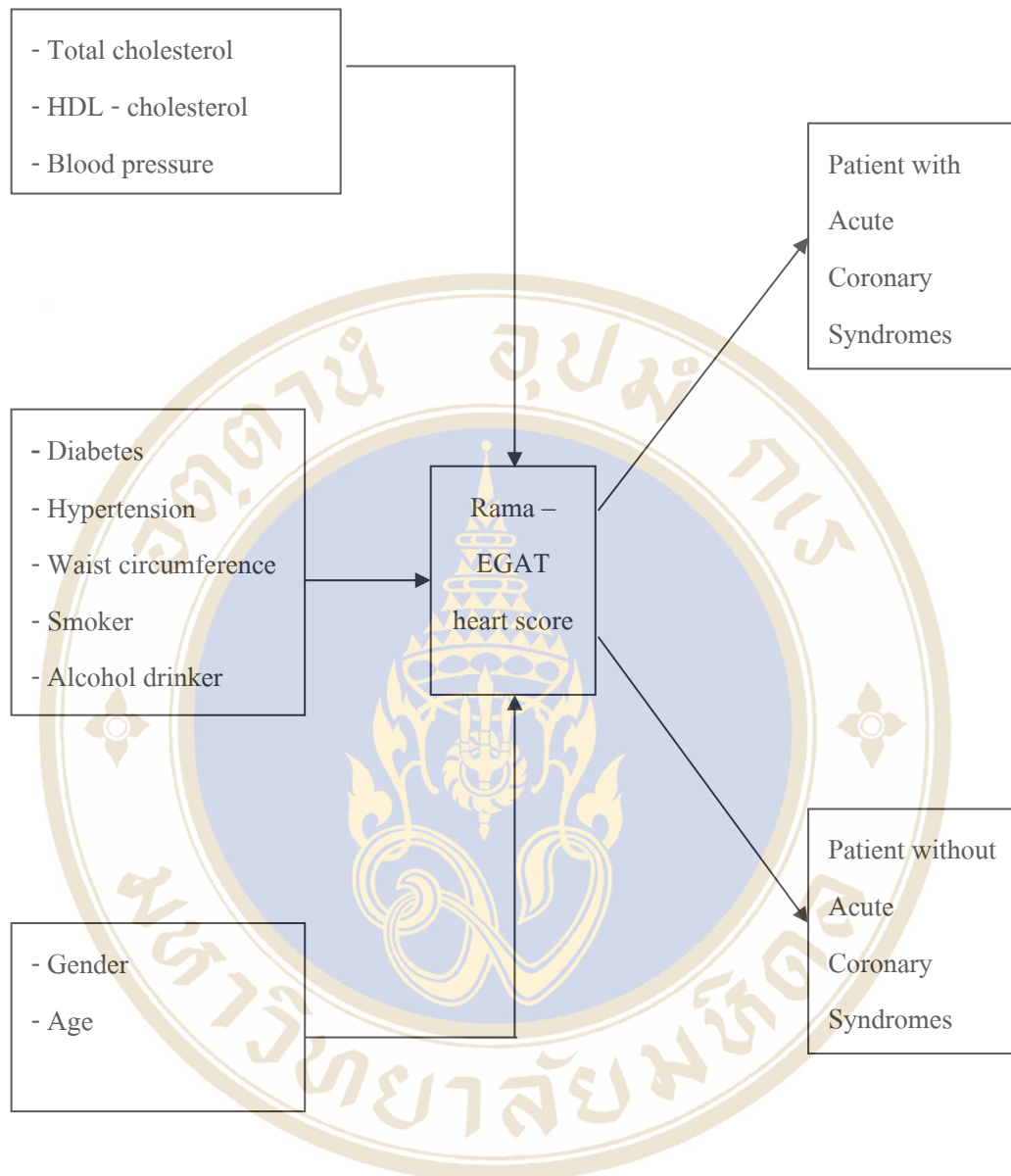


Figure 1 Conceptual frame work

CHAPTER II

LITERATURE REVIEW

The review literature was divided into 2 parts; characteristics of acute coronary syndromes and risk factors of acute coronary syndromes.

Characteristics of Acute Coronary Syndromes

Acute Coronary Syndromes (ACS) has evolved as a useful operational term to refer to any constellation of clinical symptoms that are compatible with acute myocardial ischemia. It encompasses myocardial infarction (ST-segment elevation and depression, Q wave and non-Q wave) and unstable angina (UA) (11).

1. Pathophysiology (12)

The accumulation of atherosclerotic plaques is no longer considered to be the simple result of cholesterol storage. Inflammation is increasingly implicated in plaque formation. Inflammatory responses to insults such as bacterial toxins, in addition to traditional risk factors, such as dyslipidemia, hypertension, hyperglycemia, and obesity, can initiate monocyte adherence. Once adhered to the endothelium, monocytes migrate into the vascular wall to the arterial intima, the muscular layer closest to the vessel lumen. At this point, they transform into macrophages and begin to ingest the modified lipoprotein particles, which accumulate in the intima naturally and at an accelerated rate in people with hyperlipidemia. These lipid filled macrophages are also known as foam cells, which are the hallmarks of atherosclerotic plaques. Foam cells typically come together to form a plaque within the intima. Many foam cells die by apoptosis, disintegrate with debris becoming membrane-bound, and then are eliminated by phagocytosis or by shedding. The original modified lipoproteins, macrophages, foam cells, and apoptotic debris, in addition to other important factors, such as collagen and von Willebrand factor, form the core of the

plaque. Many patients who present with ACS will have more than 1 disrupted plaque that may have become symptomatic through several mechanisms. First, erosion of the epithelial monolayer, separating the intima from the vessel blood flow, can produce a thrombus by exposing collagen and von Willebrand factor—factors that promote platelet aggregation (one of the first steps in thrombus formation). Endothelial monolayer erosion can be initiated by cell death or subendothelial basement membrane (a supportive layer that exists in between the endothelium and the intima) degradation. Inflammatory activation of T cells subjects the endothelial cells to attack in addition to local signaling that may increase apoptosis. Secondly, plaque growth also results from intraplaque hemorrhages. Inflammatory cells within the plaque promote angiogenesis by secreting mediators. These small, fragile new vessels are prone to rupture. Thrombin production upon rupture stimulates the release of platelet-derived growth factor and transforming growth factor beta, which are potent stimulants for smooth muscle growth, further increasing plaque bulk. A third mechanism of plaque growth occurs when a plaque's fibrous cap tears, permitting contact between the plaque core and circulating coagulation factors in the blood. The common link between the various ACS is the rupture of a vulnerable, but previously quiescent, coronary atherosclerotic plaque. Exposure of plaque contents to the circulating blood pool triggers the release of vasoactive amines, and activation of platelets and the coagulation cascade. The extent of resultant platelet aggregation, thrombosis, vasoconstriction, and microembolization dictates the clinical manifestations of the syndrome. The relative fibrin and platelet content of these lesions vary, with unstable angina / non-ST-segment elevation myocardial infarction (NSTEMI) more often associated with platelet – rich lesion and ST-segment elevation myocardial infarction (STEMI) associated with fibrin – rich clot, although it should be noted that all lesions contain some degree of both components.

2. Diagnosis (12)

2.1 Signs and symptoms

Patients with myocardial ischemia can present with chest pain or pressure, shortness of breath, palpitations, syncope, or sudden death. The pain of myocardial infarction (MI) is typically severe, constant, and retrosternal. The pain commonly spreads across the chest and may radiate to the throat or jaw, or down the arms. Its duration is most often more than 20 minutes. Diaphoresis, nausea, pallor, and anxiety are often present.

2.2 The Electrocardiogram

The ECG abnormalities in myocardial ischemia depend on the extent and nature of coronary stenosis and the presence of collateral flow, but the pattern of ECG changes generally gives a guide to the area and extent of infarction. The number of leads involved broadly reflects the extent of myocardium involved.

2.3 Cardiac Biomarkers

Measurement of enzymes released into the serum from necrotic myocardial cells after infarction can aid in the diagnosis of MI. The creatine kinase-MB isoenzyme (CK-MB) has been a benchmark for markers, but it is not specific for myocardium. Cardiac-specific isoforms of troponin T and I have emerged as sensitive MI indicators and, importantly, for risk stratification of Acute Coronary Syndromes patients. The characteristic rise and fall of CK-MB in serial measurements is nearly pathognomonic for diagnosing MI. The first rise in CK-MB after MI requires 4–6 hr after onset of symptoms. For diagnosis with high sensitivity and specificity, serial sampling over a period of 8–12 hr. is required. A newer serological test for the detection of myocardial damage employs measurement of cardiac troponins. The preferred biomarker for myocardial necrosis is cardiac troponin (I or T), which has nearly absolute myocardial tissue specificity as well as high clinical sensitivity, thereby reflecting even microscopic zones of myocardial necrosis. An increased value for cardiac troponin is defined as a measurement exceeding the 99th percentile of a normal reference population (URL = upper reference limit). Detection of a rise and/or

fall of the measurements is essential to the diagnosis of acute myocardial infarction. If troponin assays are not available, the best alternative is CKMB (measured by mass assay). As with troponin, an increased CKMB value is defined as a measurement above the 99th percentile URL, which is designated as the decision level for the diagnosis of myocardial infarction. Measurement of total CK is not recommended for the diagnosis of myocardial infarction, because of the large skeletal muscle distribution and the lack of specificity of this enzyme. Troponins may not be elevated until 6 hours after an acute event, and so critical therapeutic interventions should not be delayed pending assay results. Once elevated, troponin levels can remain high for days to weeks, limiting their utility to detect late reinfarction.

ACS patients with new evidence of ST-segment elevation on presenting ECG are labeled as having an ST-segment elevation myocardial infarction (STEMI). Those without ST-segment elevation but with evidence of myonecrosis are determined to have a non- ST-segment elevation myocardial infarction (NSTEMI); and those without any evidence of myonecrosis are diagnosed with unstable angina.

3. Unstable angina (UA) / non- ST-segment elevation myocardial infarction NSTEMI (11)

3.1 Definition

Unstable angina is usually secondary to reduced myocardial perfusion resulting from coronary artery atherothrombosis. In this event, however, the nonocclusive thrombus that developed on a disrupted atherosclerotic plaque does not result in any biochemical evidence of myocardial necrosis. NSTEMI represents a clinical condition presenting very similarly to unstable angina but with evidence of myonecrosis by some form of cardiac markers without ST –elevation on ECG. Patients presenting with NSTEMI have intermediate risk of acute complications when compared to unstable angina (low risk) and STEMI high risk.

3.2 Pathophysiology

These conditions are characterized by an imbalance between myocardial oxygen supply and demand. They are not a specific disease, such as

pneumococcal pneumonia, but rather a syndrome, analogous to hypertension. A relatively few nonexclusive causes are recognized. The most common mechanisms involve an imbalance that is caused primarily by a reduction in oxygen supply to the myocardium, whereas with the fifth mechanism noted below, the imbalance is principally due to increased myocardial oxygen requirements, usually in the presence of a fixed, restricted oxygen supply.

3.2.1. The most common cause of UA/NSTEMI is reduced myocardial perfusion that results from coronary artery narrowing caused by a thrombus that developed on a disrupted atherosclerotic plaque and is usually nonocclusive. Microembolization of platelet aggregates and components of the disrupted plaque are believed to be responsible for the release of myocardial markers in many of these patients. An occlusive thrombus/plaque also can cause this syndrome in the presence of an extensive collateral blood supply.

3.2.2. The most common underlying molecular and cellular pathophysiology of disrupted atherosclerotic plaque is arterial inflammation, caused by noninfectious (e.g., oxidized lipids) and, possibly, infectious stimuli, which can lead to plaque expansion and destabilization, rupture or erosion, and thrombogenesis. Activated macrophages and T lymphocytes located at the shoulder of a plaque increase the expression of enzymes such as metalloproteinases that cause thinning and disruption of the plaque, which in turn can lead to UA/NSTEMI.

3.2.3 A less common cause is dynamic obstruction, which may be triggered by intense focal spasm of a segment of an epicardial coronary artery (Prinzmetal's angina). This local spasm is caused by hypercontractility of vascular smooth muscle and/or by endothelial dysfunction. Large-vessel spasm can occur on top of obstructive or destabilized plaque, resulting in angina of "mixed" origin or UA/NSTEMI. Dynamic coronary obstruction can also be caused by diffuse microvascular dysfunction; for example, due to endothelial dysfunction or the abnormal constriction of small intramural resistance vessels. Coronary spasm also is the presumed mechanism underlying cocaine-induced UA/NSTEMI. A third cause of UA/NSTEMI is severe narrowing without spasm or thrombus. This occurs in some patients with progressive atherosclerosis or with restenosis after a Percutaneous Coronary Intervention.

3.2.4. A fourth cause of UA/NSTEMI is coronary artery dissection (e.g., as a cause of ACS in periparturient women).

3.2.5. The fifth mechanism is secondary UA, in which the precipitating condition is extrinsic to the coronary arterial bed. Patients with secondary UA usually, but not always, have underlying coronary atherosclerotic narrowing that limits myocardial perfusion, and they often have chronic stable angina. Secondary UA is precipitated by conditions that increase myocardial oxygen requirements, such as 1) fever, tachycardia, or thyrotoxicosis; 2) reduce coronary blood flow, such as hypotension; or 3) reduce myocardial oxygen delivery, such as anemia or hypoxemia.

These causes of UA/NSTEMI are not mutually exclusive.

3.3 Presentations of UA and NSTEMI

There are 3 principal presentations of UA:

3.3.1 rest angina (angina commencing when the patient is at rest).

3.3.2 new onset (less than 2 months) severe angina.

3.3.3 increasing angina (increasing in intensity, duration, and/or frequency)

Criteria for the diagnosis of UA are based on the duration and intensity of angina as graded according to the Canadian Cardiovascular Society classification

Non-ST-elevation MI generally presents as prolonged, more intense rest angina or angina equivalent.

4. ST– elevation myocardial infarction (STEMI) (12, 13)

STEMI represents the most lethal form of ACS, one in which a completely occlusive thrombus results in total cessation of coronary blood flow in the territory of the occluded artery and resultant ST-segment elevation on the ECG. ST-segment elevation of at least 1 mV in two or more contiguous leads provides strong evidence of thrombotic coronary occlusion.

The classic World Health Organization criteria for an acute MI requires that two of following three elements be present

1. a history suggestive of coronary is ischemia for a prolonged period (>30 min)
2. evolutionary changes on serial ECG suggestive of MI
3. a rise and fall in serum cardiac markers consistent with myonecrosis

Risk factors of ACS.

1. Hypertension

Hypertension, typically defined as systolic blood pressure ≥ 140 mm Hg or diastolic blood pressure ≥ 90 mm Hg, has been called the “silent killer”. Many factors determine whether or not a person develops hypertension. Age, race, socioeconomic status, education, and gender affect the progression of hypertension and response to treatment. Also, other coronary risk factors may have a cumulative effect on this condition. The risk of morbidity and mortality with coronary heart disease is related to increased levels of blood pressure indirect and continuous manner (14). Poor control rates of systolic hypertension remain a principal problem that further compromises their already high cardiovascular disease risk (15).

2. Cholesterol Level

There was a study that aimed to identify the risk factors associated with acute myocardial infarction (AMI) and their respective powers of association in the Sao Paulo metropolitan region. The following risk factors showed and independent association with AMI. LDL-cholesterol (Odd ratio = 2.75; 95% confidence interval [CI], 1.45-5.19; P = 0.0018) and HDL-cholesterol levels (Odd ratio = 0.53; 95% confidence interval [CI], 0.32-0.87; P = 0.011) showed to be independently associated with AMI within the Sao Paulo metropolitan region (16).

The Acute Myocardial Infarction Risk Factor Assessment in Brazil (AFIRMAR) study is a case-control. The conditional multivariable analysis of 33 variables showed the following independent risk factors for acute myocardial infarction (AMI), low-density lipoprotein-cholesterol 100 to 120 mg/dL (Odd ratio

2.10, $P < .00001$) and low-density lipoprotein-cholesterol >120 mg/dL (Odd ratio 1.75, $P < .00001$) (17).

3. Smoking

Cigarette smoking has many adverse effects on the cardiovascular system. These effects include increased platelet adhesiveness, increase heart rate, with resulting increase in myocardial demand; elevated catecholamine level and decreased serum oxygen-carrying capacity (14). The soluble Vascular Cell Adhesion Molecule-1 (VCAM-1) level was found significantly higher in smokers than in nonsmokers. Patients with CAD, smoking leads to elevated levels of soluble VCAM-1 that may clarify one of the mechanisms of its accelerating effect on the atherosclerotic process (18). Smoking is a major and reversible risk factor for coronary artery disease. On average, Acute Coronary Syndromes occurred 10 years earlier in smokers than in non-smokers (19).

4. Diabetes

Diabetes increases CHD risk, diabetics should be routinely and systematically assessed for CHD. Tight diabetic control coupled with modification of other CHD risk factors may help decrease CHD risk in the people.

The insulin resistance syndrome is associated with an increased risk of symptomatic coronary artery disease. Asymptomatic persons with increased coronary calcification have increased coronary plaque. Asymptomatic individuals with insulin resistance have elevated coronary calcium scores (20). A higher correlation was observed between angiographic CAD prevalence and fasting plasma glucose (FPG) levels of 6.1 to 6.9 mmol/L as compared with FPG levels ≤ 5.5 mmol/L (adjusted odds ratio [OR], 2.67; 95% confidence interval [CI], 1.72-4.10; $P = .011$). The FPG levels of 5.6 to 6.9 mmol/L (adjusted OR, 2.57; 95% CI, 1.65-4.02; $P < .001$) and 5.6 to 6.0 mmol/L (adjusted OR, 2.33; 95% CI, 1.58-3.49; $P = .008$) were modestly correlated with angiographic CAD prevalence in Chinese patients (21). Elevated glucose level on admission is associated with adverse prognosis in patients with STEMI treated with Percutaneous Coronary Intervention (PCI) (22).

5. Obesity

Obesity is becoming a worldwide phenomenon. Myocardial changes associated with the obese state are increasingly recognized, independent of hypertension, obstructive sleep apnea and coronary artery disease (23). The Acute Myocardial Infarction Risk Factor Assessment in Brazil (AFIRMAR) study shows the following independent risk factors for acute myocardial infarction; waist/hip ratio (WHR) 0.90 to 0.93 (OR 1.52, $P = .0212$) (18). Abdominal obesity measured by waist girth or WHR is associated with early atherosclerosis. Baseline waist girth and WHR were directly associated with a higher prevalence of coronary artery calcification (CAC) 15 years later. The odds ratios (ORs) for CAC in the highest versus lowest tertiles of waist girth and WHR were 1.9 (95% CI: 1.36, 2.65) and 1.7 (1.23, 2.41), respectively (24).

6. Alcohol consumption

There was a J-shaped association between alcohol intake and CHD. Light to moderate alcohol consumption (up to 1 drink daily for women and 1 or 2 drinks daily for men) is associated with cardio protective benefits, whereas increasingly excessive consumption results in proportional worsening of outcomes. Low-dose daily alcohol is associated with better health than less frequent consumption. Binge drinking, even among otherwise light drinkers, increases cardiovascular events and mortality (25).

The prevalence of significant coronary artery disease (CAD) (defined as coronary arterial luminal diameter stenosis $> 50\%$) was lower in the alcoholic group than in the control group (42% vs. 58%; $p = 0.013$). Among patients with CAD, those with a history of alcoholism had fewer vessels with stenoses (1.6 \pm 0.6 vs. 2.3 \pm 0.7; $p < 0.001$) than the control group, and were more likely to have single-vessel CAD (64% vs. 8%; $p < 0.05$) (26).

7. Coffee consumption

The role of coffee consumption in the onset of MI remains uncertain. The controversy over heavy coffee drinking and its possible role in the etiology of myocardial infarction is discussed. Data from the American Health Foundation on 1,014 male patients documents a strong association between these two variables. It is concluded that, in view of these data, "heavy" coffee consumption plays no significant

role in the etiology of cardiovascular diseases in general and myocardial infarction in particular(27). Although many studies have contrast., heavy coffee consumption increases the short-term risk of acute myocardial infarction or coronary death, independent of the brewing method or currently recognized risk factors for CHD(28). Evidence for an increased risk of myocardial infarction or unstable angina among individuals drinking more than five cups of coffee per day (29).

8. Sedentary

A sedentary lifestyle should be considered an important modifiable risk factor for type 2 diabetes and cardiovascular disease (CVD) in the general population (30). Physical activity both prevents and helps treat many established atherosclerotic risk factors, including elevated blood pressure, insulin resistance and glucose intolerance, elevated triglyceride concentrations, low high-density lipoprotein cholesterol (HDL-C) concentrations, and obesity. Exercise in combination with weight reduction can decrease low-density lipoprotein cholesterol (LDL-C) concentrations and limit the reduction in HDL-C that often occurs with a reduction in dietary saturated fat (22). Regular leisure-time physical activity seems to provide protection against myocardial infarction among lean, normal-weight and overweight subjects, this does not appear to be the case in obese subjects (31).

9. Type A personality

Based on Framingham Heart Study data, the Type A personality, characterized as aggressive, ambitious, and having a competitive drive and a chronic sense of urgency, was associated with increased CHD risk (32). Hostility, depression, and anxiety have been associated with CHD, but the role of emotional distress in the development of CHD is still a controversial issue. Evidence shows, however, that emotional distress plays a key role in the progression of CHD: (i) emotional distress is associated with pathophysiological mechanisms and cardiac events in coronary patients, (ii) psychosocial of emotional stress may reduce mortality and morbidity in these patients, and (iii) inhibition of negative emotions may accelerate CHD (33).

10. Metabolic syndrome

Patients with metabolic syndrome (MS) are at increased risk for cardiovascular events (34). Ninomiya prospectively evaluated a total of 2452 community-dwelling Japanese individuals aged 40 years or older from 1988 to 2002 and examined the effects of MS. During the follow up, 307 CVD events occurred (35). In comparison with the male patients the female patients undergoing revascularization have a higher the prevalence of MS and worse prognosis (36).

11. Age

The INTERHEART was a standardized case-control study of acute MI in which 12,461 cases (3,002 women) and 14,637 controls (3,785 women) were enrolled between February 1999 and March 2003. The study found that median age of first acute MI was higher in women than men (65 vs. 56 years; P, 0.0001). The difference in age of first MI is largely explained by the higher risk factor levels at younger ages in men compared to women (37). According to all medical care in Olmsted County, Minnesota for the 10 years prior to incident AMI was reviewed for 150 women and 148 men (38% sample) in Olmsted County, MN. On average, women were older than men at the time of incident AMI (74.7 versus 65.9 years, $p < 0.0001$) (38).

12. Gender

A Prospective Follow-Up of 14,786 middle-aged (age group of 25 to 64 years men and women in Finland. This study was done in 1982 or 1987, and the cohorts were followed up until the end of 1994. Results that CHD incidence in men compared with women was three times higher and mortality was five times. Differences in risk factors between sexes, particularly in HDL cholesterol and smoking, explained nearly half of the difference in CHD risk between men and women (39). According to the study Prediction of Coronary Heart Disease Using Risk Factor Categories was designed as a prospective, single-center study in the setting of a community-based cohort. The patients were 2,489 men and 2,856 women 30 to 74 years old at baseline with 12 years of follow-up. During the 12 years of follow-up, at total of 383 men and 227 women developed CHD (40).

13. Family history

Parental premature CVD is a risk factor for CHD. Parental premature CVD is associated with CAC (41). There was a study that aimed to assess the strength of the association between a family history of premature CHD and coronary artery calcification (CAC) in a multiethnic cohort of asymptomatic individuals. It was found that, compared with participants without a family history of premature CHD, the association with the presence of CAC was strongest in participants reporting such history in both a parent and a sibling (odds ratio, 2.74; 95% CI, 1.64 to 4.59), followed by those reporting a family history in a sibling only (odds ratio, 2.06; 95% CI, 1.64 to 2.58) and those reporting a family history of premature CHD only in a parent (odds ratio, 1.52; 95% CI, 1.19 to 1.93) (42). Compared with men with no parental history, only maternal, only paternal, and both maternal and paternal history of MI conferred relative risks (RRs) of CVD of 1.71, 1.40, and 1.85; among women, the respective RRs were 1.46, 1.15, and 2.05 for men (43).

Now, Identification of people who are at high risk of developing CHD but currently have no symptoms has become an accepted method for the primary prevention of coronary heart disease in many countries (44) such as Framingham heart score in USA., SCORE (in Europe), Chinese multi - provincial cohort study (CMCS) in China and Rama – EGAT heart score in Thailand.

There was a study that aimed to test the validity and transportability of the Framingham CHD prediction functions per a National Heart, Lung, and Blood Institute workshop organized. Sex-specific CHD functions were derived from Framingham data for prediction of coronary death and myocardial infarction. These functions were applied to 6 prospectively studied, ethnically diverse cohorts (n = 23,424), including whites, blacks, Native Americans, Japanese American men, and Hispanic men. For white men and women and for black men and women the Framingham functions performed reasonably well for prediction of CHD events within 5 years of follow-up. Among Japanese American and Hispanic men and Native American women, the Framingham functions systematically overestimated the risk of 5-year CHD events (45).

The original Framingham functions overestimated the risk of CHD for CMCS (Chinese Multi-provincial Cohort Study) participants. The discrimination using the

Framingham functions in the CMCS cohort was similar to the CMCS functions: the area under the receiver operating characteristic curve (ROC) was 0.705 for men and 0.742 for women using the Framingham functions vs 0.736 for men and 0.759 for women using the CMCS functions (7).

The SCORE project was initiated to develop a risk scoring system for use in the clinical management of cardiovascular risk in European clinical practice. The project assembled a pool of datasets from 12 European cohort studies, mainly carried out in general population settings. There were 205,178 persons (88,080 women and 117,098 men) representing 2.7 million person years of follow-up. There were 5,652 CHD deaths. Separate estimation equations were calculated for coronary heart disease and for non-coronary cardiovascular disease. These were calculated for high-risk and low-risk regions of Europe. Estimation equation model were developed, one based on total cholesterol and the other on total cholesterol/HDL cholesterol ratio. The risk estimations are displayed graphically in simple risk charts. Predictive value of the risk charts was examined by applying them to persons aged 45–64; areas under ROC curves ranged from 0.71 to 0.84(46).

CHAPTER III

MATERIALS AND METHODS

This chapter covered the study design, study participants, research site, instrument, procedure and data analysis.

Study design

The study was a case control and aimed to test validity of the Rama – EGAT heart score in the Acute Coronary Syndromes patients at Siriraj Hospital.

Study Setting

This study was collected data from the patients at Her Majesty Cardiac Center floor 8th and Department of Preventive and Social Medicine, Faculty of Medicine, Siriraj Hospital, Mahidol University, in October 2008 until January 2009.

Sample size (47)

The sample size of the study was determined using the following statistical formula that is:

$$SE = \sqrt{\frac{A(1-A) + (n_a-1)(Q_1 - A^2) + (n_n-1)(Q_2 - A^2)}{n_a n_n}}$$

Note:

SE = Standard error by calculate

A = Area under the ROC curve of Rama – EGAT heart study.

n_a = Case

n_n = Control

$Q_1 = A / (2 - A)$

$Q_2 = 2A^2 / (1 + A)$

This study chooses the sample size which give SE less than SE of Rama – EGAT heart score. From the calculation, the study covered at least 400 persons (100 cases and 300 controls). (Table 1) It found that the subjects of study consisted of 163 cases and 314 controls.

Table 1 Sample size from calculation

| SE of Rama – EGAT heart score | AUC of Rama – EGAT heart score | n_a | n_n | SE by calculate |
|----------------------------------|-----------------------------------|-------|-------|-----------------|
| A = 0.030 | 0.772 | 100 | 300 | 0.029 |
| B = 0.032 | 0.716 | 100 | 300 | 0.031 |
| C = 0.035 | 0.670 | 100 | 300 | 0.033 |

Note:

A = SE of risk assessment for public health provider.

B = SE of risk assessment for general population.

C = SE of risk assessment for general population without blood test.

Participants of study

Study participants consisted of two groups.

1. Case :

Patients with Acute Coronary Syndromes and were taken the Coronary angiography on appointing date at Her Majesty Cardiac Center floor 8th Faculty of Medicine, Siriraj Hospital, Mahidol University.

Inclusion Criteria

- a) 35 – 79 years old
- b) Communicate in Thai language
- c) Signed the informed consent

Exclusion Criteria

- a) Normal coronary artery demonstrated by percutaneous coronary intervention result.
- b) A patient with more than CHD one year history.
- c) A patient with memory disorder.
- d) A patient with depression or anxiety.
- e) A patient with ascites.
- f) A patient with incomplete answer in questions in Rama – EGAT heart score.

2. Control

Patients in checkup program

Inclusion Criteria

- a) 35 – 79 years old
- b) Communicate in Thai language
- c) Signed the informed consent

Exclusion Criteria

- a) A patient with history of coronary heart disease.
- b) A patient with memory disorder.
- c) A patient with depression or anxiety.
- d) A patient with ascites.
- e) A patient with incomplete answer in questions in Rama – EGAT heart score.

Variable of the Study

Independent variable: Risk assessment of Rama – EGAT heart score.

Dependent variable: Patients with and without coronary artery stenosis or obstruction demonstrated by CHD.

Instruments of the Study

This study consisted of two instruments. (APPENDIX A)

1. General personal information (the present resident, occupation, income, education level and underlying disease) by interview patient and data in from OPD card.

2. Risk assessment of Rama – EGAT heart score divide 3 sections; (1) PB (age, blood pressure level, total cholesterol level, HDL level, current smoker, diabetics, waist, circumference and alcohol drinker), (2) GN (age, sex, total cholesterol level, current smoker, diabetics, hypertension and waist circumference), (3) GB (age, sex, current smoker, hypertension and waist circumference). This studied data were collected from a physical examination, patient interview, and OPD card. The scoring criteria and total scores were follows Rama – EGAT heart score. The higher scores individual got, the greater chance ACS he / she would have. The score calculation were follows:

- 2.1 The rating scale of variable (age, sex, blood pressure level, total cholesterol level, HDL level, hypertension, diabetics, current smoker, diabetics, waist circumference and alcohol drinker) were follows Appendix C.

2.2 The total scores were calculated by averaging the response for all variables. The higher scores individual got, the greater chance of ACS.

Procedure and data collection of the Study.

1. Preparation

1.1 Ask for permission to use Rama – EGAT heart score.

1.2 Ask for collaboration to collect data in Her Majesty Cardiac Center floor 8th and Department of Preventive and Social Medicine, Faculty of Medicine, Siriraj Hospital, Mahidol University.

1.3 To coordinate about Ethic in Siriraj Hospital.

1.4 Trained assistant researcher.

2. Data collection

2.1 Before participating in the study, the participant was informed about the study. If he / she decided to participate in the study, he / she was asked to sign the informed consent form.

2.2 The participant was interviewed about his / her general information and variables in Rama – EGAT heart score by the researcher or a trained nurse such as: present resident, occupation, income (Baht/month), education level, cigarette smoking, alcohol drinking, was diagnosed of hypertension or was currently taking prescribe blood pressure lowering therapy, was diagnosed of diabetes or was currently taking medical therapy and underlying disease. (Appendix A)

2.3 The participant was taken about his / her physical examination by the researcher or a trained nurse such as; waist circumference and blood pressure.

2.4 Laboratory examination; total cholesterol and HDL cholesterol were collected from OPD card before dyslipidemia diagnosis. In case of no data available, the current total cholesterol level was used same as blood pressure level.

Data Analysis

1 Descriptive statistics

Frequency, percentage and mean were used to explain the characteristics of study participants.

2 Inferential statistics

2.1 Receiver operator characteristic (ROC) curve could be used to assessed the validity of Rama – EGAT heart score and find the best the cutoff point of the test. Accuracy of this screening test is measured by the area under the ROC curve (AUC).The predictive value (positive predictive value and negative predictive value) is the probability of disease, given the results of test.

2.2. Comparable validity of Rama – EGAT heart score all 3 type (risk assessment for public health provider, risk assessment for general population and risk assessment for general population with out blood test.)

CHAPTER IV

RESULTS

General characteristics of population

The studied data of this study were collected between October 2008 to January 2009 and was conducted with informed consent from all participants. There were two groups in this study: 163 patients with coronary heart disease as case group and 314 patients without coronary heart disease as control group.

This study is matching age and gender. The mean age of population was 65 years and 60.4% was male. Smokers was found in male more than female (93.9% & 6.1%) as reported by Non-Communicable Disease Information Center, Bureau of Non-Communicable Disease, Ministry of Public Health in 2005(4). Drinker was also found more in male (91.5 in male and 8.5% in female). The male population of this study had diabetes and hypertension disease, 53.2% and 58.5 % respectively. (Table 2)

Table 3 showed the most of the patient in case group were diabetic and hypertension (23%), and diabetic with hypertension and dyslipidemia (16.6%). None of the patient in case group was diabetic without hypertension and dyslipidemia.

Table 4 showed that, educational level of most subject in primarily school (47.9%) and bachelor degree (25.8%) which higher than high school or uneducated.

Table 5 showed risk factors used in Rama – EGAT heart score equation. Compare case group to control group the following risk factors were higher in case group, smoking rate (case 23.3%, control 14%), hypertension (case 83.4%, control 31.8%) and diabetes (case 43.8%, control 12.1%). The mean of systolic blood pressure was 157, 130 mmHg., mean of total cholesterol level was 232.15 ,212.82 mg% and mean of HDL level was 47.22,55.22 mg% in case and control groups ,respectively. There were significant difference between case and control. ($p < 0.05$)

Table 2 Summary of general characteristic in the population

| Characteristic | Number of participant | | p – value Chi-square |
|----------------|-----------------------|------|-------------------------|
| | (n = 477) | (%) | |
| Age(yr) | | | |
| 40 - 44 | 16 | 3.3 | < 0.001 |
| 45 - 49 | 19 | 4 | |
| ≥50 | 442 | 92.7 | |
| Sex | | | |
| male | 228 | 60.4 | < 0.001 |
| female | 189 | 39.6 | |
| Smoking | | | |
| male | 77 | 93.9 | < 0.001 |
| female | 5 | 6.1 | |
| Drinking | | | |
| male | 108 | 91.5 | < 0.001 |
| female | 10 | 8.5 | |
| DM | | | |
| male | 58 | 53.2 | 0.50 |
| female | 51 | 46.8 | |
| HT | | | |
| male | 138 | 58.5 | 0.09 |
| female | 98 | 41.5 | |

Table 3 Diseases of cases and controls

| Disease | Case | | Control | | p – value Chi-square |
|-------------------------------|-------|------|---------|------|-------------------------|
| | n=163 | % | n =314 | % | |
| HT | 31 | 19 | 42 | 13.4 | 0.198 |
| DM | 0 | 0 | 11 | 3.5 | NA |
| Dyslipidemia | 7 | 4.3 | 13 | 4.1 | 0.18 |
| HT and DM | 38 | 23.3 | 18 | 5.7 | 0.08 |
| HT and Dyslipidemia | 21 | 12.9 | 21 | 6.7 | 1.0 |
| DM and HT and Dyslipidemia | 27 | 16.6 | 9 | 2.9 | 0.003 |

NA: not applicable as N = 0

Table 4 Educational level in the studied population

| Education level | Case | | Control | | p- value Chi-square |
|------------------|-------|------|---------|------|------------------------|
| | n=163 | % | n=314 | % | |
| Uneducated | 5 | 3.1 | 19 | 6.1 | 0.004 |
| Primary school | 78 | 47.9 | 76 | 24.2 | 0.872 |
| High school | 31 | 19 | 60 | 19.1 | 0.002 |
| Diploma | 4 | 2.5 | 27 | 8.6 | <0.001 |
| Bachelor degree | 42 | 25.8 | 115 | 36.6 | <0.001 |
| Master degree | 3 | 1.8 | 15 | 4.8 | 0.005 |
| Doctorate degree | 0 | 0 | 2 | 0.6 | NA |

NA: not applicable as N = 0

Table 5 Variables of Rama –EGAT heart score in cases and controls

| Variable | Case | Control | p – value |
|---|-------------------|-------------------|---------------------|
| | n=163 | n =314 | |
| Age (mean) | 65 | 65 | >0.050 ^b |
| Male % | 102 (60%) | 186 (56.4%) | <0.001 ^a |
| Smoking % | 38 (23.3) | 44 (14) | 0.508 ^a |
| Drinking % | 36 (22.1) | 82 (26.1) | <0.001 ^a |
| Diabetic % | 71 (43.8) | 38 (12.1) | 0.002 ^a |
| Hypertension % | 136 (83.4) | 100 (31.8) | 0.019 ^a |
| Waist circumference | | | |
| ≥ 90 cm. in male % | 50 (49) | 81 (43.1) | 0.007 ^a |
| ≥ 80 cm. in female % | 46 (75.4) | 87 (68) | <0.001 ^a |
| Systolic blood pressure (range) mmHg. | 157 (103, 216) | 130 (90, 200) | <0.001 ^b |
| Diastolic blood pressure (range) mmHg. | 85 (23, 94) | 80 (56, 110) | <0.001 ^b |
| Cholesterol (range) mg%. | 232.15 (106, 474) | 212.82 (107, 432) | <0.001 ^b |
| HDL (range) mg% | 47.22 (23, 94) | 55.22 (26, 123) | <0.001 ^b |

^ap – value by Chi – Square Test

^bp – value by Independent - Sample – T Test

Performance of Rama – EGAT heart score

The screening results of the Rama – EGAT heart score in GN showed higher accuracy for screening Acute Coronary Syndromes than in PB for male and GB.

In addition, the risk assessment when used by PB of Rama –EGAT heart score modified for female was the highest accuracy for screening Acute Coronary Syndromes. (Table 10) (Figure 2).

There are three algorithm of Rama - EGAT heart score for PB, GN, GB. The validity of Rama - EGAT heart score show that.

Section 1: The area under the ROC curve (AUC) of PB was 0.724, 0.849 for male and female respectively (Table 10) The optimal cutoff point for screening Acute Coronary Syndromes was 2 with 80% sensitivity, 50% specificity for male and 90% sensitivity, 59% specificity for female, respectively. (Table 6) (Table 7)

Section 2: The area under the ROC curve (AUC) of GN was 0.763. (Table 10) The optimal cutoff point for screening Acute Coronary Syndromes was 8 with 88% sensitivity and 46% specificity, respectively. (Table 8)

Section 3: The area under the ROC curve (AUC) of GB was 0.691. (Table 10) The optimal cutoff point for screening Acute Coronary Syndromes was 9 with 83% sensitivity and 50% specificity, respectively. (Table 9)

With this cutoff point for PB, the positive predictive value (PPV) was 47%, 51% , the negative predictive value (NPV) was 82%, 93% and the accuracy was 60% , 69% in male and female , respectively. (Table 6) (Table 7)

The cutoff point of GN and GB it yielded 45%, 46% of PPV, 88%, 85% of NPV and 60%, 61% of accuracy, respectively. (Table 8) (Table 9)

Table 6 The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and accuracy of the PB^a(for male)

| Cutoff Point | Sensitivity | Specificity | PPV | NPV | Accuracy |
|--------------|-------------|-------------|-----------|-----------|-----------|
| 1 | 89 | 39 | 45 | 87 | 57 |
| 2 | 80 | 50 | 47 | 82 | 60 |
| 3 | 72 | 67 | 55 | 81 | 69 |
| 4 | 56 | 75 | 55 | 76 | 68 |

^aPB; Rama - EGAT heart score using by public health provider.

Table 7 The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and accuracy of the PB^a (for female).

| Cutoff Point | Sensitivity | Specificity | PPV | NPV | Accuracy |
|--------------|-------------|-------------|-----------|-----------|-----------|
| 1 | 92 | 45 | 44 | 92 | 60 |
| 2 | 90 | 59 | 51 | 93 | 69 |
| 3 | 84 | 69 | 56 | 90 | 74 |
| 4 | 72 | 83 | 67 | 86 | 79 |

^aPB; Rama - EGAT heart score using by public health provider.

Table 8 The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and accuracy of the GN^a.

| Cutoff Point | Sensitivity | Specificity | PPV | NPV | Accuracy |
|--------------|-------------|-------------|-----------|-----------|-----------|
| 7 | 97 | 11 | 36 | 87 | 40 |
| 8 | 88 | 46 | 45 | 88 | 60 |
| 9 | 87 | 48 | 46 | 87 | 61 |
| 10 | 85 | 53 | 48 | 87 | 63 |

^aGN; Rama - EGAT heart score using by general population.

Table 9 The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and accuracy of the GB^a.

| Cutoff Point | Sensitivity | Specificity | PPV | NPV | Accuracy |
|--------------|-------------|-------------|-----------|-----------|-----------|
| 8 | 85 | 33 | 40 | 81 | 77 |
| 9 | 83 | 50 | 46 | 85 | 61 |
| 10 | 79 | 53 | 48 | 83 | 63 |
| 11 | 66 | 62 | 47 | 78 | 63 |

^aGB; Rama - EGAT heart score using by general population without blood test.

Table 10 Validation of Rama –EGAT heart score by participant in Siriraj Hospital.

| Type of risk assessment | AUC | SE | Asymptotic Sig. | Asymptotic Confidence Interval | |
|--------------------------------|------|------|--------------------|--------------------------------------|----------------|
| | | | | Lower Bound | Upper Bound |
| 1. PB ^a | | | | | |
| 1.1 risk assessment for male | 0.72 | 0.03 | <0.001 | 0.67 | 0.78 |
| 1.2 risk assessment for female | 0.85 | 0.03 | <0.001 | 0.79 | 0.91 |
| 2. GN ^b | 0.76 | 0.02 | <0.001 | 0.72 | 0.81 |
| 3. GB ^c | 0.69 | 0.02 | <0.001 | 0.641 | 0.74 |

^aPB; Rama - EGAT heart score using by public health provider.

^bGN; Rama - EGAT heart score using by general population.

^cGB; Rama - EGAT heart score using by general population without blood test.

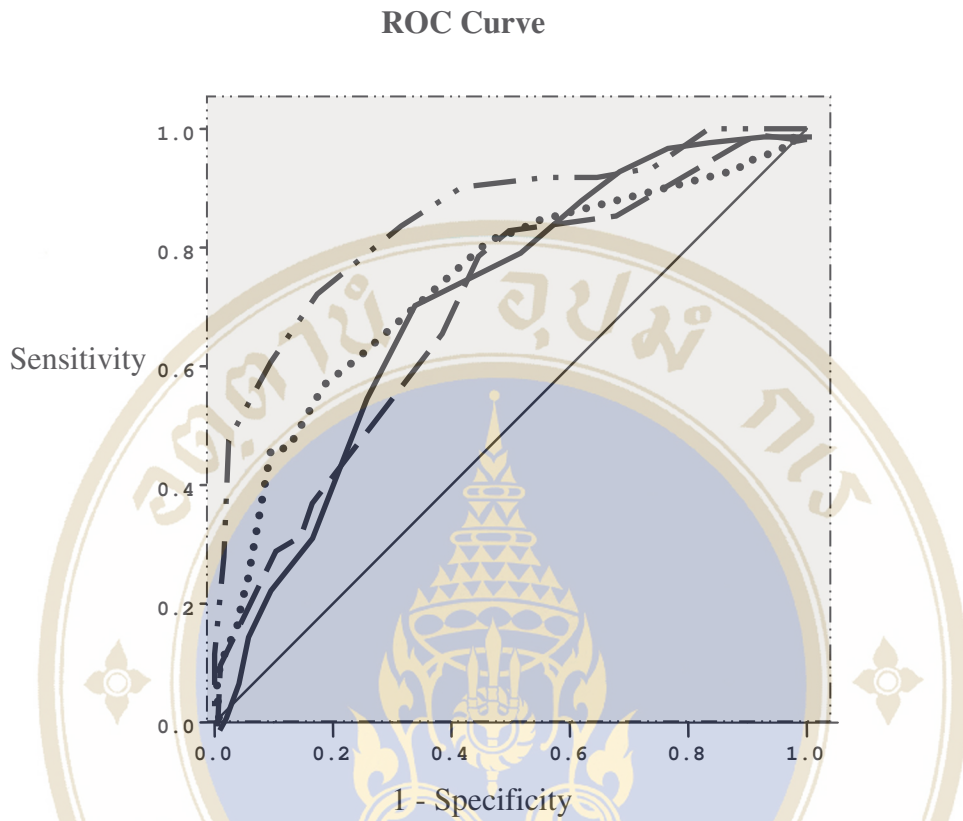


Figure 2 Comparison area under the ROC curve

Source of the curve

- Rama - EGAT heart score using by public health provider for male.
- · - · Rama - EGAT heart score using by public health provider for female.
- Rama - EGAT heart score using by general population.
- - - - Rama - EGAT heart score using by general population without blood test.

This study was conducted in Siriraj hospital. The population was patients who had to treat or to check health. Then, the demographics characteristics of participants was difference from Rama-EGAT heart study as for example age and gender .If the researcher selected the age (≥ 35 age ≤ 54) and gender (only male in section PB) same as participant of Rama-EGAT heart study. The results found that, this study the best type of risk assessment was GN but the Rama – EGAT heart study was PB. Nevertheless, it was a similarity in GB. (Table 11)

Table 11 Comparison AUC in a similarity of population between 2 studies.

| Type of risk assessment | AUC of study in Siriraj Hospital (n= 477) | AUC of Rama - EGAT heart study (n= 3,499) |
|-------------------------|---|---|
| 1. PB ^a | 0.734 | 0.772 |
| 2. GN ^b | 0.754 | 0.716 |
| 3. GB ^c | 0.670 | 0.670 |

^aPB; Rama - EGAT heart score using by public health provider.

^bGN; Rama - EGAT heart score using by general population.

^cGB; Rama - EGAT heart score using by general population without blood test.

Table 12 displays accuracy of Rama – EGAT heart score in different age groups. Performance of risk assessment in the age group < 60 years was higher than the age group ≥ 60 years. However, in both groups the PB modified for female was more accurate than male.

Table 12. Comparison area under the ROC curve between participant < 60 years and ≥ 60 years.

| Type of risk assessment | AUC | AUC |
|--------------------------------|----------------------|---------------------------|
| | Age < 60 (n= 163) | Age ≥ 60 (n= 374) |
| 1. PB ^a | | |
| 1.1 risk assessment for male | 0.750 | 0.705 |
| 1.2 risk assessment for female | 0.870 | 0.849 |
| 2. GN ^b | 0.784 | 0.753 |
| 3. GB ^c | 0.707 | 0.685 |

^aPB; Rama - EGAT heart score using by public health provider.

^bGN; Rama - EGAT heart score using by general population.

^cGB; Rama - EGAT heart score using by general population with out blood test.

CHAPTER V

DISCUSSION

Demographic characteristic of participant

Most participant of the study are male and elderly. This study found, more percentage of hypertension and drinker in male than in female. The result correlate as reported by Non-Communicable Disease Information Center, Bureau of Non-Communicable Disease, Ministry of Public Health in 2005 except more percentage of hypertension was found in female (4).

This study revealed that the proportion of hypertension, diabetics with hypertension and dyslipidemia in case group was higher than in control group (P -value <0.05). Proportion of smoker of the case group was almost twice higher than of the control group. In contrast no difference proportion of drinker was found between case and control group. The diabetics in case group was almost third times higher than in control group because of the aging of the population and an increasing prevalence of obesity and sedentary life habits, the prevalence of diabetes is increasing. Thus, diabetes must take its place alongside the other major risk factors as important causes of cardiovascular disease (CVD). In fact, from the point of view of cardiovascular medicine, it may be appropriate to say, "diabetes is a cardiovascular disease"(48). The same result was found in hypertension risk factor. As a study that was reported, there was a gradual shift from diastolic blood pressure to systolic blood pressure with the increasing age (49). This study found that, cholesterol level in case group was higher than control group, while HDL level was lower than control group. The study about the prevalence of dyslipidemia among rural Thais (in Khon Kaen province) reported that prevalence of dyslipidemia increased with advancing age and increasing body mass index (50).

Performances of Rama – EGAT heart score in participant at Siriraj hospital.

Rama - EGAT heart score is an estimation equation model for the risk of CHD in Thailand. Nevertheless, the population of female and elderly of Rama- EGAT heart study is not enough to create accurate risk assessment equation. Then, this study was intended to test validity of the Rama – EGAT heart score in patients who have Acute Coronary Syndromes at Siriraj Hospital. Table 11 showed that, the section used by PB in EGAT population is more accurate than this study. Maybe it is from the limitation of the study design. In some case blood pressure level were collected from the record in patient OPD card before hypertension diagnosis or taking medicine to control blood pressure may be the measurement is less accuracy than Rama – EGAT heart study such as equipment, health officer who took blood pressure. The study design of Rama –EGAT heart study is retrospective cohort so that the data has high accuracy. In contrast, section used by general population is more accurate than Rama – EGAT heart study. The possible reason probably is appropriate for female and higher proportion of female than Rama –EGAT heart study (Table 11). The modify risk assessment section used by public health provider for female is more accurate than male as a form of area under the ROC curve is 0.85.(Table 10).The possible reason, the women care and pay attention to their health better than men so that may be giving data high accuracy. As the result with previous study showed the women had more retrospective self report of alcohol consumption accuracy than men (51).

Primary prevention of coronary heart disease involves identifying patients at high risk and offering them lifelong preventive treatment (44). Patients with low risk scores can be reassured. Those with higher scores should be counseled to adopt risk-reducing life habits, ie, smoking cessation, dietary change, weight control, and exercise (52).Then, optimal cutoff point with higher sensitivity value than specificity value because this study was aimed to detect all possible ACS.

The result of this study found that Rama – EGAT heart score when used in age group < 60 years is higher accuracy than age group \geq 60 years. This might be because the age is one of CHD risk factor. The age group 70 – 74 years was higher score than 50 – 54 year of Framingham heart score (male 3 points in 50 – 54 years, 12 points in 70 – 74 years and female 6 points in 50 – 54 years, 14 points in 70 – 74 years) While, Rama- EGAT heart score has limitation such as insufficient of elderly to

create equation. This study, in age group above 54 years was got score as 50 – 54 years. Most elderly had non – communicable disease (hypertension, diabetes and dyslipidemia) so that no difference was found between case and control group. And it might be because of cognitive deficits in the older elderly.



CHAPTER VI

CONCLUSION AND RECOMMENDATION

Conclusion

This research was a case – control study. Data collection was carried out from October 2008 to January 2009 at Her Majesty Cardiac Center floor 8th and Department of Preventive and Social Medicine, Faculty of Medicine, Siriraj Hospital, Mahidol University, Bangkok. The aim of the study is Rama – EGAT heart score validation in screening ACS in Siriraj Hospital patients. There were the 163 patients with ACS in case group and 314 in control group.

The screening results of the Rama – EGAT heart score. It was found that, the GN had higher accuracy for screening ACS than PB and GB. In addition, the study found that the PB when modified for female was the most accurate for screening ACS. The area under curve (AUC) were 0.724, 0.849 in section PB for male and female, respectively. And the AUC were 0.763, and 0.691 in GN and GB, respectively (Table 10).

There were three optimal cutoff point values of Rama – EGAT heart score for screening ACS determined by three groups of users; 2 point in PB (80% sensitivity, 50% specificity for male and 90% sensitivity, 59% specificity for female), 8 point in GN (88% sensitivity, 46% specificity), 9 point in GB (83% sensitivity, 50% specificity).

The PPV and NPV of the PB were 47% and 51%, 82% and 93% with 60% and 69% accuracy in male and female, respectively. The PPV and NPV were 45% and 46%, 88% and 85% with 60% and 61% accuracy in GN and GB, respectively.

Finally, Rama – EGAT heart score appropriate with female and found that the validation was decreased when used in age group ≥ 60 years.

Recommendation from this study

1. The Rama – EGAT heart score can be used as an alternative screening test for early detecting Acute Coronary Syndromes in Thai people with acceptable validity.

2. The Rama – EGAT heart score section PB when modified for female may be appropriate with female.

3. The Rama – EGAT heart score section GB could be useful for relative of the CCU patient without information. Patient in a check up program with lipid profile and blood pressure level information used the section for GN.

Recommendation for further study

This study collected data from volunteers in Siriraj Hospital in Bangkok, it might be useful to carry out studies in various rural area. If the Rama – EGAT heart score give high validity it may be appropriate for screening Acute Coronary Syndromes in the Thai people.

Limitation of this study

This study was limited by study setting and the sample group. As this study was conducted at university hospital in Bangkok which is an urban area. Therefore, limitation of this study is limited by the selection bias.

REFERENCES

1. ศิริพร เหลียงกอบกิจ. คุณภาพชีวิตของผู้ป่วยโรคหัวใจโคโคณารีย์. [วิทยานิพนธ์ ปริญญาวิทยาศาสตร มหาบัณฑิต (สาธารณสุขศาสตร์) สาขาวิชาเอกโรคติดต่อ] กรุงเทพฯ: บัณฑิตวิทยาลัย มหาวิทยาลัยมหิดล;2542.
2. Mackay J, Mensah G. Dead from coronary heart disease. In: WHO, editor. The Atlas of heart disease and stroke 2004. p. 48-9.
3. Krainec KMaB, Devi K. MD b; Eisenberg, Mark J. MD, MPH c. Coronary artery disease in the developing world. American Heart Journal. 2004;148.
4. ศูนย์ข้อมูลโรคไม่ติดต่อ สำนักโรคไม่ติดต่อ กรมควบคุมโรค กระทรวงสาธารณสุข. สถานการณ์โรคไม่ติดต่อ. 2008; Available from: www.thaincdinfo.com.
5. Pongchai Anukoolsawat M, Piyamitr Sritara, MD*, Yot Teerawattananon, MD. Costs of Lifetime Treatment of Acute Coronary Syndrome at Ramathibodi Hospital THAI HEART JOURNAL. 2006 Oct;19(4):132-42.
6. Pearson TA. New Tools for Coronary Risk Assessment: What Are Their Advantages and Limitations? Circulation. 2002 February 19, 2002;105(7):886-92.
7. Liu J, Hong Y, D'Agostino RB, Sr., Wu Z, Wang W, Sun J, et al. Predictive Value for the Chinese Population of the Framingham CHD Risk Assessment Tool Compared With the Chinese Multi-provincial Cohort Study. JAMA. 2004 June 2, 2004;291(21):2591-9.
8. สุกิจ เข้มวงษ์. โครงการพัฒนาแบบประเมินความเสี่ยงต่อโรคหัวใจและหลอดเลือด. 2005; Available from: <http://hrn.thainhf.org/>
9. Sritara P, Cheepudomwit S, Chapman N, Woodward M, Kositchaiwat C, Tunlayadechanont S, et al. Twelve-year changes in vascular risk factors and their associations with mortality in a cohort of 3499 Thais: the Electricity Generating Authority of Thailand Study. International Journal of Epidemiology. 2003 June 1, 2003;32(3):461-8.
10. Kanungnit Srisala PREVALENCE of the metabolic syndrome using the NCEP ATPIII, WHO and IDF definitions in personnel in the cardiovascular health

program at the ELECTRICITY GENERATING AUTHORITY OF THAILAND. Bangkok: Mahidol; 2006.

11. Anderson JL, Adams CD, Antman EM, Bridges CR, Califf RM, Casey DE, Jr., et al. ACC/AHA 2007 Guidelines for the Management of Patients With Unstable Angina/Non ST-Elevation Myocardial Infarction Executive Summary: A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to Revise the 2002 Guidelines for the Management of Patients With Unstable Angina/Non ST-Elevation Myocardial Infarction) Developed in Collaboration with the American College of Emergency Physicians, the Society for Cardiovascular Angiography and Interventions, and the Society of Thoracic Surgeons Endorsed by the American Association of Cardiovascular and Pulmonary Rehabilitation and the Society for Academic Emergency Medicine. 2007. p. 652-726.
12. Steven M. Hollenberg, Tracy Walker. Acute Coronary Syndromes. In: S.Skolnik N, editor. Cardiology in Family Practice. United State of America: American Standard Institute; 2006. p. 1-5.
13. Michael C., Kim ASK, Valentin Fuster. DEFINITIONS OF ACUTE CORONARY SYNDROMES. In: R.Wayne Alexander, Robert A., editors. HURST'S THE HEART: McGRAW - HILL Medical publishing Division; 2004. p. 1211-5.
14. Catherine Daly - NEE, Howard Brunt, Nalini Jairath. Risk and Coronary Heart Disease. In: Jairath N, editor. CORONARY HEART DISEASE & RISK FACTOR MANAGEMENT: W.B.SAUNDERS COMPANY; 1999.p.11-3.
15. Wong ND, Lopez VA, L'Italien G, Chen R, Kline SE, Franklin SS. Inadequate Control of Hypertension in US Adults With Cardiovascular Disease Comorbidities in 2003-2004. Archives of internal medicine. 2007 Dec 10;167(22):2431-6.
16. Avezum A, Piegas LS, Pereira JC. [Risk factors associated with acute myocardial infarction in the Sao Paulo metropolitan region: a developed region in a

- developing country]. *Arquivos brasileiros de cardiologia*. 2005 Mar;84(3):206-13.
17. Piegas LS, Avezum A, Pereira JC, Neto JM, Hoepfner C, Farran JA, et al. Risk factors for myocardial infarction in Brazil. *American heart journal*. 2003 Aug;146(2):331-8.
18. Cavusoglu Y, Timuralp B, Us T, Akgun Y, Kudaiberdieva G, Gorenek B, et al. Cigarette Smoking Increases Plasma Concentrations of Vascular Cell Adhesion Molecule-1 in Patients with Coronary Artery Disease. *Angiology*. 2004 July 1, 2004;55(4):397-402.
19. Castela S, Duarte R, Reis RP, Correia MJ, Toste J, Carmelo V, et al. Acute coronary syndromes in smokers: clinical and angiographic characteristics. *Rev Port Cardiol*. 2004 May;23(5):697-705.
20. Arad Y, Newstein D, Cadet F, Roth M, Guerci AD. Association of multiple risk factors and insulin resistance with increased prevalence of asymptomatic coronary artery disease by an electron-beam computed tomographic study. *Arteriosclerosis, thrombosis, and vascular biology*. 2001 Dec;21(12):2051-8.
21. Dong X, Zhou L, Zhai Y, Lu B, Wang D, Shi H, et al. Impaired fasting glucose and the prevalence and severity of angiographic coronary artery disease in high-risk Chinese patients. *Metabolism: clinical and experimental*. 2008 Jan;57(1):24-9.
22. Gasior M, Stasik-Pres G, Pres D, Lech P, Gierlotka M, Lekston A, et al. Relationship between blood glucose on admission and prognosis in patients with acute myocardial infarction treated with percutaneous coronary intervention. *Kardiol Pol*. 2007 Sep;65(9):1031-8.
23. Wong C, Marwick TH. Obesity cardiomyopathy: pathogenesis and pathophysiology. *Nature clinical practice*. 2007 Aug;4(8):436-43.
24. Lee CD, Jacobs DR, Jr., Schreiner PJ, Iribarren C, Hankinson A. Abdominal obesity and coronary artery calcification in young adults: the Coronary Artery Risk Development in Young Adults (CARDIA) Study. *The American journal of clinical nutrition*. 2007 Jul;86(1):48-54.

25. O'Keefe JH, Bybee KA, Lavie CJ. Alcohol and Cardiovascular Health: The Razor-Sharp Double-Edged Sword. *JACC*. 2007 September 11, 2007;50(11):1009-14.
26. Kokolis S, Marmur JD, Clark LT, Kassotis J, Kokolis R, Cavusoglu E, et al. Effects of alcoholism on coronary artery disease and left ventricular dysfunction in male veterans. *The Journal of invasive cardiology*. 2006 Jul;18(7):304-7.
27. MacCornack FA. The effects of coffee drinking on the cardiovascular system: Experimental and epidemiological research. *Preventive Medicine*. 1977;6(1):104-19.
28. Happonen P, Voutilainen S, Salonen JT. Coffee Drinking Is Dose-Dependently Related to the Risk of Acute Coronary Events in Middle-Aged Men. *JNutr*. 2004 September 1, 2004;134(9):2381-6.
29. Tofler OB, Foy S, Ng K, Hickey G, Burke V. Coffee and coronary heart disease. *Heart, Lung and Circulation*. 2001;10(3):116-20.
30. Bassuk SS, Manson JE. Epidemiological evidence for the role of physical activity in reducing risk of type 2 diabetes and cardiovascular disease. *Journal of Applied Physiology*. 2005 September 1, 2005;99(3):1193-204.
31. Fransson E, de Faire U, Ahlbom A, Reuterwall C, Hallqvist J, Alfredsson L. The effect of leisure-time physical activity on the risk of acute myocardial infarction depending on body mass index: a population-based case-control study. *BMC public health*. 2006;6:296.
32. Menotti A, Puddu PE, Lanti M. Comparison of the Framingham risk function-based coronary chart with risk function from an Italian population study. *European Heart Journal*. 2000 March 1, 2000;21(5):365-70.
33. Johan D. Personality, emotional distress and coronary heart disease. 1997.p.343-57.
34. Novo G, Corrado E, Muratori I, Tantillo R, Bellia A, Galluzzo A, et al. Markers of inflammation and prevalence of vascular disease in patients with metabolic syndrome. *Int Angiol*. 2007 Dec;26(4):312-7.
35. Ninomiya T, Kubo M, Doi Y, Yonemoto K, Tanizaki Y, Rahman M, et al. Impact of Metabolic Syndrome on the Development of Cardiovascular Disease in

- a General Japanese Population: The Hisayama Study. *STROKEAHA*. 2007 July 1, 2007;38(7):2063-9.
36. Hu R, Ma CS, Nie SP, Lu Q, Kang JP, Du X, et al. [Prognosis of metabolic syndrome in coronary artery disease patients of different genders.]. *Zhonghua yi xue za zhi*. 2007 Oct 16;87(38):2681-4.
37. Anand SS, Islam S, Rosengren A, Franzosi MG, Steyn K, Yusufali AH, et al. Risk factors for myocardial infarction in women and men: insights from the INTERHEART study. *European Heart Journal*. 2008 April 1, 2008;29(7):932-40.
38. Yawn B, Wollan P, Yawn R, Jacobsen S, Roger V. The gender specific frequency of risk factor and CHD diagnoses prior to incident MI: A community study. *BMC Family Practice*. 2007;8(1):18.
39. Jousilahti P, Vartiainen E, Tuomilehto J, Puska P. Sex, Age, Cardiovascular Risk Factors, and Coronary Heart Disease : A Prospective Follow-Up Study of 14 786 Middle-Aged Men and Women in Finland. *Circulation*. 1999 March 9, 1999;99(9):1165-72.
40. Wilson PW, D'Agostino RB, Levy D, Belanger AM, Silbershatz H, Kannel WB. Prediction of coronary heart disease using risk factor categories. *Circulation*. 1998;97:1837 - 47.
41. Parikh NI, Hwang S-J, Larson MG, Cupples LA, Fox CS, Manders ES, et al. Parental Occurrence of Premature Cardiovascular Disease Predicts Increased Coronary Artery and Abdominal Aortic Calcification in the Framingham Offspring and Third Generation Cohorts. *Circulation*. 2007 September 25, 2007;116(13):1473-81.
42. Nasir K, Budoff MJ, Wong ND, Scheuner M, Herrington D, Arnett DK, et al. Family history of premature coronary heart disease and coronary artery calcification: Multi-Ethnic Study of Atherosclerosis (MESA). *Circulation*. 2007 Aug 7;116(6):619-26.
43. Sesso HD, Lee IM, Gaziano JM, Rexrode KM, Glynn RJ, Buring JE. Maternal and Paternal History of Myocardial Infarction and Risk of Cardiovascular Disease in Men and Women. *Circulation*. 2001 July 24, 2001;104(4):393-8.

44. Brindle P, Emberson J, Lampe F, Walker M, Whincup P, Fahey T, et al. Predictive accuracy of the Framingham coronary risk score in British men: prospective cohort study. *BMJ*. 2003 November 29, 2003;327(7426):1267.
45. D'Agostino SRB, Grundy S, Sullivan LM, Wilson P, for the CHDRPG. Validation of the Framingham Coronary Heart Disease Prediction Scores: Results of a Multiple Ethnic Groups Investigation. *JAMA*. 2001 July 11, 2001;286(2):180-7.
46. Conroy RM, Pyorala K, Fitzgerald AP, Sans S, Menotti A, De Backer G, et al. Estimation of ten-year risk of fatal cardiovascular disease in Europe: the SCORE project. *European Heart Journal*. 2003 June 1, 2003;24(11):987-1003.
47. Hanley, McNeil. The magnificent ROC. 2001 [cited 2008]; Available from: <http://www.anaesthetist.com/mnm/stats/roc/Findex.htm>.
48. Grundy SM, Benjamin IJ, Burke GL, Chait A, Eckel RH, Howard BV, et al. Diabetes and Cardiovascular Disease : A Statement for Healthcare Professionals From the American Heart Association. *Circulation*. 1999 September 7, 1999;100(10):1134-46.
49. Franklin SS, Larson MG, Khan SA, Wong ND, Leip EP, Kannel WB, et al. Does the Relation of Blood Pressure to Coronary Heart Disease Risk Change With Aging? : The Framingham Heart Study. *Circulation*. 2001 March 6, 2001;103(9):1245-9.
50. Pongchaiyakul C, Pratipanawatr T. Prevalence of dyslipidemia in rural Thai adults: an epidemiologic study in Khon Kaen province. *Journal of the Medical Association of Thailand* 2005:1.
51. Perrine MW, Schroder KE. How many drinks did you have on September 11, 2001? *Journal of studies on alcohol*. 2005 Jul;66(4):536-44.
52. Grundy SM, Balady GJ, Criqui MH, Fletcher G, Greenland P, Hiratzka LF, et al. Primary Prevention of Coronary Heart Disease: Guidance From Framingham : A Statement for Healthcare Professionals From the AHA Task Force on Risk Reduction. *Circulation*. 1998 May 19, 1998;97(18):1876-87.



APPENDIX A

แบบเก็บบันทึกข้อมูล

Code.....

ส่วนที่ 1

อายุ.....

เพศ ชาย หญิง

ปัจจุบันพักอาศัย ณ. จังหวัด.....

อาชีพ.....

รายได้.....บาท/เดือน

จบการศึกษาขั้นสูงสุด

ประถมศึกษา ปริญญาโท

มัธยมศึกษา ปริญญาเอก

ปริญญาตรี อื่นๆ(โปรดระบุ)

โรคประจำตัว.....

รอบแถว.....ชม.

ปัจจุบันสูบบุหรี่หรือไม่

ไม่สูบ

เลิกสูบนาน.....ปี

ปัจจุบันดื่มสุราหรือไม่

ดื่ม

ไม่ดื่ม

เลิกดื่มนาน.....ปี

ท่านได้รับการวินิจฉัยจากแพทย์ว่าเป็นโรคความดันโลหิตสูงหรือไม่

เป็น

ไม่เป็น

ท่านได้รับการวินิจฉัยจากแพทย์ว่าเป็นโรคเบาหวานหรือไม่

เป็น

ไม่เป็น

ส่วนที่ 2

ระดับ Systolic blood pressure =.....mmHg.

ระดับ Diastolic blood pressure =.....mmHg.

ระดับ Total cholesterol =.....mg%

ระดับ HDL – cholesterol=mg%

APPENDIX B

Rama-EGAT heart score

Score for using by public health provider

| Risk factors | Score |
|----------------------------|-------|
| Age (yr.) | |
| 35 – 39 | -1 |
| 40 – 44 | 0 |
| 45 – 49 | 1 |
| 50 – 54 | 2 |
| Blood pressure (mmHg.) | |
| SBP<120, DBP<80 | 0 |
| SBP 120 – 129, DBP 80 – 84 | 0 |
| SBP 130 – 139, DBP 85 – 89 | 1 |
| SBP 140 – 159, DBP 90 – 99 | 1 |
| SBP > 160 DBP, > 100 | 2 |
| Total cholesterol (mg%) | |
| < 160 | -2 |
| 160 – 199 | 0 |
| 200 – 279 | 0 |
| > 280 | 2 |

\

Score for using by public health provider

| Risk factors | Score |
|--------------------|-------|
| HDL (mg.%) | |
| < 35 | 2 |
| 35 – 49 | 0 |
| 50 – 59 | -1 |
| > 60 | -5 |
| Current smoker | |
| No | 0 |
| Yes | 1 |
| Diabetic | |
| No | 0 |
| Yes | 2 |
| Waist \geq 90 cm | |
| No | 0 |
| Yes | 1 |
| Alcohol drinker | |
| No | 0 |
| Yes | -2 |

Score for using by general population

| Risk factors | Score |
|---|-------|
| Age (yr.) | |
| 35 – 39 | -2 |
| 40 – 44 | 0 |
| 45 – 49 | 2 |
| 50 – 54 | 4 |
| Sex | |
| Female | 0 |
| Male | 3 |
| Cholesterol (mg%) | |
| < 280 | 0 |
| ≥ 280 | 4 |
| Current smoker | |
| No | 0 |
| Yes | 2 |
| Diabetic | |
| No | 0 |
| Yes | 5 |
| Hypertension | |
| No | 0 |
| Yes | 3 |
| Waist circumference male ≥ 90 cm. / female ≥ 80 cm. | |
| No | 0 |
| Yes | 3 |

Score for used by general population without blood test

| Risk factors | Score |
|---|-------|
| Age (yr.) | |
| 35 – 39 | -2 |
| 40 – 44 | 0 |
| 45 – 49 | 2 |
| 50 – 54 | 4 |
| Sex | |
| Female | 0 |
| Male | 3 |
| Current smoker | |
| No | 0 |
| Yes | 2 |
| Hypertension | |
| No | 0 |
| Yes | 3 |
| Waist circumference male \geq 90 cm. / female \geq 80 cm. | |
| No | 0 |
| Yes | 4 |

APPENDIX C

Rama –EGAT heart score by participant in Siriraj Hospital.

Score for used by public health provider for male screening

| Risk factors | Score |
|----------------------------|-------|
| Age (yr.) | |
| 35 – 39 | -1 |
| 40 – 44 | 0 |
| 45 – 49 | 1 |
| 50 – 54 | 2 |
| ≥ 55 | 2 |
| Blood pressure (mmHg.) | |
| SBP<120, DBP<80 | 0 |
| SBP 120 – 129, DBP 80 – 84 | 0 |
| SBP 130 – 139, DBP 85 – 89 | 1 |
| SBP 140 – 159, DBP 90 – 99 | 1 |
| SBP > 160 DBP, > 100 | 2 |
| Total cholesterol (mg%) | |
| < 160 | -2 |
| 160 – 199 | 0 |
| 200 – 279 | 0 |
| > 280 | 2 |

Score for used by public health provider for male screening

| Risk factors | Score |
|--------------------|-------|
| HDL (mg.%) | |
| < 35 | 2 |
| 35 – 49 | 0 |
| 50 – 59 | -1 |
| > 60 | -5 |
| Current smoker | |
| No | 0 |
| Yes | 1 |
| Diabetic | |
| No | 0 |
| Yes | 2 |
| Waist \geq 90 cm | |
| No | 0 |
| Yes | 1 |
| Alcohol drinker | |
| No | 0 |
| Yes | -2 |

Score for used by public health provider for female screening

| Risk factors | Score |
|----------------------------|-------|
| Age (yr.) | |
| 35 – 39 | -1 |
| 40 – 44 | 0 |
| 45 – 49 | 1 |
| 50 – 54 | 2 |
| ≥ 55 | 2 |
| Blood pressure (mmHg.) | |
| SBP<120, DBP<80 | 0 |
| SBP 120 – 129, DBP 80 – 84 | 0 |
| SBP 130 – 139, DBP 85 – 89 | 1 |
| SBP 140 – 159, DBP 90 – 99 | 1 |
| SBP > 160 DBP, > 100 | 2 |
| Total cholesterol (mg%) | |
| < 160 | -2 |
| 160 – 199 | 0 |
| 200 – 279 | 0 |
| > 280 | 2 |
| HDL (mg.%) | |
| < 35 | 2 |
| 35 – 49 | 0 |
| 50 – 59 | -1 |
| > 60 | -5 |
| Current smoker | |
| No | 0 |
| Yes | 1 |

Score for used by public health provider for female screening

| Risk factors | Score |
|--------------------|-------|
| Diabetic | |
| No | 0 |
| Yes | 2 |
| Waist \geq 80 cm | |
| No | 0 |
| Yes | 1 |
| Alcohol drinker | |
| No | 0 |
| Yes | -2 |


Score for used by general population

| Risk factors | Score |
|---|-------|
| Age (yr.) | |
| 35 – 39 | -1 |
| 40 – 44 | 0 |
| 45 – 49 | 1 |
| 50 – 54 | 2 |
| ≥ 55 | 2 |
| Sex | |
| Female | 0 |
| Male | 3 |
| Cholesterol (mg%) | |
| < 280 | 0 |
| ≥ 280 | 4 |
| Current smoker | |
| No | 0 |
| Yes | 2 |
| Diabetic | |
| No | 0 |
| Yes | 5 |
| Hypertension | |
| No | 0 |
| Yes | 3 |
| Waist circumference male ≥ 90 cm. / female ≥ 80 cm. | |
| No | 0 |
| Yes | 3 |

Score for used by general population without blood test

| Risk factors | Score |
|---|-------|
| Age (yr.) | |
| 35 – 39 | -1 |
| 40 – 44 | 0 |
| 45 – 49 | 1 |
| 50 – 54 | 2 |
| ≥ 55 | 2 |
| Sex | |
| Female | 0 |
| Male | 3 |
| Current smoker | |
| No | 0 |
| Yes | 2 |
| Hypertension | |
| No | 0 |
| Yes | 3 |
| Waist circumference male \geq 90 cm. / female \geq 80 cm. | |
| No | 0 |
| Yes | 4 |

BIOGRAPHY



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