

Coronary Artery Disease in the Thai Population: Data from Health Situation Analysis 2010

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Background: The rate of cardiovascular disease marked by coronary artery disease (CAD) is increasing in low-middle income countries including Thailand. The burden of CAD will have a significant impact on the healthcare system and the national budget.

Objective: To identify the CAD-related hospitalization rate over one year, to determine in-hospital mortality in various subgroups of patients with CAD and to examine the hospitalization costs of patients with CAD.

Material and Method: The data were extracted from in-patient discharge forms from the three main health insurance schemes in Thailand for the fiscal year 2010 (October 1, 2009 to September 30, 2010). The data included the three major health insurance schemes which provided coverage for about 62 million people (96% of the population). Data regarding coronary artery disease using the ICD-10 (I20-angina, I21-acute myocardial infarction (AMI) and I25-chronic ischemic heart disease) were extracted and analyzed for number of admissions, mortality rate, length of hospital stay and hospital charges.

Results: In 2010, the total admissions of patients with coronary artery disease were 22,507. The most common presentation of CAD was angina pectoris (10,822 admissions) followed by AMI (6,391 admissions) and chronic ischemic heart disease (5,294 admissions). The respective in-hospital mortality rates in patients admitted with AMI, chronic ischemic heart disease and angina pectoris were 11.3%, 2.9% and 0.7%.

Conclusion: Thailand is entering a period of epidemiologic transition marked by an increase of cardiovascular disease and hospital expenses dominated by cardiovascular disease. Information on the burden of CAD-indicates a need to improve health care system.

Keywords: Coronary artery disease, Burden, Thais

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Cardiovascular diseases (predominantly coronary artery disease) are the leading cause of death worldwide. Of concern, the rates of coronary artery disease (CAD) are now also increasing in low- to middle-income countries⁽¹⁻³⁾. An aging population and unhealthy life style have precipitated the increasing share of non-communicable disease of the total disease burden in many developing countries⁽⁴⁾. The magnitude of CAD will likely have a significant impact on the healthcare system and increase the economic challenges to the nation.

Despite a declining death rate from communi-

cable disease, elderly individuals are living with the consequences of atherothrombotic-related diseases. The advent of modern cardiologic practice-including thrombolytic therapy, percutaneous coronary intervention and drug-eluting stents, which together represent high-cost treatments-have increasingly been adopted in today's cardiology practice in Thailand to reduce morbidity and mortality. While many preventive efforts have also been adopted, there is a need to monitor the burden of CAD both in terms of hospital mortality and economic burden and to identify subgroups of CAD conditions at high-risk of mortality requiring more healthcare expenditures.

The healthcare system in Thailand has been dramatically improved over the past decade. At present, the public health financing schemes provide insurance coverage for about 96% of the population including (a) the Universal Coverage scheme (UC), (b) the Social

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Security scheme (SS) and (c) the Civil Servant Medical Benefits scheme (CSMB). The information from these three major public health insurance schemes provide an opportunity to identify the magnitude and burden of CAD in Thai population. The objectives of the present study were: (a) to identify the CAD-related hospitalization rate, (b) to identify the in-hospital mortality in various subgroups of patients with CAD and (c) to examine the hospitalization cost of patients with CAD.

Material and Method

Data included (a) in-patient Medical Expense Forms for the fiscal year 2010 (October 1, 2009 to September 30, 2010) from the National Health Security Office (UC) and the Social Security Office (SS) and (b) in-patient data from the Civil Servants Benefit System from the Comptroller General's Department (CSMB). A data analysis team checked the data for: (a) the overlapping information, (b) mismatched visiting dates, (c) missing items, (d) incorrect coding and (e) correct fiscal year.

Using the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10), the authors extracted data on coronary artery disease including code: I20-angina, I21-acute myocardial infarction (AMI) and I25-chronic ischemic heart disease. The data were analyzed for number of admissions, mortality rate, length of hospital stay and hospital charges. The basic statistical analyses of variables, including frequencies and inter relationships were calculated using SPSS for Windows version 11.

Results

In 2010, there were 6,888,815 in-patient admissions. The largest group of in-patient admissions (excluding infants between 0-1 year of age) was elderly patients (≥ 60 years) (Fig. 1). Disease of the circulatory system (I00-I99) was the most common health problem leading to hospital admission among elderly patients (Table 1). Total admissions of patients with coronary artery disease was 22,507. Most in-patients admissions due to CAD were in the central region (11,656), followed by the northern (4,066), northeastern (3,855) and southern (2,930) regions (Fig. 2).

The characteristics of patients admitted with CAD are presented in Table 2. The most common presentation of CAD was angina pectoris (10,822 admissions) followed by AMI (6,391 admissions) and chronic ischemic heart disease (5,294 admissions). The

average age of these patients ranged between 63 and 68 years and the majority of patients were males. Diabetes was the most common co-morbidity (recorded as a secondary diagnosis) in 20% of patients with CAD. Dyslipidemia was more prevalent among patients with chronic ischemic heart disease (18.5%) while hypertension was more prevalent among patients with angina pectoris (14.8%) (Table 2).

Thrombolytic therapy agents were used in only 4.5% of patients with AMI. Percutaneous coronary intervention (PCI) was performed in 45%, 12% and 3% of patients with chronic ischemic heart disease, AMI and angina pectoris, respectively. Drug-eluting stent (DES) was used in 57% of patients with chronic ischemic heart disease and 45% of those with AMI. Overall, reperfusion therapy (thrombolytic or PCI) was used in 16% of patients with AMI. Coronary artery bypass graft (CABG) was performed in 15% of patients with chronic ischemic heart disease, 2.8% in those with AMI and 0.2% in those with angina pectoris (Table 2).

Hospital case fatality rates were higher for patients with AMI than patients with angina or chronic ischemic heart disease. The in-hospital mortality rates among patients admitted with AMI, chronic ischemic heart disease and angina pectoris were 11.3%, 2.9%, and 0.7%, respectively. The mean length of hospital stay were three days for patients with angina and about six days for patients with AMI and chronic ischemic heart disease. The average hospital expenditure were highest for patients with chronic ischemic heart disease (122,472 Baht/patient) which were almost 10 times greater than the hospital expense for patients with angina (14,874 Baht).

Table 3 presents the mortality rate in the subgroup of patients with AMI. The mortality rates-according to the location of myocardial infarction-were 14.5% for anterior wall AMI, 13% for inferior wall AMI, and 20% for unspecified AMI. The mortality rate in acute subendocardial myocardial infarction was 9.1%.

The characteristics of patients diagnosed with chronic ischemic heart disease are presented in Table 4. Atherosclerotic heart disease, a non-specific nomenclature, was the most common term recorded on the discharge summary forms for 4,543 admissions. Aneurysm of the heart and ischemic cardiomyopathy were associated with high mortality, *i.e.* 16.7% and 8.2% respectively.

Discussion

The authors have reported on the burden of CAD in the Thai population. These data provide an

overview of CAD in Thais with the intent of improving the healthcare delivery system and reimbursement sustainability. The data of the present study were based on the discharged forms of in-patients submitted by each hospital for reimbursement of expenses. The data included the three major health insurance schemes which provided coverage for about 96% of the population in 2010.

CAD is one of the most prevalent forms of cardiovascular disease and is emerging as a disease burden worldwide. CAD has increased in both the high and low income countries and also in both urban and rural areas⁽⁵⁻⁸⁾. It has indeed been predicted that more than half the cases of cardiovascular disease in the world will be in India within the next 15 years⁽³⁾.

Co-morbidity and the risk factors for CAD have been derived from westernized, developed nations; even though two-thirds of the worldwide cardiovascular burden occurs in the low to middle

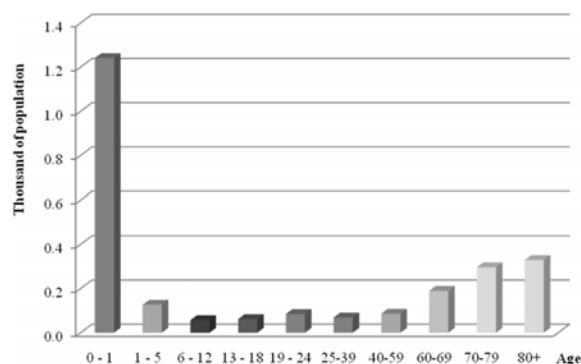


Fig. 1 Rates of in-patient hospital admission per 1,000 population by age group in 2010

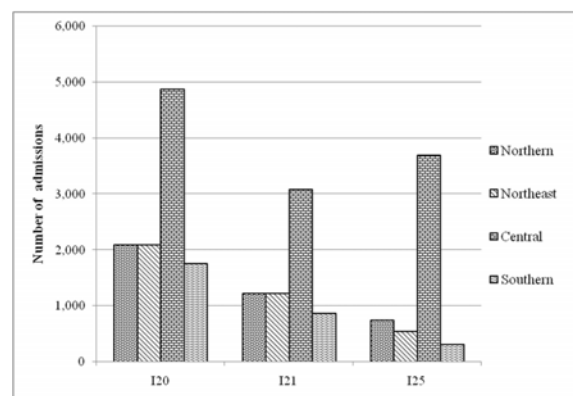


Fig. 2 Number of hospital admissions of heart diseases (I20, I21, I25) by regions (I20 = angina pectoris; I21 = acute myocardial infarction; I25 = chronic ischemic heart disease)

Table 1. Top five reasons for in-patient admissions (IPD) and primary diagnosis (ICD 10) in elderly patients by age group in 2010

Age group (Years)	1	2	3	4	5
60 - 69	I00-I99 Diseases of the circulatory system n 99,291 (13.3)	J00-I99 Diseases of the respiratory system n 83,282 (11.2)	K00-K93 Diseases of the digestive system n 79,911 (10.7)	C00-D48 Neoplasms n 75,332 (10.1)	A00-B99 Certain infectious and parasitic diseases n 72,255 (9.7)
70 - 79	I00-I99 Diseases of the circulatory system n 107,066 (15.1)	J00-I99 Diseases of the respiratory system n 104,621 (14.8)	K00-K93 Diseases of the digestive system n 70,122 (9.9)	A00-B99 Certain infectious and parasitic diseases n 68,415 (9.7)	N00-N99 Diseases of the genitourinary system n 60,180 (8.5)
80 +	I00-I99 Diseases of the respiratory system n 60,271 (18.1)	I00-I99 Diseases of the circulatory system n 56,022 (16.8)	A00-B99 Certain infectious and parasitic diseases n 35,123 (10.6)	K00-K93 Diseases of the digestive system n 32,020 (9.6)	N00-N99 Diseases of the genitourinary system n 30,529 (9.2)

Table 2. Characteristics of patients with coronary artery disease (I20, I21, I25)

Characteristics of patients	Angina n = 10,822	Acute myocardial infarction n = 6,391	Chronic ischemic heart disease n = 5,294
Age (mean \pm SD)	66.6 \pm 11.7	68.0 \pm 11.8	63.5 \pm 11.5
Male sex, (%)	55.3	57.0	66.5
Co-morbidity			
DM, n (%)	2,205 (20.4)	1,397 (21.8)	1,112 (21.0)
Dyslipidemia, n (%)	1,657 (15.3)	809 (12.6)	977 (18.5)
Hypertension, n (%)	1,604 (14.8)	705 (11.0)	428 (8.0)
Other comorbidity, n (%)	5,356 (49.5)	3,480 (54.4)	2,777 (52.4)
Thrombolytic therapy, n (%)	22 (0.2)	288 (4.5)	24 (0.4)
Revascularization Procedure, n (%)			
PCI	375 (3.4)	755 (11.8)	2,385 (45.0)
BMS stent	103 (27.4)	370 (49.0)	971 (40.7)
DES stent	261 (69.6)	341 (45.1)	1,367 (57.3)
Other	11 (2.9)	44 (5.8)	47 (1.9)
CABG	28 (0.2)	182 (2.8)	801 (15.1)
In-hospital mortality, (%)	0.7	11.3	2.9
Length of stay (days, mean \pm SD)	3.3 \pm 4.1	6.4 \pm 15.3	5.9 \pm 10.5
Hospital charge in Thai bahts (mean \pm SD)	14,874.7 \pm 39756.0	52,058.6 \pm 10,7652.2	122,472.4 \pm 138,695.0

Table 3. Mortality rate in acute myocardial infarction (I21)

Variable	n	Death rate n (%)
I21.0 Acute transmural myocardial infarction of anterior wall	771	112 (14.5)
I21.1 Acute transmural myocardial infarction of Inferior wall	491	64 (13.0)
I21.2 Acute transmural myocardial infarction of other site	132	14 (10.6)
I21.3 Acute transmural myocardial infarction of unspecified	203	29 (14.3)
I21.4 Acute subendocardial myocardial infarction	4,170	379 (9.1)
I21.9 Acute myocardial infarction unspecified	624	125 (20.0)

Table 4. Characteristics of patients with chronic ischemic heart disease

Variable	n	Death n (%)
I25.0 Atherosclerotic cardiovascular disease	43	1 (2.3)
I25.1 Atherosclerotic heart disease	4,543	122 (2.7)
I25.2 Old myocardial infarction	129	4 (3.1)
I25.3 Aneurysm of the heart	6	1 (16.7)
I25.4 Coronary artery aneurysm	6	0 (0)
I25.5 Ischemic cardiomyopathy	268	22 (8.2)
I25.6 Silent myocardial ischemia	2	0 (0)
I25.8 Other form of chronic ischemic heart disease	5	0 (0)
I25.9 Chronic ischemic heart disease, unspecified	292	8 (2.7)

income countries. The risk factors for CAD may be somehow different among each region of the world⁽⁹⁻¹¹⁾. Yusuf et al has reported that abnormal lipids, smoking, hypertension, diabetes, abdominal obesity,

psychosocial factors, consumption of fruits, vegetables and alcohol and regular physical activity account for most of the risk of myocardial infarction worldwide in both sexes and at all ages in all regions⁽¹²⁾. In the present

report diabetes, hypertension and dyslipidemia were the major co-morbidity diseases among patients with CAD.

The common presentations of CAD are angina pectoris, myocardial infarction and chronic ischemic heart disease. Acute myocardial infarction has a high mortality and needs urgent management, including pharmacological and non pharmacological therapies. The management of AMI has been well-established and is addressed in guidelines⁽¹³⁻¹⁷⁾. Notwithstanding, real life practice may have a heterogeneity of practice that differ markedly from the guidelines⁽¹⁸⁻²¹⁾. Although all patients with AMI should be offered reperfusion therapy, this standard strategy is less frequently applied in Thailand. Reperfusion therapy was, in fact, used in 16% of patients; while reperfusion therapy-either thrombolytic therapy or PCI-was used in almost 62% in the GRACE registry⁽²¹⁾. Based on our information, there are several explanations. General practice physicians are not familiar with the use of thrombolytic therapy, in part because of the risk of bleeding. It may also be that health personnel are under-trained regarding the benefit of reperfusion therapy and relatedly, a well organized hospital network has not been established in Thailand. Finally, the dearth of cardiologists and availability of PCI centers represent further major limitations for this strategy of treatment.

Hospital mortality for patients with acute myocardial infarction was higher in this present report than in the GRACE registry: hospital mortality was about 5% in the GRACE registry compared with 10% in the present report. Unfortunately, the authors' information does not provide sufficient detail of medical management practices that would help with interpretation of adherence to the standard guidelines. Further study in this regard is needed.

Most of the low to middle income nations (including Thailand) are entering an epidemiologic transition, marked by a dramatic increase in non-communicable disease. The rate of cardiovascular disease is rising globally. The WHO predicts that by 2030, cardiovascular disease will be responsible for 24.2 million deaths annually worldwide⁽²²⁾. In the next few years, hospital expenditures in Thailand will be dominated by cardiovascular disease due to an aging demographic and unhealthy lifestyle choices. The burden of cardiovascular disease is set to grow, demanding strategies to protect the healthcare system, such as (a) increased preventative health promotion and (b) an emphasis on training cardiology in the medical curriculum.

In conclusion, Thailand is entering a period of epidemiologic transition marked in particular by an increase of cardiovascular disease and hospital expenses dominated by cardiovascular disease. Information on the burden of disease-particularly cardiovascular disease-indicates a need to (a) channel resources to preventative health promotion strategies (b) underscore cardiology issues in medical education and (c) ensure sufficient cardiologists are being trained for the healthcare system.

Study limitations

The present study has several limitations that have to be taken into consideration. The data analyzed were from discharge summary forms; therefore, the reliability and validity of the results depended on correct medical diagnosis and coding. Several ICD-10 codes are non-specific and can lead to misinterpretation. Caution should, therefore, be exercised when extrapolating the results herein.

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Potential conflicts of interest

None.

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โรคหลอดเลือดหัวใจในประชากรไทยจากข้อมูลของระบบสุขภาพในปี พ.ศ. 2553

ทรงศักดิ์ เกียรติชูสกุล, สุมิตร สุตรา, แก้วใจ เทพสุธรรมรัตน์

ภูมิหลัง: อัตราการเกิดโรคหลอดเลือดหัวใจสูงขึ้นในประเทศที่มีรายได้ต่อประชากรต่ำถึงปานกลางรวมทั้งประเทศไทย จำนวนผู้ป่วยโรคหลอดเลือดหัวใจซึ่งเป็นโรคที่มีค่าใช้จ่ายสูงที่เพิ่มจำนวนมากขึ้น อาจส่งผลกระทบต่อให้บริการทางการแพทย์ของคนไทย

วัตถุประสงค์: เพื่อศึกษาหาจำนวนครั้งที่ผู้ป่วยเข้ารับรักษาในโรงพยาบาลในระยะเวลา 1 ปี และศึกษาอัตราการเสียชีวิตของผู้ป่วยโรคหลอดเลือดหัวใจชนิดต่างๆ และค่าใช้จ่ายในการรักษา

วัสดุและวิธีการ: ใช้ข้อมูลที่โรงพยาบาลส่งเบิกจ่ายจากสามระบบประกันสุขภาพ คือ ระบบประกันสุขภาพถ้วนหน้า ระบบประกันสังคม และระบบสวัสดิการรักษายาพยาบาลข้าราชการ ในปีงบประมาณ พ.ศ. 2553 ซึ่งครอบคลุมประชากร 62 ล้านคน (ร้อยละ 96 ของประชากรของประเทศ) โดยทำการวิเคราะห์ข้อมูลผู้ป่วยในที่ถูกบันทึกการวินิจฉัยโรค I20, I21 และ I25 โดยวิเคราะห์อัตราการเข้ารับรักษาในโรงพยาบาล อัตราการเสียชีวิต ระยะเวลานอนโรงพยาบาล และค่าใช้จ่ายในการรักษา

ผลการศึกษา: ในปี พ.ศ. 2553 มีผู้ป่วยเข้ารับรักษาในโรงพยาบาลด้วยโรคหลอดเลือดหัวใจทั้งสิ้น 22,507 ครั้ง แบ่งเป็นอาการแน่นหน้าอกจากกล้ามเนื้อหัวใจขาดเลือด 10,822 ครั้ง กล้ามเนื้อหัวใจตายเฉียบพลัน 6,391 ครั้ง และกล้ามเนื้อหัวใจขาดเลือดชนิดเรื้อรัง 5,294 ครั้ง พบอัตราการเสียชีวิตสูงสุดในผู้ป่วยกล้ามเนื้อหัวใจตายเฉียบพลันร้อยละ 11.3 อัตราการเสียชีวิตในผู้ป่วยกล้ามเนื้อหัวใจขาดเลือดชนิดเรื้อรัง และผู้ป่วยที่มีอาการแน่นหน้าอกพบได้ร้อยละ 2.9 และ 0.7 ตามลำดับ

สรุป: ประเทศไทยเข้าสู่ยุคของผู้สูงอายุ และมีการเปลี่ยนแปลงแบบแผนการเจ็บป่วยจากโรคติดต่อไปสู่โรคไม่ติดต่อ โดยเฉพาะโรคหลอดเลือดหัวใจ ซึ่งเป็นโรคที่มีค่าใช้จ่ายสูง ข้อมูลที่ได้จากการศึกษานี้จะช่วยในการพัฒนาระบบการให้บริการสุขภาพให้ดีขึ้น เพื่อนำไปสู่การมีสุขภาพดีถ้วนหน้า
